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The B&R Technology Magazine

Process and factory automation

Take control of every process

mapp technology Full focus on innovation

Automation Studio Standardization paves the way to the future

HMI systems What goes around, comes around

Process control APROL – For stepwise migration

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Tel.: +43 (0) 7748/6586-0
redaktion@automotion.info

Managing Director: Hans Wimmer

Editor: Alexandra Fabitsch
Editorial staff: Craig Potter
Authors in this edition: Eugen Albisser, Yvonne Eich, Vitor Hayakawa, Stefan Hensel, Peter Kemptner, Jana Otevrelova, Franz Joachim Roßmann, Jaehoon Sa, Huazhen Song

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As environmental regulations and demographic changes continue to shape the future of the process manufacturing industry, one of the most prominent themes will be plant modularization. The challenge of the modular plant will be how to quickly and effectively integrate intelligent units into a complex production line without excessive engineering overhead, yet retaining the ability to satisfy customers' individual requirements and requests.

In spite of all this newly gained flexibility, there is no room for compromise with regard to product quality, seamless documentation and traceability, and sustainable production methods.

B&R's APROL process control system satisfies the requirements of flexible and modular process manufacturing plants without neglecting the high demands on availability and data consistency. This innovative distributed control system already facilitates the design of machinery and plants that meet the needs of Industry 4.0 production.

APROL has taken the next step in this direction with a fully integrated business intelligence solution that gives users powerful and convenient reporting functions that allow for exploratory analysis of plant and production data.

In this edition of automoton, you'll find out more about the potential for advanced, modular process and factory automation.

We also look forward to welcoming you at ACHEMA 2015 in Frankfurt.

Happy reading!

Stefan Lau
Head of B&R's Competence Center for Process & Factory Automation, Northern Europe

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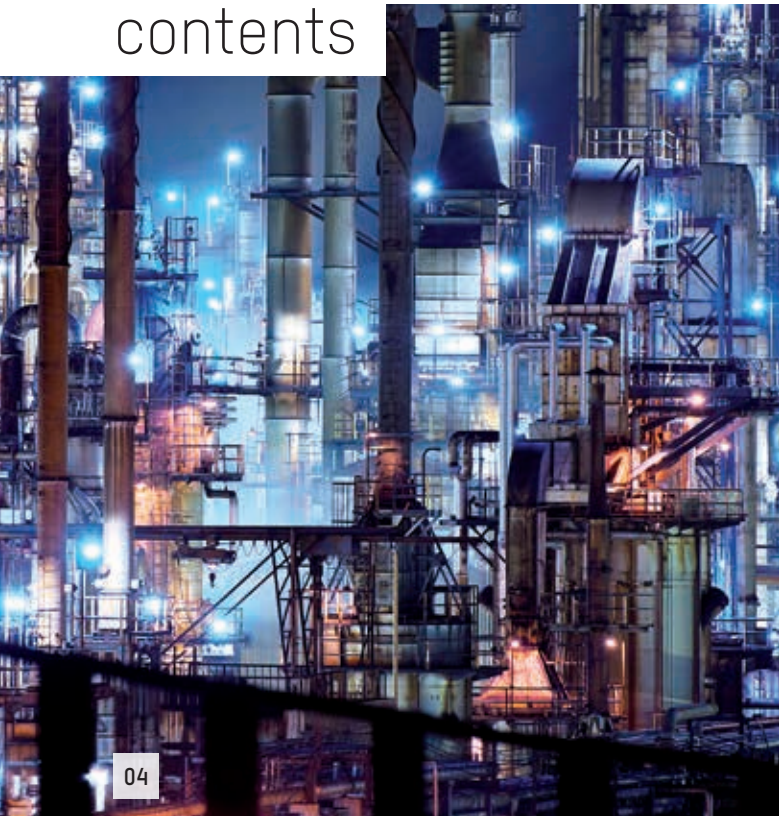

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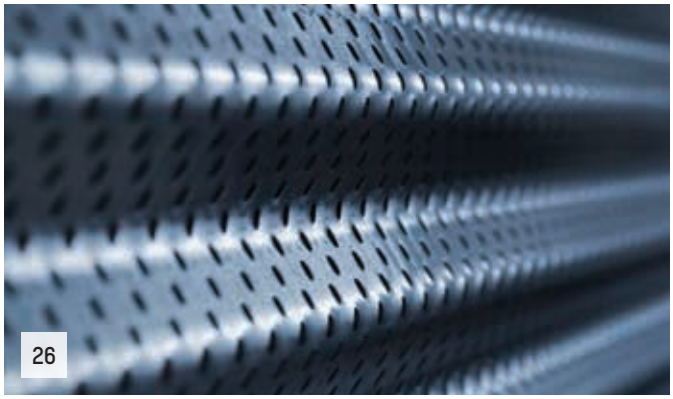

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Take control of every process

As industrial manufacturing processes grow more complex, increasing numbers of sensors flood the control system with input, while increasing numbers of actuators require highly precise output. When conventional SCADA and PLC solutions run up against their limits, what's needed is a fully integrated system to control, monitor and coordinate every aspect of production.

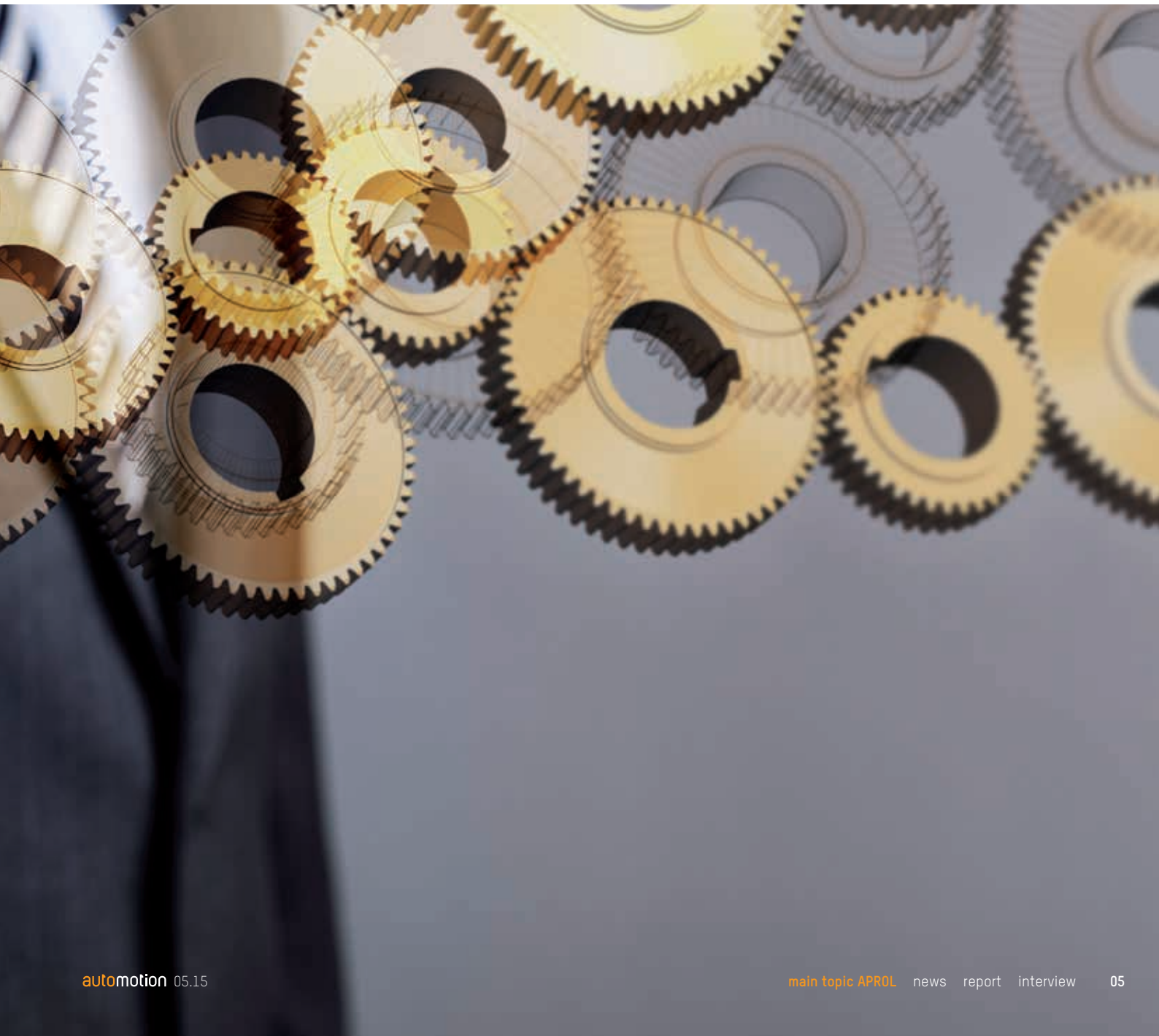
Photo © iStock.

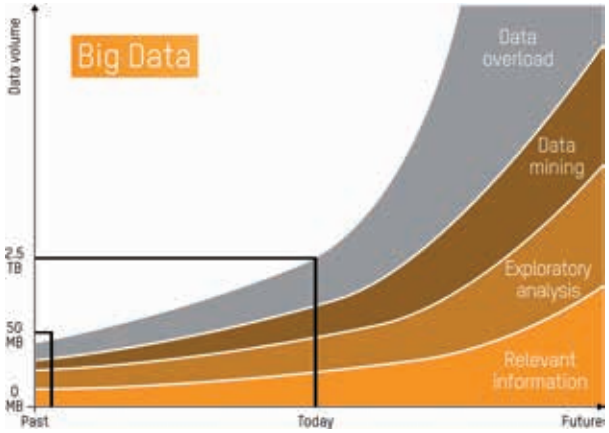
"The days when each machine and line in a factory could be treated like a self-contained unit are over," explains Martin Reichinger, manager of B&R's Process Automation business unit. "To name just one example: If you want to guarantee maximum productivity and product quality, then the packaging machine at the end of the line needs to coordinate with the filler at the beginning." Production processes have grown so complex that it is no longer feasible to configure and monitor key production parameters manually. Big data is a big challenge. Channeling and filtering the overwhelming flood of machine data, process data and operating data into coherent, actionable information calls for what is known as a manufacturing intelligence solution.

One solution for any manufacturing process

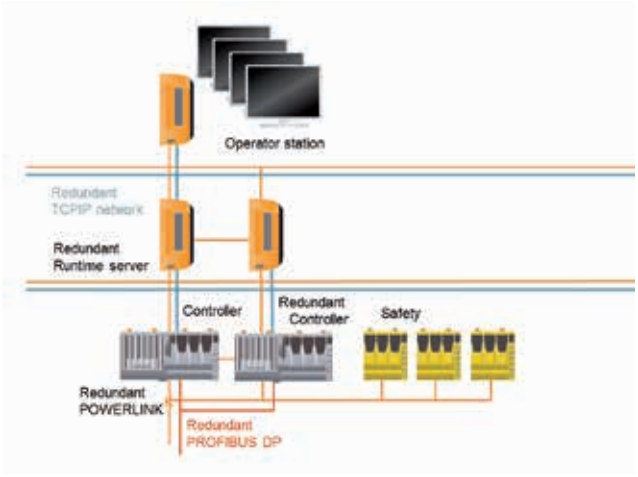
The other thing the market demands is flexibility. "You need to be able to make product changes on the fly with minimal setup," explains Reichinger. "That's the only way you can hold your own in today's market." Custom-printed bottles and packaging may be found in isolated marketing campaigns for now, but in a matter of years they will become the norm.

Even small and mid-sized plant owners need to be thinking about how they are going to offer this level of flexibility. The only answer is a fully integrated solution that unifies control, monitoring and coordination of all aspects of production.





Intelligent systems filter relevant information from a rising flood of data.



APROL makes it easy to design high-availability systems with redundancy at every level.

"For a long time, you would only find these systems in large processing plants," recalls Reichinger. It is this history that gave rise to the term process control system. Yet, the underlying principle of a process control system can just as easily be applied to any manufacturing process or infrastructure system.

Factory, process and infrastructure automation with APROL

The transition to a process control solution is notoriously complicated and costly. This has led many process control system suppliers to offer a separate system for factory automation and another for infrastructure automation in an attempt to clear the initial hurdle. "This approach presents plant operators with a major disadvantage," explains Reichinger. "They end up with three different systems, each generating its own costs for training, replacement parts and maintenance." That's why B&R took a different path with APROL. In a single, consistently easy-to-use platform, APROL unifies process automation, factory automation and infrastructure automation.

Scalable architecture

The APROL architecture is perfectly scalable. From a basic configuration with a controller and an industrial PC up to a complex client-server system featuring hundreds of controllers and dozens of runtime servers and operator stations – there is an ideal APROL architecture for any set of requirements. Should those requirements change, the system can be expanded modularly at any time to add new functions.

"Say you're already controlling a production plant with APROL, and down the road you determine that climate control is a relevant factor for your process," says Reichinger. "It's no problem to integrate control and monitoring of that equipment into the process control system to ensure optimal environmental conditions at all times." You don't need to purchase, install and maintain a whole new system. You don't need new software, and you don't need any additional control stations.

Systems with 50 to 200,000 I/O channels

With APROL, it makes no difference whether you're building a demo plant at a technical school with 50 I/O channels, or a large-scale infrastructure project with 200,000. The architecture can even be expanded during operation. For specific applications such as energy monitoring, condition monitoring and advanced process control, APROL offers out-of-the-box solutions that come preinstalled, preconfigured and ready to use. "APROL delivers all the advantages of process control without demanding specialist knowledge," says Reichinger. These solutions can be expanded into a full-fledged process control system at any time without having to switch to a new system.

Redundancy at every level

In many processes, high availability must be guaranteed in order to avoid costly downtime. Such plants rely on complete system redundancy. In an APROL system, the fieldbus, controller, process bus, runtime server, operator bus and operator stations can all be laid out redundantly. Should the active system malfunction, the standby system takes over all of its tasks in a bumpless failover. This prevents production downtime, improves process reliability and ensures consistent output quality. It also prevents any gaps in data acquisition, which ensures comprehensive and seamless documentation of the entire manufacturing process. "Since no special hardware is required, a non-redundant system can made

APROL provides a clear overview of all the data for a plant, machine or factory.

redundant at any time. This makes every component a 100% secure investment," explains Reichinger.

Open standards reduce risk

Bringing machines and lines from multiple manufacturers together to form a well-functioning factory is normally a job for a systems integrator. Interfaces are required so that these machines can communicate not just with one another, but with a supervisory level control system such as SCADA. "B&R offers a completely uniform solution for this," explains Reichinger. APROL supports all of the most common fieldbus technology, allows connection of third-party controllers and supports open standards like OPC, OPC UA, PLCopen and PackML. The inconvenience and potential for errors that come with programming custom interfaces are all but eliminated.

Seamless acquisition and documentation of process data

"More and more companies are finding themselves obligated – whether through legal standards or customer contracts – to provide rigorous documentation of their manufacturing processes," notes Reichinger. While this phenomena has traditionally been limited to the food, beverage and pharmaceutical industries, today you'll also find automotive manufacturers, for example, requiring that their suppliers provide a comprehensive part history for each and every component. "Not only does a process control system record all relevant production data, it also keeps a history of every operator action and a logs every warning or alarm ever generated. It's the perfect tool for the job," says Reichinger. B&R's process data acquisition solution, APROL PDA, is available as an integrated feature of the APROL process control system or as a preconfigured standalone package.

Martin Reichinger
Business Manager of Process Automation, B&R

"With B&R's APROL automation platform, you have one easy-to-use system that incorporates factory automation, process automation and infrastructure automation."

Creative data exploration

Traditional analysis methods based on rigidly defined reports are gradually giving way to more creative exploratory approaches. When dealing with large data sets whose correlations are not fully understood, exploratory data analysis is an approach that uses graphical visualizations to provide insight and help form hypotheses. With access to data from all sources, the analysis can expose important cause-and-effect relationships. APROL features a comprehensive selection of reporting and analytical tools able to generate custom reports at the push of a button. Designing a custom report is as easy as using drag-and-drop. Ad-hoc reports, dashboards and mobile access with server-side authentication ensure that the information you need is available when and where you need it. You don't need to be an IT specialist to figure it out, either. "The analytical and reporting features really round off the APROL automation platform. They are a key part of what makes it the ideal tool for meeting the challenges of the future head-on," says Reichinger. ←

Photo © Sanofi-Aventis

Process control systems

Managing migration risk with B&R process control

When you replace a process control system, it's important to implement a carefully planned migration strategy in order to minimize the impact on ongoing production. This is especially true when the system in question supplies downstream production lines with raw, base or auxiliary material. In these cases, even a brief outage can be amplified into major production downtime. Sanofi-Aventis Germany has implemented a pilot installation at their Frankfurt-Hoechst location for a system that supplies pharmaceutical production lines with WFI-grade water. In the process, they illustrated that even a system structure that has grown in complexity over the years can be safely and efficiently migrated using a combination of B&R's APROL technology and a well-designed strategy. Upon successful completion of this pilot project, Sanofi-Aventis – one of the world's top ten pharmaceutical companies – began migrating numerous other plants to the powerful process control system from B&R.

As plants and systems age, their reliability may begin to waver or suppliers may discontinue certain components, and eventually they need to be replaced. When this happens, the top priority is to get back up and running at full capacity as quickly as possible and to ensure reliability over the years to come. Ideally, the change is also accompanied by improvements to the previous system. Yet the time and cost of migrating to more modern technology is not to be underestimated – nor is the risk of unexpected production downtime. This becomes especially critical when downstream production relies on the materials produced by the migrated system. The risks can be minimized by developing a customized migration strategy.

Managing migration risk

"There is no such thing as a one-size-fits-all migration strategy. Strategies are strongly influenced by how the individuals involved perceive the situation and assess the risks," explains Christian Sturm, the responsible Sanofi-Aventis project engineer. "Like most pharmaceutical companies, we prefer an incremental approach to migration. This minimizes the risks involved in migration without allowing the processes of system qualification and validation – which are required each time changes are made – to get out of hand."

With an incremental migration, the process control system is replaced by new technology while at the control and field level things remain relatively unaffected. If these systems also need to be replaced, the company can buy some time by building up a supply of replacement parts.

"The added security of an incremental migration does come at a price, however," Sturm points out. "For one, the existing system needs to be kept alive, parallel to the new process control system, until the migration is complete." This means extra space, extra organizational costs and extra documentation.

"The main question, though, is how and when the new process control system can be commissioned and validated," emphasizes the Sanofi-Aventis expert. "If you're able to access the existing system in parallel, then technology can be commissioned prior to the actual changeover. And perhaps more importantly, it is then also possible to qualify the control system and validate the new computer systems in advance."

These advantages more than compensate for the disadvantages of incremental migration. An important criterion when selecting a process control system is therefore the extent to which it permits and supports an incremental migration strategy.

Software structure affects life cycle

For Sturm, the complexity and usability of the software is an important consideration when evaluating a process control system. "When a plant exceeds a certain size, it's better to avoid becoming completely dependent on external services and keep the necessary know-how primarily in-house." This is only possible if the software can be used without requiring an IT expert every step of the way. "The structure of the software must also be sufficiently mature. The software should form an encapsulated unit that runs independently of the respective operating system and its programming interfaces. In the end, this will increase the service life of the control system," adds Sturm.

Many migration tools claim to help manage complexity and simplify engineering. "Unfortunately, it has been our experience that not all tools live up to their promises," says Patrick Heiber, head of EMR maintenance at Sanofi-Aventis. One problem we frequently encounter is that systems tend to accumulate dead code over the years, and a migration tool will automatically adopt this unnecessary code into the new system without checking it. Instead of simplifying the software, this makes it even more complex. "Migration tools can also be very helpful in reducing the amount of programming required," Heiber concedes, "although I have yet to see a tool that delivers 100% migration without requiring some level of man-

Christian Sturm
Project Engineer,
Sanofi-Aventis Deutschland GmbH

"The results confirm that B&R APROL was the right choice."

ual interference or revision – especially when it comes to dynamic objects." Checking the code and objects remains an indispensable step in the process.

Dedicated tools can often provide the best possible support for the migration process, as the TAG Importer from APROL demonstrates. The TAG Importer only needs to be validated once, and can then read the code from various controllers and create an entire APROL project at the press of a button with virtually no input from the user. "Once the process has been validated according to the specifications in CFR Title 21, Part 11 or Annex 11, it is safe to assume that the process functions reliably and doesn't require any further qualification," adds the Sanofi-Aventis project manager. "The TAG Importer tool is not only helpful during migration, but also when making modifications later in the system's life cycle."

B&R's APROL comes out on top

When Sanofi-Aventis initiated the migration project for 15 systems that supply Water For Injection (WFI) for pharmaceutical applications – systems that had been growing in size and complexity for many years – the tight integration with existing controllers provided by the TAG Importer helped B&R APROL prevail over four other competing process control systems in an extensive evaluation.

B&R APROL also provides parallel access to the existing control layer while allowing the existing process control system to continue operating unimpaired. This allowed Sanofi-Aventis to perform an incremental migration including process validation "on a living subject" with impressive results.

"We're especially happy with the structure of the software, which we tested quite thoroughly," reports Sturm. "As a Linux-based system, APROL comes very close to the ideal of an encapsulated automation solution decoupled from the fast-changing world of office software." Sturm also cites APROL's intelligent disaster recovery mechanisms as contributing toward the decision in favor of B&R. "B&R also set up a control computer that doesn't require a degree in Computer Science to operate," adds Sturm. "Even system maintenance is no problem for our own personnel."

Pilot installation with APROL and ABB Freelance controllers

Sanofi-Aventis already uses large numbers of B&R components, though they had never implemented a full company-wide project with APROL. "As a pharmaceutical company we are very conservative, so we started the migration with a single pilot system to further reduce the risk involved in switching suppliers," explains Sturm. The pilot installation has been built new from the ground up, but provides all the same functionality as the large existing systems. We equipped it with a B&R APROL process control system and ABB components at the control and field level. "Our high expectations were fully satisfied. The results confirm that B&R APROL was the right choice," summarizes Sturm. "We have already begun the process of converting the remaining WFI systems to the new process control solution over the course of the next two years." ←

Photos © Sanofi-Aventis

Competence Center for Process

B&R has been active in the field of process manufacturing for years with its APROL process control system, making inroads in a variety of industries and establishing a solid installed base. From this base has grown a team of specialists with in-depth knowledge of each industry's unique characteristics and needs.

Now, B&R is intensifying its focus on process and factory automation by mounting an internationalization campaign to bring APROL to more than 15 countries – supported by strategically located international competence centers.

The APROL Competence Centers provide B&R's customers access to valuable expertise in the development of applications and processes for a wide range of industries. In return, B&R will be able to learn more about its customers' requirements in order to continually optimize its solutions.

At the APROL Competence Centers, users will benefit from these industry experts' many years of experience in the field: ←

For more than 25 years, Martin Reichinger has been active internationally in the area of product management for process control systems, fieldbus systems and field devices. He has been B&R's business manager for process automation for the past 10 years.

Wolfgang Esterbauer has 15 years of project management experience in the field of automation and engineering. As of 2015 he is now the Competence Center's business development manager. He is our expert for oil, gas and energy.

Felix Tücking has been active in the process manufacturing industry for 25 years. For the past 8 years he has worked as a process automation sales engineer at B&R. Before joining the B&R team, he spent 18 years as a sales engineer for process control systems in the chemical industry. He is our expert for the chemical industry.

& Factory Automation

Stefan Lau has been active in the field of automation for over 25 years. For the past 11 years, he has been responsible for process automation at B&R Germany, and since 2014 he is also the head of the APROL Competence Center. Prior to that, he served for 10 years as a global account manager for key customers in the food & beverage, pharmaceutical and chemical industries. He is our expert for the pharmaceutical industry.

Ludwig Hafner has been with B&R for more than 25 years. He spent 10 years in the area of applications and support before moving to sales for process control systems. Since 2015 he has served as the head of business development at B&R. He is an expert in the areas of steel and fiber production as well as oil and gas.

Matthias Rosch has been a B&R process automation systems specialist for the past 7 years. Before joining B&R he worked for 5 years as a service engineer for chemical processing plants. He is our expert for plant manufacturing.

Ulrich Ahlert has worked with B&R's APROL process control system for 17 years. For 3 years he was the project manager in charge of the Veltins brewery project. He is our expert for the food and beverage industry.

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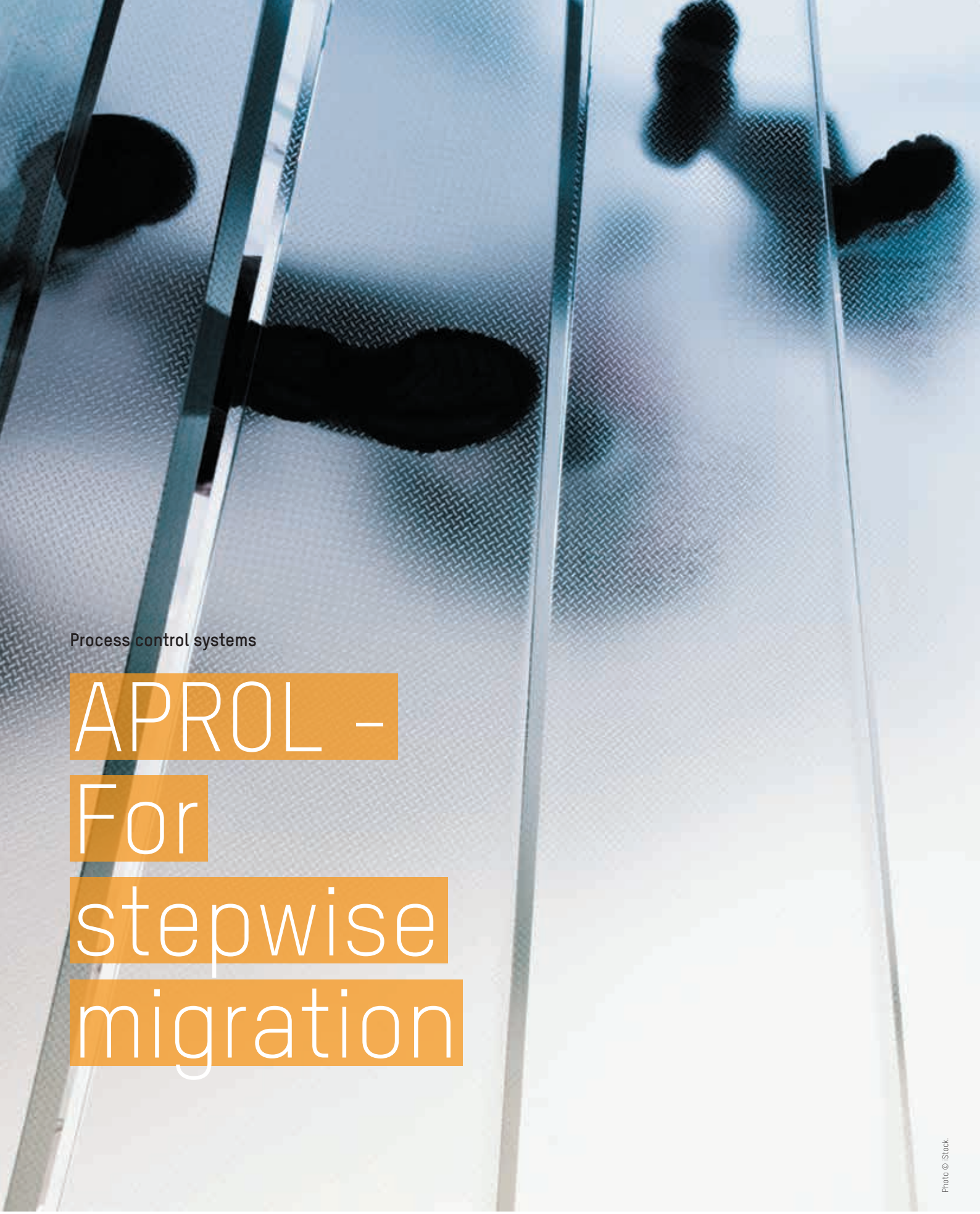

Process control systems

APROL – For stepwise migration

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Companies, particularly medium-sized enterprises, cannot afford excessive production outages in the course of modernizing the control technology used in their processing systems. Migrating to a new solution step by step can be the answer to maximizing system availability and avoiding extended or unplanned downtime, as demonstrated by a recent migration project at specialty chemical producer CHT/BEZEMA. In order to succeed at this, however, the process control system and control technology need to support the stepwise approach – as exemplified by the B&R solution.

"We've improved the reliability of our processes and the quality of our products, and we're now able to react more quickly and flexibly to changing market requirements," reports Günther Schätzle, head of production engineering at CHT R. BEITLICH. This was made possible by modernizing the processing stations at the company's key production site, the factory in Dusslingen, Germany, with B&R technology.

"A solution like B&R's APROL is especially popular with midsized companies like CHT," adds Schätzle, "because it allows us to minimize the risk involved in system migration." Unlike other process control solutions, APROL doesn't cater solely to big industry and its fully automated recipe approach. This was welcome news for CHT, because a system migration was becoming increasingly urgent.

Premium specialty chemicals from 68 stations

From its origins as a supplier of textile chemicals, CHT has expanded its business to include specialty chemicals in the areas of textiles, textile care, construction chemicals and performance chemicals. The company's customer-oriented product development continues to expand an already broad spectrum of products. The majority of the CHT's revenue comes from very complex products, which are produced primarily at the production and logistics center in Dusslingen.

The Dusslingen site is home to 68 processing stations, including 10 higher-level supply systems, 40 mixing vessels and 14 chemical reactors. Many of the production stations are multifunctional and can be used to produce up to 100 different products.

Migration objective: Increased efficiency

"It was becoming increasingly apparent that our systems for control, HMI and operating data acquisition, which had grown over the course of many years, would soon no longer be able to keep up with the intensifying demands on product quality, quality assurance, process reliability and safety regulations," says Schätzle, explaining CHT's motives for beginning the migration process early in 2011. "What is more, our outdated technology was preventing us from filling new orders."

It took three days, for example, just to install a new valve and get it up and running. The increasing frequency of age-related equipment failure and difficulty obtaining replacement components were further arguments in favor of migration.

The objective was to replace the control, HMI and data acquisition systems, which had become outdated, inflexible and prone to failure, with state-of-the-art new technology. "Fully automating everything was certainly not our primary goal," adds Schätzle, "as that would have been too complex for our multifunctional stations."

The APROL process control system stands out

CHT formed a team of experts to perform an in-depth evaluation of three different process control systems, as well as control and HMI solutions from two bidders, based on an exhaustive matrix of specific criteria. In the end, B&R came out on top. For Schätzle, the arguments supporting this decision were clear. "One of the decisive factors was that B&R's APROL – in contrast to the other very well known, widely used systems we evaluated – provides optimum support for stepwise migration. APROL allowed us to move our production stations successively to the new process control system while keeping the old systems running in parallel."

The CHT experts especially valued the newfound independence from Windows. B&R's process control and HMI technology is based on Linux, and the structure of the process control system is remarkably clear and intuitive.

B&R hardware perfectly scaled to the system structure

B&R's finely graduated selection of control and HMI products has allowed CHT to match the performance of each system's PLC to its requirements, as well as equip each system with a unique lineup of I/O modules and its own HMI unit. It was this flexibility that led the chemical producer to rely on B&R for control and HMI in addition to the process control system.

"The advantage is that we can mirror the actual system structure directly in the control and HMI technology, which helps us implement the stepwise migration perfectly from a hardware perspective," explains Schätzle. He continues, "Another argument in favor of a single source solution is the lack of problems with interfaces and communication."

Schätzle concedes that a solution from a large German control supplier would also have allowed CHT to equip each of its stations with a separate controller. "Yet this would only have been possible in a roundabout way or with the aid of a soft PLC, both of which were out of the question for us," he explains.

The CHT manager sees very few disadvantages to switching suppliers for its process control system and control technology. "We would have had to rewrite a significant portion of our software anyway since 50% of the code we've accumulated over the years is now unused, which would make reusing the software virtually impossible."

From a cost perspective, Schätzle sees little difference between the solutions evaluated. "There were some considerable differences in the offers we received from systems integrators," says Schätzle, "yet the price estimates for the respective process control solutions varied by no more than 20%." This is likely due to the strongly decentralized structure of the production stations, which can be represented ideally by the distributed structure selected for the process control system.

APROL provides flexibility through openness

For CHT, selecting a systems integrator was about more than the bid price alone. More importantly, the integrator would need to be willing and able to accommodate the needs of a specialty chemical producer, especially

Günther Schätzle (r.)
Head of Production Engineering, CHT R. BEITLICH

"APROL allows us to monitor and document our processes, giving us clearer insight into the complex interrelationships."

In addition to the APROL process control system, CHT is also adopting B&R's X20 control system. The new solution includes a total of 46 Power Panel HMI units from along with countless other control and I/O modules B&R.

CHT's process sequences are much easier to analyze with APROL. TrendViewer and AuditTrail now permit analysis of processes that couldn't even be observed with previous solutions.

with regard to additional changes throughout the course of the project. Of the five systems integrators in question going into the evaluation phase, Erler came out on top.

"Going into the project we were well aware of the scope and complexity of the task at hand. Since we had no previous experience with APROL, we were initially a bit skeptical as to whether this system was up to the challenge," explains Alois Erler. "Our doubts faded quickly over the course of the project, however."

The migration process also went more smoothly than expected, as Erler confirms: "APROL is very open compared to other process control systems, which allows us to react very flexibly to customer requirements even when a project is already underway. We were also very pleased with how easy it was to link up to the existing legacy system. That went astoundingly well."

The first migration took place in late 2011 on an immensely complex pilot station with around 360 digital and 20 analog I/O channels, and since then a new production station has been migrated nearly every week. By the second quarter of 2013, all 68 stations at the Dusslingen plant had been completely migrated to APROL, and the old process control system was shut down for the last time. CHT's new solution includes 46 Power Panel HMI units, just under 70 X20 controllers and a total of around 14,000 digital and 1,000 analog X20 I/O channels, as well as various shift supervisor stations connected via VNC. The system includes two runtime servers, one engineering server and a VNC server secured by a disaster recovery system. The redundant Linux-based production network communicates with Windows devices on the corporate network via a clearly defined interface.

Double redundancy guarantees availability

"We have even incorporated double redundancy," adds Schätzle. Every component in a station can be reached via two bus systems: an operator bus and a process bus. Each bus can take over for the other if it becomes necessary. In addition, each station is equipped with two ports that can back each other up. This ensures the high availability that the stations demand.

Before the migration was even complete, it was clear that CHT had found more than simply a replacement for the old system. "The APROL system is significantly more flexible, and we can now have a new valve up and running in a matter of hours rather than days. Any changes to the software can also be reversed with a single click if an error is detected."

Analyzing process sequences is also a much simpler task these days. "With TrendViewer and AuditTrail, we found that we were able to analyze processes that we didn't have access to before," explains Schätzle. "APROL lets us analyze interactions between processes in real time in order to implement process optimizations on the spot. Failed batches can be tracked and analyzed later on based on the logged process data."

One way that CHT uses this additional information is to analyze and reduce energy consumption. "We now also have the option of controlling critical process values individually to further increase the safety of the stations, especially with regard to processes that require certification.

Utilizing savings potential with APROL EnMon

CHT is looking to take advantage of the additional savings offered through energy management by becoming one of the first users of the brand new EnMon library for APROL.

"We are absolutely satisfied with the progress of the migration so far, and it hasn't cost half of what a fully automated solution would have. The stepwise approach, the parallel operation of the APROL and legacy systems, and routing via a data concentrator – all that hardly affected our production, and we had no data loss whatsoever," says Schätzle, pleased. "This system allows us to react more flexibly and quickly to the latest developments and implement changes cost-effectively. The positive results have convinced us to continue the migration to APROL for more of our production sites." ←

Photos © CHT

Fiber production

Fully automatic, automatically full

Lenzing AG produces cellulose fibers for textiles and sanitary products. Because the source material is produced continuously but utilized at a rate that fluctuates with demand, the system must be operated with a high level of anticipation that has previously proven difficult to automate. The model predictive control functionality offered by B&R's APROL process control system, however, relieves operators and improves process reliability.

From technical applications to the production of textiles and sanitary products, manufacturers have many different uses for special man-made fibers. Cellulose fibers make up an important part of this global market. Produced from wood, a renewable resource, they are more friendly toward both human skin and the environment than their synthetic counterparts. With an annual production of 890,000 tons, Lenzing AG counts among the world's leading manufacturers of cellulose fibers. Many consumers are familiar with the Austrian company's products under the brand names TENCEL, Lenzing Modal and Lenzing Viscose.

Photo © iStock.

Beyond PID

To convert cellulose into finished fibers, the infeed and outfeed must operate continuously while the material between undergoes a two-stage batch process. Supplied at a average rate of 50 tons per hour, the material must first be pre-treated in a reactor and then homogenized before being transported into a 1,000 cubic meter tank. The preliminary product is not taken from this buffer tank at a constant rate, but rather on demand. To minimize the risk of downtime in downstream stations, a constantly high fill level must be maintained. Due to the duration of the upstream batch processes, however, it takes around two hours to react to a fluctuations in demand. This dead time ruled out the use of a PID controller to automate flow rate adjustments.

Instead, the previous solution relied on human operators' ability to make predictions based on past experience rather than simply reacting to a given situation. By adjusting the upstream flow rate in advance, they are able to compensate for downstream disturbances, such as maintenance work. Six plant operators per shift were tasked with this responsibility. Since the effects of each ad-

justment linger for hours, the hand-off between shifts was always problematic. Considering the serious costs that could be associated with a mistake, only highly experienced employees were trusted with the job.

Goal: Automatic fill level regulation

"We've frequently been unhappy with the results at this central location in response to changes in production volume. That gave us the idea to regulate the fill level based on data from the production planning system," says Bernhard Voglauer, the head controls engineer for fiber technology. What Lenzing wanted was a solution that is transparent for plant operators and provides constant control quality across all shifts. "From a previous attempt we had learned that external systems – in addition to being expensive and high-maintenance – require expert knowledge to operate. This time around, our goal was therefore to find a solution that could be seamlessly and completely integrated in the existing APROL process control system from B&R."

Model predictive control (MPC) presented itself as the perfect solution. MPC calculates the effects of infeed flow rate on future production states based on a dynamic discrete-time model of the process. This takes advantage of the plant operator's knowledge to calculate the optimum infeed flow rate while also accounting for input constraints such as the maximum permitted ramp-up and ramp-down slopes. The control algorithm is executed cyclically in order to pick up any changes to the actual values.

APROL-integrated MPC

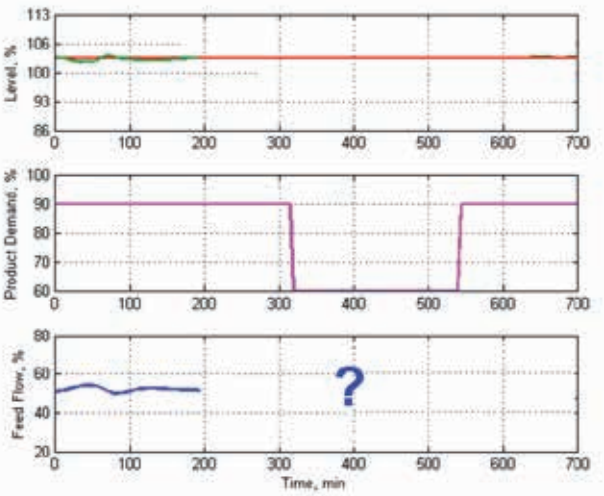
Having set this goal, Lenzing worked with B&R to specify its model predictive control requirements, and B&R developed the APROL APC (Advanced Process Control) solution for its APROL process control system. APROL APC is available starting with the current release, APROL 4.0.

"The solution requires the latest version of APROL, but our system runs an older version and we had no plans to upgrade," says Voglauer, recalling what seemed like an obstacle to fully integrating the solution in the existing system. "By installing an APROL APC system with a dedicated X20 controller, however, we were able to cross-communicate with the rest of the system in real time and successfully migrate the MPC solution."

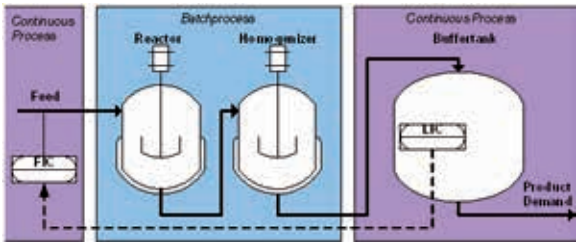
The MPC module uses on a non-parametric impulse response model. "This makes it very easy to enter the model or change it later if necessary," confirms Voglauer. "There is hardly any more input effort than with a PID controller."

Manual or fully automatic

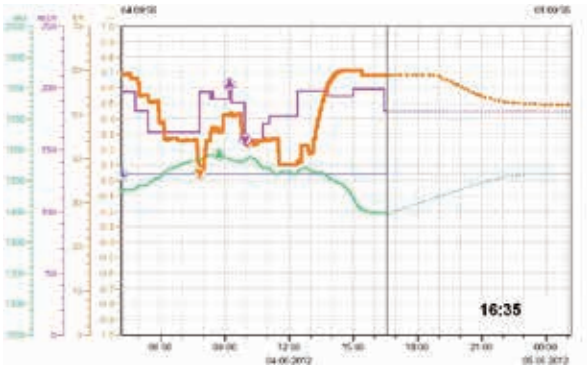
The MPC controller reads the actual values cyclically in three-minute intervals. Optimal infeed flow rate adjustments are determined



The challenge was to figure out the optimum feed rate adjustment for dealing with predictable future changes in demand, such as downstream maintenance.



The preliminary product is prepared continuously, then subjected to a two-hour batch conversion process involving a reactor and homogenization stage before being stored in a buffer tank to be utilized on demand. Since the buffer tank only lasts for a few hours, the goal is to maintain a constantly high fill level in order to prevent production outages.



The fill level of the buffer tank (green), the outfeed flow rate (pink) and infeed flow rate (orange) plotted over time with a trend forecast.

Lenzing AG operates the world's largest integrated pulp and viscose fiber production site, with an annual capacity of 268,000 tons.

automatically. This is a very intuitive solution for the plant operators, who often have it running even when operating manually, serving as a sort of GPS navigation system for flow rate regulation.

The standardized HMI application provided with APROL MPC records the changes in flow rate and fill level over time. Unlike the strips of paper produced by the old chart recorder, it displays a continuous trend forecast. This helps visualize future changes in the fill level based on planned utilization, as well as the timing and slope of changes in the infeed flow rate.

GPS and autopilot rolled into one

Unlike a regular navigation system, APROL MPC offers the option of switching to fully automatic mode. "After a little tuning to account for special contingencies, the automatic mode produces results that only the most experienced plant operators can match – particularly when faced with sudden, strong fluctuations in demand," notes Voglauer. "Our operators still like to run things manually, but they appreciate the 'GPS' support and the ability to switch on 'autopilot' during shift changes and in other special situations."

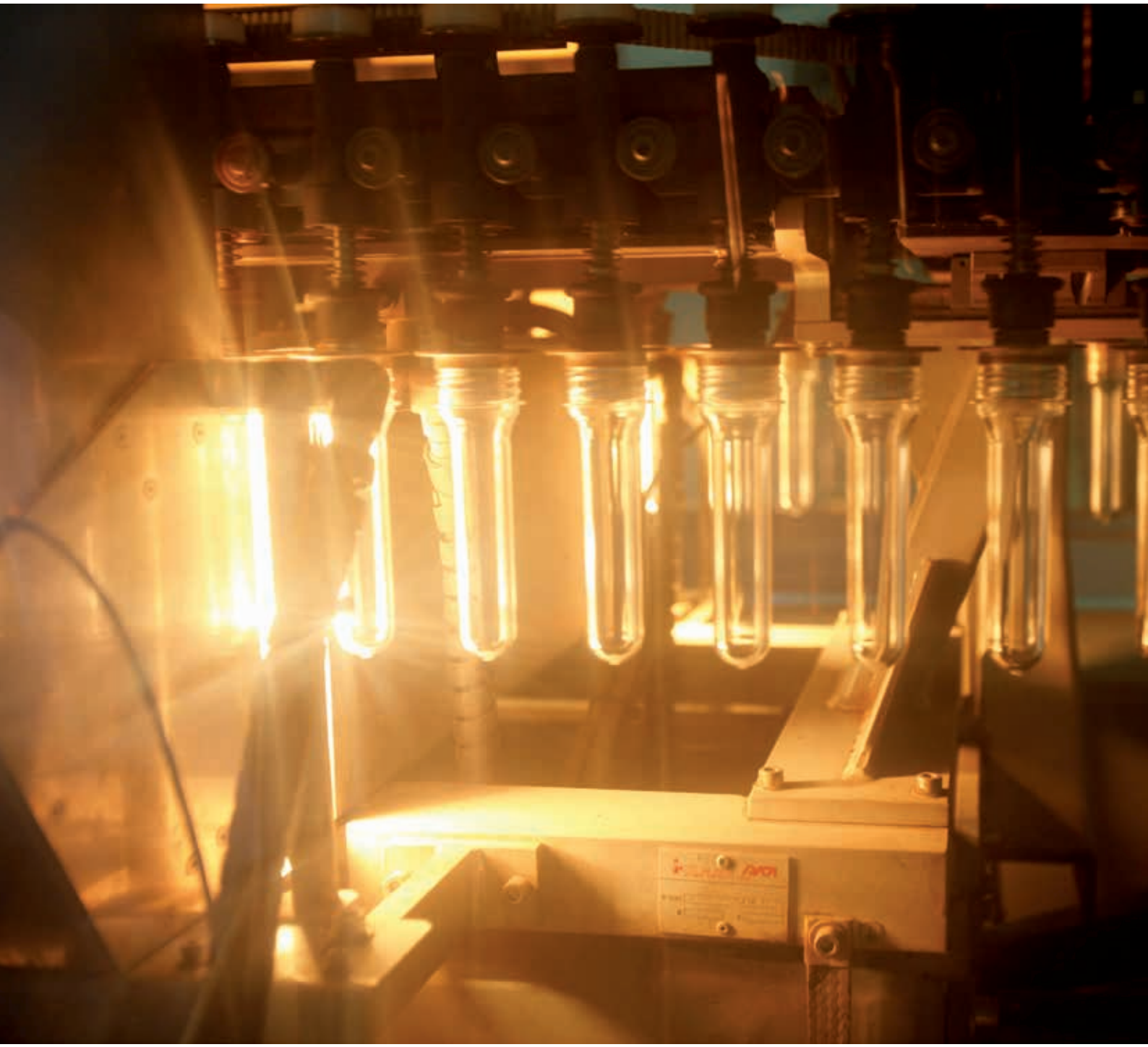
Complemented by an HMI application, an alarm system and other key plant operation functions, the model predictive control solution is available as a SISO system, with a MIMO version currently in development. Often far superior to conventional PID controllers – and just as easy to implement – MPC is sure to quickly replace them in many applications. Voglauer is now working on using MPC to boost process stability in other Lenzing plants. ←

Bernhard Voglauer
Head Controls Engineer, Lenzing AG

"Due to the two hours of dead time in the cellulose conversion process, regulation of the buffer tank's fill level was impossible to automate – until we had an easy-to-use model predictive control solution integrated seamlessly in our APROL process control system."

Photos © Lenzing AG, Markus Kirchgatterer)

Energy savings on a dairy basis



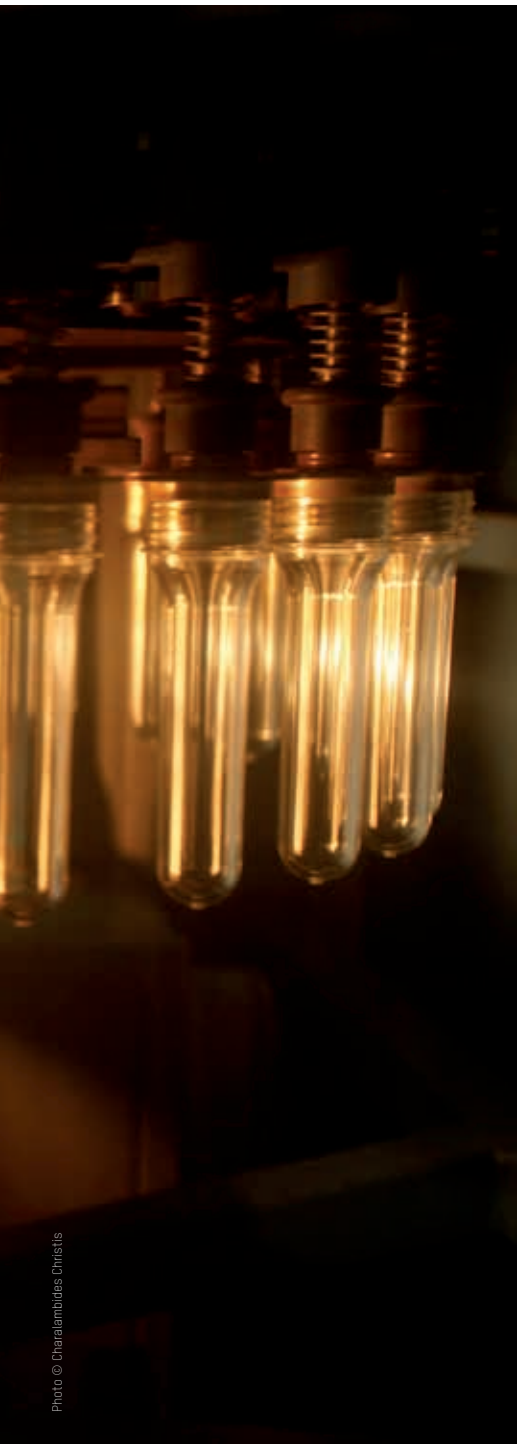


Photo © Charalambides Christis

When Charalambides Christis began operations in 1945 with two men and a cow, resource management wasn't much of an issue. Seventy years later, as the largest dairy company in Cyprus, collecting and analyzing data effectively is no easy task. In less than six months, the company implemented APROL EnMon in an effort to reduce resource consumption up to 20% over the next three years. More than that, though, the company now has a flexible platform that will allow it to build and invest for the future.

In addition to serving the Cypriot market, Charalambides Christis also exports around 17% of the goods it produces – from fresh milk and yogurt to famous Halloumi cheese – to 27 countries worldwide. Seventy years of growth have turned a family business into a multinational company with over 550 employees and an infrastructure that has grown to match.

With operations spanning multiple cities, collecting and analyzing data in a way that provides a holistic overview is quite a challenge, yet this is precisely what is required in order to react quickly in the event of a quality assurance or production problem. When it comes to maintenance and inspection, the traditional solution involves a team of technicians reading meters individually and documenting temperatures and consumption data manually.

In the past, this time-consuming routine tied up important resources at Charalambides Christis, sometimes resulting in the loss of valuable information and real-time data. But with a long history of investing in state-of-the-art technology to maintain its position as Cyprus' largest dairy producer, it is no great surprise that the company would solve this challenge by seeking out B&R and the best solution for managing and reducing energy costs on the market: APROL EnMon.

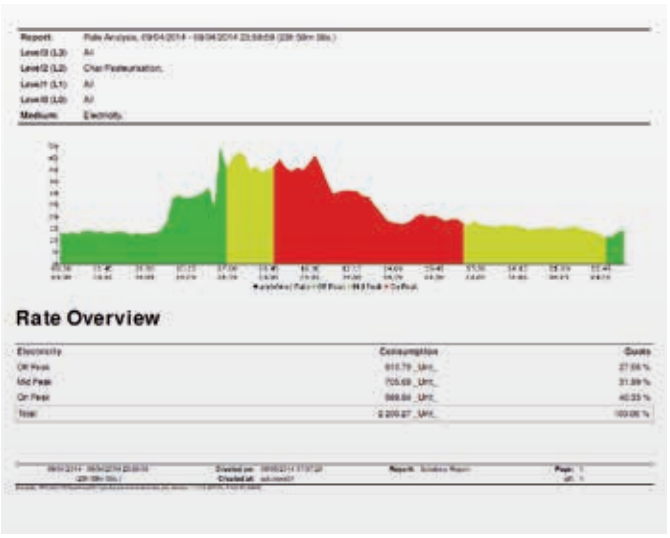
Measure, manage and improve

For Energy and Technical Services Manager Constantinos Dalmiras, it was important to find a solution that would centralize all collected data in a way that would make it easy to monitor and analyze – a solution that would integrate all relevant meters and process data into comprehensive dashboards for quick and convenient assessment of production and energy performance.

Further specifications included a very ambitious implementation schedule, the flexibility to accommodate expansion into a full-scale DCS and a strictly defined budget.

When presented with B&R's energy monitoring solution, APROL EnMon, Dalmiras knew it was the perfect fit for his requirements. With excellent support and using standard B&R hardware, the basic system was fully operational in less than six months – despite the implementation difficulties resulting from 24-hour plant operation – and already measuring data for electricity, temperature,

Rotative filling system in one of Charalambides Christis' factories.



Analysis of peak energy consumption using APROL EnMon.

humidity, fuel, thermal energy, milk processing and water throughout the company's manufacturing chain.

A short time later, it was possible to estimate the amount of potential savings in electricity, water and fuel consumption, a number that would give Charalambides Christis a full return on its investment within just a few months of implementation.

"We looked at various systems on the market but chose B&R because of the system's flexibility to expand into a DCS and the possibility to integrate other technologies such as condition monitoring. Other systems could not handle as many types of fieldbuses and inputs." Constantinos Dalmiras, Energy and Utilities Manager at Charalambides Christis.

Comprehensive dashboards for all

Despite its extremely powerful range of functions, APROL EnMon is extremely simple to operate. One of Charalambides Christis' requirements was that the dashboards be easy to understand for colleagues in different departments. In other words, they wanted to have the right information presented in the right way to the right people. With easily customizable screens, APROL EnMon does exactly that: offering faceplates with instrumentation meters for inspection technicians, plant performance indicators for production managers, monitoring of critical parameters for the quality assurance team and consumption cost data for the finance department – all in a single, uniform system.

Expanding for even more savings

Encouraged by the success achieved with APROL EnMon so far, Charalambides Christis has decided to extend the distribution of data points and collect data directly from the machines in the production lines. This will shed light on all of the company's subsystems and allow it to target top consumers and prioritize improvement projects.

Subsequent goals include expanding to a full DCS solution and using B&R's condition monitoring system, APROL ConMon, for predictive maintenance – significantly reducing downtime and allowing for immediate reactions to problems in production. As the company moves forward, the potential for growth appears virtually limitless. A feasibility study for the full control of its HVAC and refrigeration systems is already underway. ←

Photos © Charalambides Christis

Standardization paves the way to the future

Gernot Bachler (technical manager of Motion at B&R) receives the certificate of compliance from Eelco van der Wal (managing director of the PLCopen Foundation) at the SPS IPC Drives trade fair.

B&R software has now also received PLCopen certification for Coordinated Motion.

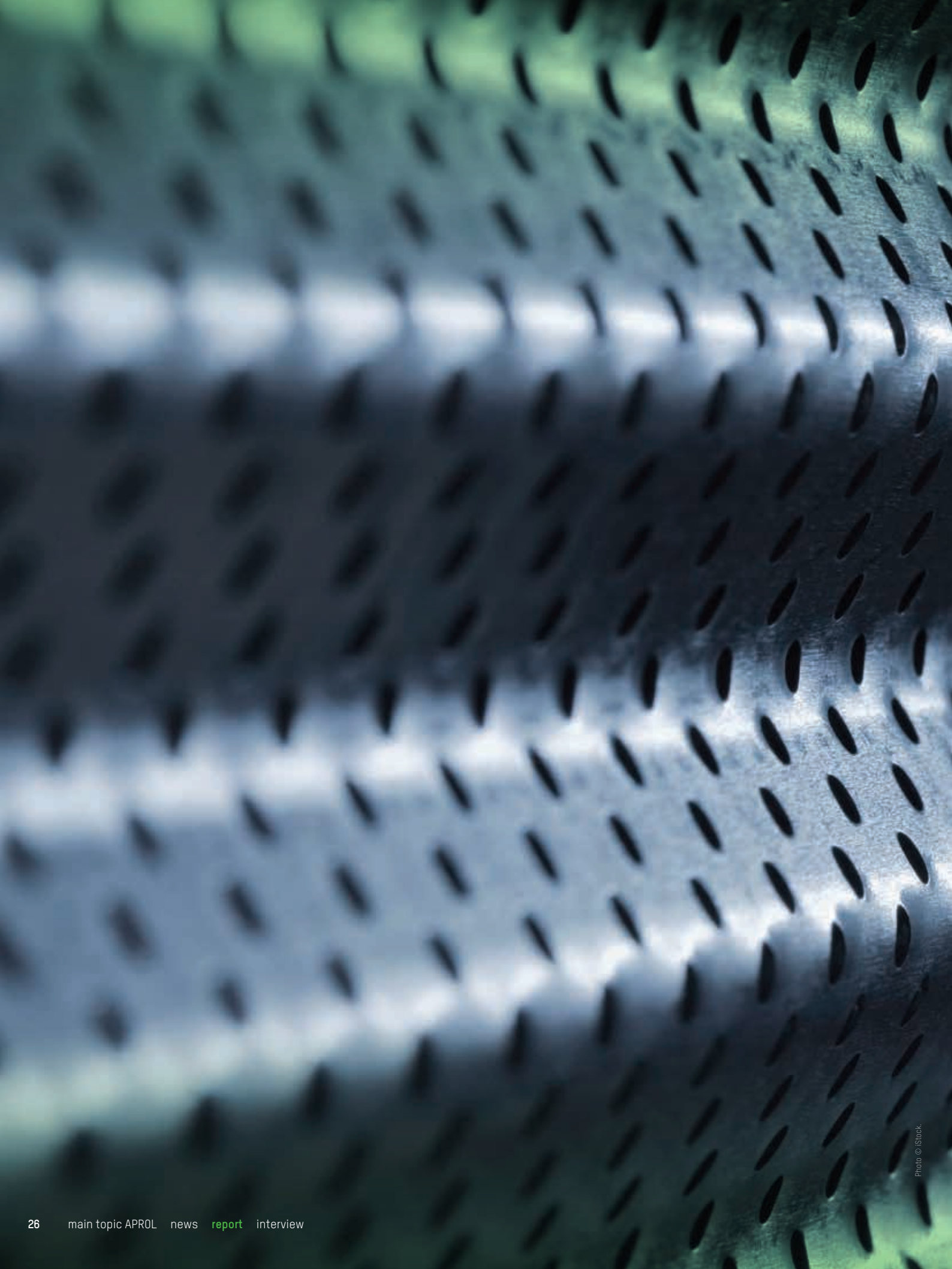
B&R's Automation Studio development platform now makes programming and configuring multi-axis systems easier than ever before. This is made possible with the addition of PLCopen-certified Coordinated Motion function blocks to the proven Generic Motion Control approach. B&R has constantly been adding to its portfolio of certified PLCopen blocks since 2004.

"Standardization paves the way to the future," stated Eelco van der Wal, managing director of the PLCopen Foundation, as he awarded the certificate of compliance at the SPS IPC Drives trade fair in Nuremberg, Germany. "Modular and individual machine concepts can only become reality when it is possible to swap out components from different manufacturers."

Vendor-independent

PLCopen Motion Control Part 4 – Coordinated Motion specifications encompass predefined function blocks and machine state descriptions that make it possible to control any multi-axis system with a standardized interface. "What these PLCopen blocks have done is made it just as easy to configure any type of robot – regardless of its kinematic structure – as it is to set up single axes," explains Gernot Bachler, technical manager of Motion at B&R. Identical command execution is guaranteed by the use of standardized interfaces. "Not a single line of code needs to be changed."

Photo © B&R



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Machine tools

Shear genius

The transition from a disjointed patchwork system with a conventional controller to a fully integrated, perfectly scalable B&R automation solution was an important step for EHT. Users now have a much easier time taking advantage of the versatile functionality offered by the company's power squaring shears. Known worldwide for its sheet metal forming and cutting technology, EHT was also able to step up the shears' performance while simultaneously reducing the cost of producing both standard and specialty machines.

EHT developed the software for the new ECS-Touch controller used in its successful VarioCut and MultiCut series of power squaring shears entirely in Automation Studio. The openness of the engineering environment is essential for the company, giving it unlimited access to make software adjustments on their own at any time. The full integration and centralized data management have allowed EHT to reduce development and commissioning times and minimize customer downtime.

"Since switching to B&R, we need considerably less time to commission our systems," says EHT's sales manager, Holger Ebin. "What used to take us three days is now done in two hours." For Ebin, this is the natural result of having a uniform, fully integrated automation system with centralized data management.

With the control and HMI software as well as all motion control parameters all stored on a CompactFlash card, all you have to do is insert the card in the slot on the controller and start up the machine. The B&R system then automatically copies the software to the respective automation components and configures them. All that's left to do is home the machine, and it's ready to go.

Centralized data management simplifies commissioning and maintenance

"It's just as easy to get our machines back up and running after a component failure," adds Alexander Eirich, who developed the new EHT controller. "Replace the defective part, insert the CF card and set the POWERLINK address – then switch it on and you're done."

Yet the time saved during commissioning and maintenance doesn't fully explain the substantial reduction in costs that EHT has experienced compared to its previous control solution. The greatly simplified architecture played an important role as well, as Eirich explains: "Since we're able to control our hydraulic proportional valves with an X20 motor module that we were already using for I/O, we've been able to do away with the separate upstream modules." The X20 module also allows for more precise ramp settings, and in turn more dynamic hydraulic movements, so EHT was able to increase the cut count as well. The motor module also functions as a counter card for the shear's motorized backgauge.

Reduced number of components with B&R technology

The simplification was even more dramatic with the VarioCut series. Like the MultiCut series, these high-precision swing beam shears are available in numerous varieties with countless options. What sets them apart is that EHT customizes them to user specifications and optionally integrates them into the production line. Due to the rigidly limited functionality of the old standard controller, the additional tasks that arose through customization and integration had to be handled by a second, higher level controller.

Thanks to the performance and openness of the Power Panel 520, a single controller is able to handle the automation of the entire line. With its 10.4" screen, B&R's controller has plenty of resources left over to serve as an HMI operator panel.

Complete, homogeneous and flexible automation

All of the machine's software, including the HMI application, was created using Automation Studio. The environment's complete openness allows EHT to maintain, adapt and expand the software without any outside assistance. B&R delivered the basic framework, shortening the development phase and freeing up EHT's programmers to implement new functions. The libraries provided in Automation Studio inspired Eirich to integrate a function that allows machine operators to generate analytical data and save it on a flash drive.

"We're then able to use this data – which they can send us directly via FTP – to provide them with an updated software image that preserves all of the operator's settings," explains Eirich. "Machine updates are completed in no time and with minimal impact on production."

The new control solution also minimizes downtime in the event of an error. "Before we switched to B&R technology, the task of troubleshooting alone was problematic," recalls Ebin. "Now we have a complete and

EHT's MultiCut series of power squaring shears, featuring an ECS touch screen controller, is designed for one-off and series production of parts of all sizes. Its extensive selection of sophisticated options make it especially efficient and ergonomic to use.

EHT's MultiCut series of power squaring shears, featuring an ECS touch screen controller, is designed for one-off and series production of parts of all sizes. Its extensive selection of sophisticated options make it especially efficient and ergonomic to use.

ETHERNET POWERLINK

EHT's new ECS-Touch controller is based on a Power Panel 520 from B&R. In addition to controlling all of the machine's processes, it also serves as an HMI platform and operator interface.

homogeneous automation solution that also allows remote VNC access – so we can quickly identify and correct errors without ever setting foot on site." In a hotly contested market like sheet metal cutting, where profit margins are extremely thin, this is a significant cost advantage.

Price increase successfully avoided

EHT was particularly impressed by B&R's ability to achieve a level of positioning precision using an AC motor that would otherwise require an expensive servo motor, and took advantage of this to implement a highly precise, yet very cost-effective, position control solution for the backgauge. The AC motor is controlled by an ACOPOSinverter P74, which communicates with the Power Panel and the X20 system via POWERLINK.

The controller and POWERLINK are powerful enough to operate all of the machine's axes at once during setup – barring any collisions – and utilize the machine more efficiently. "The topic of control has become an important selling point for us. The B&R solution has also made a significant contribution to the success of our company by helping us lower our production costs enough to avoid an impending price increase." ←

Holger Ebin
Sales Manager, EHT Werkzeugmaschinen GmbH

"The B&R solution has helped us lower our production costs enough to avoid an impending price increase."

Photos © EHT, F. Rossmann

"Full focus on innovation"

B&R caused quite a stir at the 2014 SPS IPC Drives with the unveiling of mapp technology. The automation specialist claims that mapp slashes the time it takes to develop application software by an average of 67% – dubbing it a revolution in automation software. We sat down with Christoph Trappl, manager of International Applications at B&R, to find out what's behind all the hype.

Christoph Trappl
International Applications Manager, B&R

"mapp technology virtually eliminates the need for glue code. According to a benchmark study by the independent LIAM institute, mapp was able to reduce the amount of source code by 83%."

Christoph, a 67% reduction in software development time sounds very impressive. How did you arrive at that number?
Remember, that's an average of 67% – in some cases it can be even higher. The number itself is an objective measurement obtained by the independent LIAM institute. They performed a benchmark study in which the same group of programmers was asked to write a flying saw application – one that included a recipe system, data management, axes coupled via cam profiles and HMI application – first using mapp and then using standard IEC 61131 and PLCopen functions. These results have been backed up by numerous pilot applications in the areas of packaging, metalworking, plastics and robotics. On average, software can be developed in a third of the time using mapp.

Where is it that mapp saves so much time?
From talking to our customers, we know that the majority of time and resources spent on developing a new application goes into programming the core functionality. In addition to things like motion control functions, this also includes recipe management, machine diagnostics and much more. We're talking about 60 to 80% of the software development effort for a machine or plant. So that's exactly where we focused our efforts with mapp. Unlike other products out there, mapp components are not limited to motion control functions, which is why they are able to deliver such massive time savings.

What does that mean in practice – how do these components work?
The programmer moves the desired mapp components into the application using drag-and-drop and then configures them there graphically. Yet the components themselves are only one part of mapp technology. They wouldn't be nearly as powerful without mapp links, which allow mapp components to exchange the data they need – alarm information, for example – completely automatically. Avoiding glue code as much as possible means that there is considerably less source code. The LIAM institute's benchmark study found that mapp technology eliminated 83% of the source code. This makes programs both easier to understand and less expensive to maintain.

Can you give me an example of a mapp component?
Absolutely. Pretty much every machine needs a recipe system, so let's look at the mapp component responsible for that. First off, mapp follows a model-view-controller framework, so an application is divided into the data model, the view and the controller. For a basic recipe system, you need to drag and drop two different components into the application. One is the recipe system itself; the other is the RecipeView for viewing the data. These components are connected automatically by a mapp link. You've now got a functioning recipe system, and you didn't write a single line of code.

But different machines can have very different requirements for the recipe system. How flexible are mapp's recipe components?
With mapp's modular structure, the only limit is the developer's imagination. You can implement a small solution with three variables or a complex machine with 500 or more. Decentralized software architectures are also supported. A machine's optional features and their additional parameters can be enabled or disabled with a click of the mouse. Of course, mapp links ensure seamless communication with other mapp components – a user management system, for example. The recipe system also comes with popular functions such as filtering and sorting already integrated. Recipes can be saved in either CSV or XML format, and we're currently working on an encryption option.

Speaking of development, what can we expect from mapp down the road?
We launched mapp in the fall of 2014 with an array of 70 functions that cover everything from core functionality to all of the most prevalent axis movements. You won't catch us resting on our laurels, though. We're constantly expanding the selection of components to make software development even easier for our customers. The overwhelming interest following the SPS IPC Drives has confirmed that we're on the right track. We've been flooded with requests.

How are things going to change now that your customers are able to develop so much faster?
First and foremost, it's going to mean that they get their machines to market faster and at lower cost. Of course, machine builders can also elect to take the time savings and invest it in implementing more of their specialized process know-how. Either way, machine manufacturers can concentrate on further expanding their market position – with their full focus on innovation.

Photo © B&R

Photo © iStock.

Process control

Generating high availability with POWERLINK

In areas such as the chemical, petrochemical and power generation industries, high availability is a critical requirement of control systems and their associated hardware. A good way to ensure this is through network redundancy – and with an open source protocol like POWERLINK, high availability comes at minimal added cost. That's why Czech control system specialist ZAT uses a ring-configured POWERLINK bus as the foundation for its highly reliable redundant control systems.

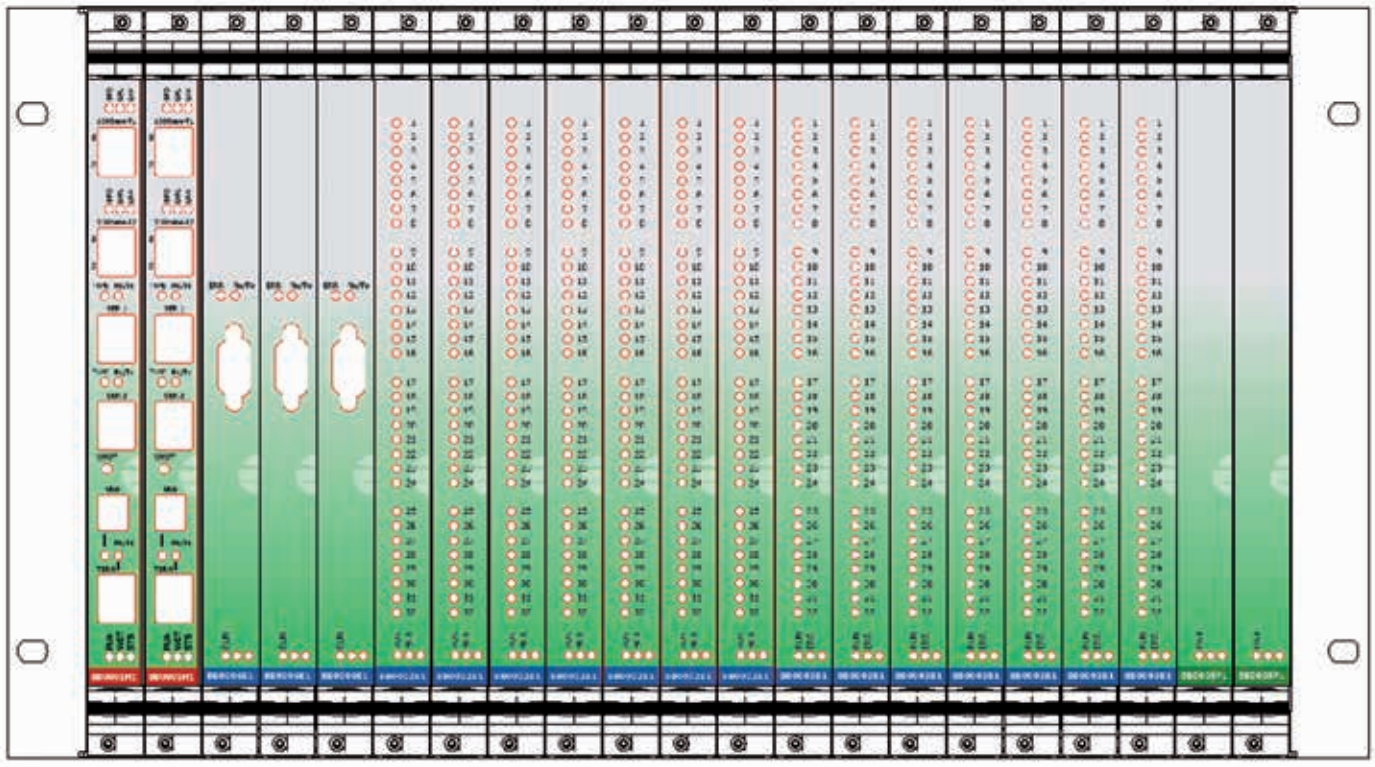
With more than 50 years of automation experience both in the Czech Republic and globally, ZAT is a well-known supplier of control systems for industries where equipment safety and reliability are crucial. From engineering, assembly and implementation to commissioning and servicing – the company provides a full range of services for the complex automation underlying continuous processes such as conventional and nuclear power generation.

The products manufactured by the company are based on a combination of proprietary ZAT systems as well as technology from other vendors. A example of this is the company's flagship ZAT-Plant Suite DCS system, based on SandRA (Safe and Reliable Automation) – a series of powerful next-generation control stations developed and produced at ZAT. When developing the new control system in 2009, rather than drawing on its own proprietary I/O modules, ZAT elected to integrate B&R X20 distributed I/O stations to benefit from the solution's openness.

Complete success thanks to B&R's X20 I/O system

The X20 I/O system from B&R was initially connected via PROFIBUS DP and fully integrated into the ZAT-Plant Suite. Supported by the ZAT Pertinax development environment, it has completely replaced the ZAT I/O modules that were used previously. This new arrangement was first put into practice in the Náchod heating plant, where a control system for one of the boilers was refurbished in 2009.

The success experienced with B&R's X20 system inspired ZAT to include POWERLINK support in its SandRA control stations. The decision was thus made to develop a special communication board for the SandRA Z200 control station that included the managing node



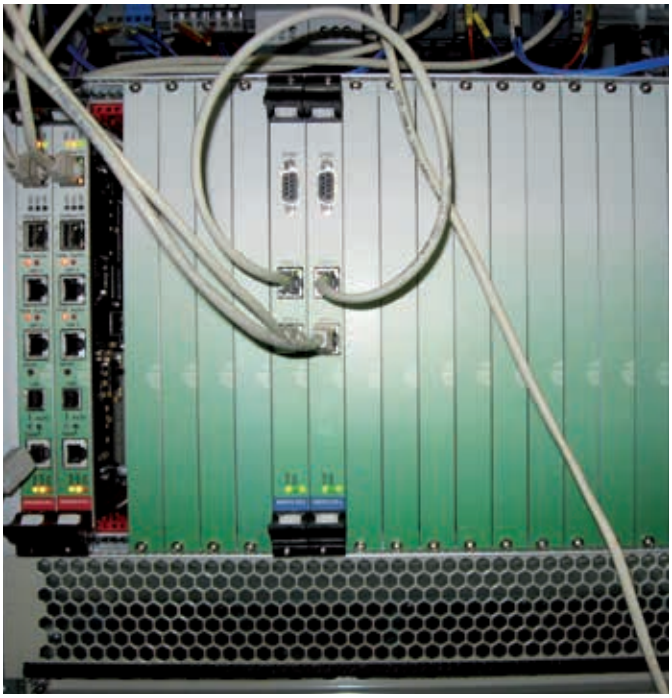
(MN) features of POWERLINK. Through direct cooperation with IXXAT Automation, a specialist in industrial protocols, the BB0012E1 board was quickly brought to life. It features two Ethernet 10/100 Base-T ports and the POWERLINK MN software implemented on an FPGA.

Communication between SandRA Z200 and the distributed X20 I/O modules over POWERLINK first took place at the Opatovice power station, where the system prevents deposits from forming in the fuel line to the tanks of the air cooling system.

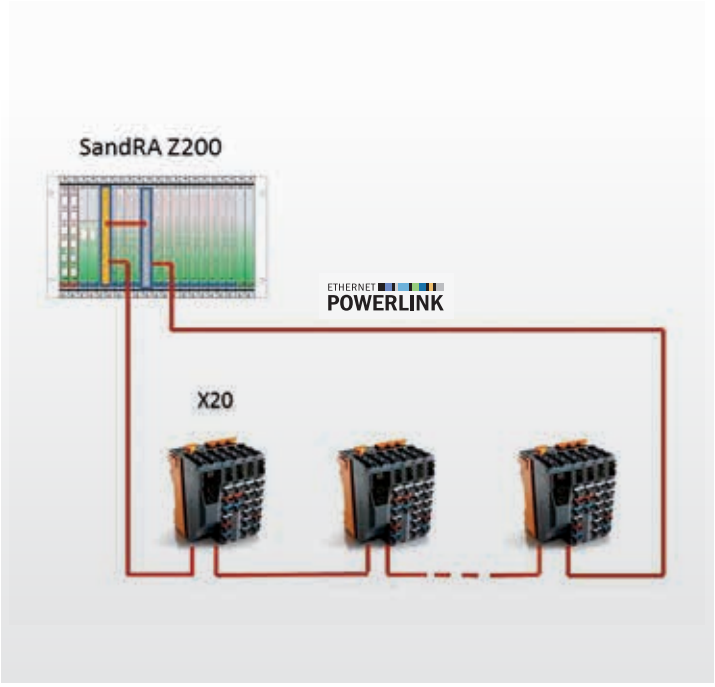
Redundant ring on the POWERLINK bus

In the power generation industry, high availability means that control systems must eliminate all potential points of failure. ZAT therefore decided to partner with IXXAT to integrate redundant ring-topology network software with a redundant POWERLINK MN into the SandRA Z200 control stations.

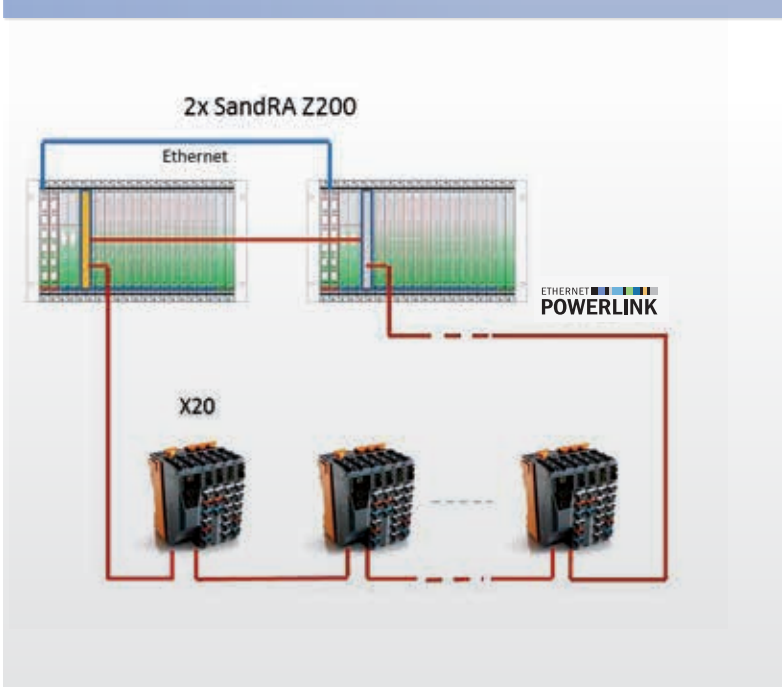
"The arrangement features a pair of redundant control stations, each containing a control board, communication board, power supply and the POWERLINK bus in a ring topology," explains Pavel Kulík, manager of the Technology Processes department at ZAT, "which not only ensures the operability of the entire control network should any of the elements fail, but also allows hot-swapping – all implemented with just a minimal increase in cost."



Redundant SandRA Z200 control station with two processor boards, two BB0012E1 communication boards and two power supply units.



The alternative redundant-ring solution uses a single SandRA Z200 control station with a pair of redundant processor boards and a pair of communication boards as redundant managing nodes on the POWERLINK bus.



The solution with a pair of redundant control stations and redundant-ring POWERLINK bus not only ensures the operability of the entire control network should any of the elements fail, but also allows hot-swapping.

The solution with a pair of redundant ZAT SandRA Z200 control stations and nineteen remote X20 I/O stations from B&R transferring 1,670 I/O signals over the redundant-ring POWERLINK bus was introduced in late 2012 to control the dry fly ash collection system in the Opatovice power station. After all, were this system to fail, the entire plant would have to be shut down.

In May 2013, the control system for air cooling was also reconfigured to use the ring topology. In this case, a single SandRA Z200 control station includes internal redundancy of the control and communication boards, with four X20 stations rounding out the system.

High-availability through technological partnership

"The close cooperation between ZAT, IXXAT and B&R, together with the friendly attitude of the technology operator, opened up a pathway to an exceptional modernization of the control systems employed in the Opatovice power station," reports Kulík. "This new solution ensures the high availability of the control technology, which has a direct positive impact on the operational reliability of the entire plant. The cost-effective redundant control systems developed for this application – featuring B&R components – have gone on to become an integral part of ZAT's current product line." ←

Pavel Kulík
Technology Processes Manager, ZAT

"Our new solution ensures the high availability of the control technology, which has a direct positive impact on the operational reliability of the entire plant. The cost-effective redundant control systems developed for this application – featuring B&R components – have gone on to become an integral part of ZAT's current product line."

Photos © ZAT

What goes around, comes around

The award-winning design and attention to detail of Kilian's rotary tablet press turned heads at Interpack 2014.

Kilian Tableting didn't waste any time after its integration into the Romaco Group. By the end of the fiscal year, the company had outpaced its own goals and posted a 15% increase in order volume. This success was in no small part due to the new KTP420X rotary tablet press, the first representative of the Kilian portfolio to debut the new design, featuring a completely revamped HMI system based on B&R technology.

The newly designed HMI system with gesture control is based on a powerful Automation PC 910 with a dual-core i7 processor and a hygienic Automation Panel with a 21.5" display.

Premiering at Interpack 2014, Kilian's new KTP420X rotary tablet press turned more than a few heads with an innovative design that stood out from the crowd. Several of those heads belonged to a panel of experts – who presented it with the 2014 iF product design award.

Although it causes its fair share of double-takes, a single glance is enough to appreciate the simple elegance of the tablet press. The combination of stainless steel and tinted glass – accentuated by stylish light strips that indicate the machine's status – is a statement of progressive design and premium quality. The 21.5" display of the new operator panel, based on a hygienic stainless steel model of B&R's Automation Panel, perfectly complements the machine's functional beauty. The HMI software runs on a powerful Automation PC 910 with a dual-core i7 processor.

Total package

"We closely examined HMI products from a number of suppliers," says Kilian's chief technology officer Jens Carstens. "B&R offered by far the best total package for our application."

The machine builder was looking for a 21.5" Full HD multi-touch display to provide ample space for a clearly structured user interface.

"At the time, B&R had not yet released a 21.5" model," remembers Carstens. "With only weeks remaining until Interpack, B&R

Photos © Kilian Tableting, Franz Roßmann

The display and illuminated ring keys on Kilian's new HMI system adhere to the most stringent hygiene standards and can be used in any industry.

accepted the challenge and delivered four prototypes – *ahead* of schedule. Very impressive!"

Hygienic design

B&R's developers created an open-backed stainless steel HMI housing that can either be mounted on a swing arm or built into a remote operator terminal.

Since Kilian planned for the new HMI to be used in all types of machines and industries, hygiene standards played a prominent role in the specifications. With no dirt-collecting gaps and a shatter protection membrane over the touch screen, B&R's solution hit the mark here as well. The new solution is perfectly suited for use in the food & beverage and pharmaceutical industries.

Illuminated ring keys with tactile feedback

An E-stop button and four illuminated ring keys for frequently used functions are integrated along the bottom of the display. "We've stopped using virtual keys for the most heavily used functions because of the visible wear we encountered with our previous system," explains Carstens. "Unlike virtual keys, the hardware keys also provide tactile feedback, which has benefits such as allowing operators to keep their eye on the machine when working in jog mode." In addition to the illuminated ring keys, the display also has an integrated RFID receiver, which Kilian plans to use for access control and rights management in the future.

To complement the sophisticated hardware design, Kilian also worked with a UI design specialist to create a state-of-the-art user interface based on a comprehensive analysis of operator behavior.

Commanding performance for demanding applications: APC 910

Regarding the lengths that Kilian went to in developing the user interface, the CTO explains: "The expectations that today's users have for production machinery interfaces are shaped by their experience with smartphones and tablets. In addition to highly intuitive operation in general, they expect fast responses when switching between screens or displaying system messages.

Kilian recognized early on that they would want the new HMI system to offer gesture control options. Extensive comparison testing with numerous industrial PCs showed

Jens Carstens
CTO, Kilian Tableting GmbH

"We closely examined HMI products from a number of suppliers. B&R offered by far the best total package for our application."

that the swiping gesture in particular places very high demands on computing and graphics performance. B&R's Automation PC 910 emerged as the clear winner in this category as well.

Real-time data for every tablet

The sheer volume of data produced by a tablet press is demanding on the HMI. The KTP420X produces up to 360,000 tablets per hour, and the maximum pressing force for each and every one is monitored, recorded and displayed in real time for quality assurance and traceability. In combination with the extensive variety of configuration and parameter settings – such as different test sampling methods – this volume of data makes the HMI application very complex.

The Automation Panel 900 communicates with the Automation PC 910 via SDL3. Not only does this communication standard guarantee minimal latency, it has also reduced the number of connection cables Kilian needs and given them greater freedom in the positioning of the HMI unit.

Uncompromisingly robust industrial PC

The industrial PC platform for the HMI application – which was written in C# and the .NET framework using WPF – operates fan-free in spite of the powerful performance it offers. With applications and data all stored on a high-speed 128 GB solid-state drive, the Automation PC has no rotating parts and ensures minimal latency. "The flexible options for mounting orientation are a clear advantage of B&R's industrial PC," adds Carstens. Like in the previous version of the machine, Kilian uses an OPC interface between the control and HMI applications, which simplified the transition to the new HMI system as well allowing for easy integration into higher level systems.

With its fresh design and new HMI system – as well as numerous improved details – Carstens is proud to report that the KTP420X has been well received by its users: "The first machines were sold before the fair was even over. We've already exceeded our sales goals for the first quarter of 2015, and the KTP420X has had a lot to do with that."

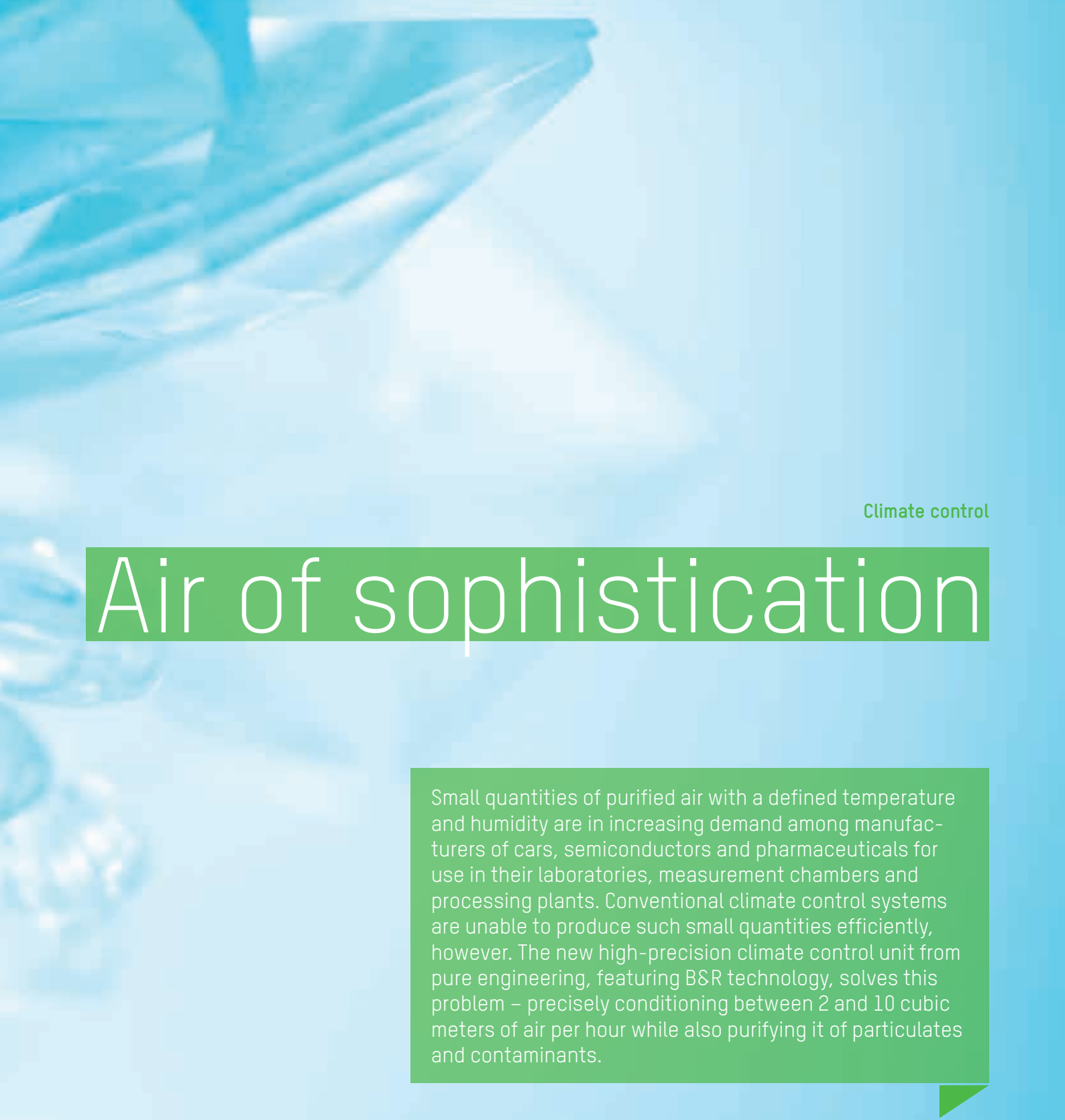
Kilian sets course for growth with B&R

The success story continues. At ACHEMA 2015, Kilian will unveil the next machine to equipped with the new HMI system: A bi-layer rotary press able to produce around 720,000 tablets per hour.

But that's not all. Kilian also has plans to equip the machines in its lower price segment with the new HMI system, featuring the newly developed user interface and B&R technology. "The modular structure of our software, which separates design from functionality, together with the scalability of B&R's technology, will enable us to offer a state-of-the-art solution in this class as well – with relatively little effort," concludes Carstens. ←

Photos © Kilian Tableting, Franz Roßmann

Photo © iStock.



Climate control

Air of sophistication

Small quantities of purified air with a defined temperature and humidity are in increasing demand among manufacturers of cars, semiconductors and pharmaceuticals for use in their laboratories, measurement chambers and processing plants. Conventional climate control systems are unable to produce such small quantities efficiently, however. The new high-precision climate control unit from pure engineering, featuring B&R technology, solves this problem – precisely conditioning between 2 and 10 cubic meters of air per hour while also purifying it of particulates and contaminants.

Ralf Bräuer
Managing Partner, pure engineering

"B&R's engineering environment allows us to adapt quickly to changes in the hardware or software. The libraries they provide and the excellent support we've grown accustomed to from B&R's experts made developing our firmware considerably easier."

Increasingly stringent emissions standards, new production methods and pressure to optimize the quality and cost of products – these trends all increase the demand for climate control units that produce small quantities of precisely conditioned air. Ideally, they should filter out organic compounds and particles while they're at it. Conventional climate control systems, designed to output hundreds or thousands of cubic meters per hour, are ill-fit for this purpose.

"With a conventional climate control unit, to produce only 5 m³/h with a flow rate deviation of less than 2%, you would typically need to condition 500 m³/h. In other words, 99% of the air – which you've expended a great deal of energy to produce – goes unused. Technically, economically and ecologically, that's just not a solution," reasons Ralf Bräuer, managing partner at pure engineering, explaining the circumstances leading to the development of the pureCAM low volume climate control units.

Oversized climate control units are expensive to buy and generate unnecessary costs throughout their entire service life. This is especially true in applications that require additional filtration systems to meet heightened restrictions on the concentration of particulates and organic molecules. The volume of air being processed influences not only the concentration of contaminates at the intake and outlet but also the deposition rate that the filters can achieve. An appropriately sized climate control system is therefore particularly important.

Solving climate control challenges
What seems efficient and practical from the user's perspective – having small quantities of processed air supplied on demand – is deceptively challenging from a climate control perspective. This is one of the main reasons climate control units with a volumetric flow rate under 100 m³/h are such a rarity. The volumetric flow rate

The flexibility of B&R's control solution makes pure engineering's climate control unit exceptionally scalable and easy to integrate in a higher level control system.

plays a pivotal role in controlling the temperature of processed air. The lower the flow rate, the lower the required cooling capacity of the heat exchanger. At a volumetric flow rate of 5 m³/h you need no more than a few watts. The decisive factor is the level of precision with which the cooler's power output – and with it the air temperature – can be controlled. Controlling the temperature with a precision of ± 0.2 K would require controlling the heat exchanger with a precision of ± 300 mW. The situation is similar when it comes to the humidity of the processed air and the capacity of the humidifier – roughly 50 g/h for a volumetric flow rate of 5 m³/h. To control humidity with a precision of ± 1%, you only need a water supply of 14.7 mg/min – hardly enough to fill a single-dose syringe.

When it comes to designing a low volume climate control unit, this example illustrates just how crucial it is to have a perfectly tuned, highly precise and dynamic system of sensors and actuators – and a control system to match. "After years of success with B&R control systems, we were confident using them in the new pureCAM units as well," reports Bräuer. pure engineering has built a range of different systems and test stands using B&R control solutions.

Modular I/O for flexible climate control

"B&R's X20 system offers the modularity we need, along with a rich selection of fieldbus interfaces and I/O modules. This gives us the flexibility to select the optimal components, install them with minimal effort and then integrate the whole thing into the higher level control software of a test stand," says Bräuer. "What also speaks in favor of the X20 is the high resolution of the analog input cards. The 12-bit resolution allows us to achieve the control increments of 0.02 K that we need for a stability of ± 0.2 K."

Bräuer also praises the extensive programming possibilities offered by Automation Studio's integrated software development environment. "B&R's engineering environment allows us to adapt quickly to changes in the hardware or software. The libraries they provide and the excellent support we've grown accustomed to from B&R's experts made developing our firmware considerably easier."

The standard model of the compact 19" pureCAM system with integrated scrubbers for particulates and volatile organic compounds (VOCs) is designed for automatic operation. In this mode, the integrated X20 controller receives the setpoint values for flow rate, temperature and humidity via Ethernet from the higher level test stand controller, which can then return the current process variables as actual values. Optionally, the unit can also be equipped with a B&R Power Panel, allowing the operator to enter setpoints and monitor the current state of operation locally. The integrated operator interface also makes it easier for service personnel to troubleshoot and perform targeted maintenance.

Meets test specs efficiently and ecologically

The specifications for automotive emissions testing require extremely high precision, even when conditioning and purifying very small volumes of air. The standard model of pure engineering's robust and reliable pureCAM is designed for flow rates from 1 to 10 m³/h (± 2%) and guarantees temperature stability of ± 0.2 K and humidity control with a deviation of no more than ± 1% of the relative humidity.

The pureCAM is an economically and ecologically responsible way for users to meet the most stringent flow rate, temperature and humidity tolerances for processed air used in their laboratories, test stands, measurement chambers and processing plants. The flexibility of B&R's control solution makes the units exceptionally scalable and easy to integrate in higher level control systems. ←

Photos © pure Engineering GmbH & Co KG

Technology day: Open Robotics

The Open Robotics & Industry 4.0 event held in Lyon, France, demonstrated how the future of Industry 4.0 is already within reach using today's automation technology. Following an invitation from the EPSG and its members B&R, Cognex, Comau and Festo, more than 120 industry and university experts made their way to Lyon to find out about the latest developments in the field.

100% open robot controller

The concept of integrated robotics allows synchronized operation of robots and machines. "B&R produces scalable hardware and software that makes it possible to design state-of-the-art integrated robotics solutions," explains Tomas Prchal, CNC & robotics technology manager at B&R. "Companies such as Trumpf, B+M, Leoni and Comau are already benefiting from our integrated robotics technology." Comau took the opportunity to present its latest open robotics platform, C5G Open. This open approach gives the robot control unit the added processing power of a PC with direct integration of external sensors. This simplifies the implementation of complex manufacturing applications.

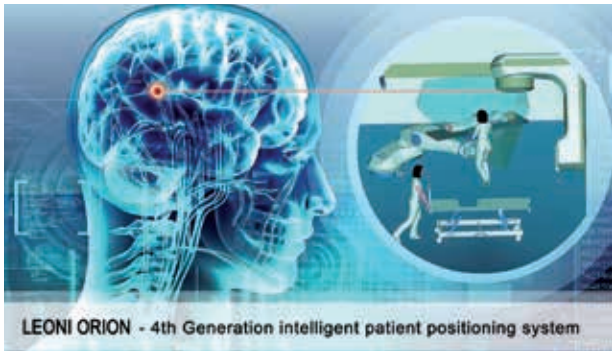
Open communication standards

"The distributed automation logic that characterizes the production systems of Industry 4.0 creates an urgent need for high-speed, failsafe communication networks with unrestricted openness," explains Stéphane Potier, technology marketing manager for the EPSG in France. "With POWERLINK and openSAFETY, the foundations of the fourth industrial revolution have already been laid." Among the numerous other solutions on exhibit was the new CPX automation platform from Festo, which is particularly easy to integrate into POWERLINK networks.

Open standards are essential for the success of Industry 4.0. Along with POWERLINK and openSAFETY, OPC UA (Unified Architecture) is another key open technology. OPC UA provides complete scalability – from embedded control software to management information systems. OPC UA allows vertical communication to SCADA, MES and ERP systems as well vendor-independent communication from PLC to PLC.

& Industry 4.0

With its C5G Open robot controller, Comau Robotics provides an open robotics platform that enables direct and intuitive interaction between human operators, sensors and robots.



Leoni's ORION medical robot, based on an open safe robotics controller.

New CPX platform from Festo integrates POWERLINK open communication standard.

Innovative safe robotics applications

The company Leoni introduced ORION, a patient positioning system for radiotherapy treatment. Based on a 6-axis robot, this system achieves positioning precision of 0.5 mm, setting a new standard in radiotherapy robotics. Combining a safe robotics system and a sophisticated dynamic volume modeling system, the ORION robot requires high volumes of real-time data exchange between all hardware and software components. Leoni therefore decided for an open and safe robot controller based on POWERLINK and openSAFETY technologies.

Successful industry-university partnership

"The success of this Technology Day event demonstrates the benefits of our partnership with University Lyon 1," explains Jan Gadras, B&R France's technical manager in charge of university partnership. "We are happy to receive feedback from our customers that such an event, bringing together experts from industry and academia, shows the way to Industry 4.0." ←

The event was covered by the French web TV Manufacturing. The video (in French) is available at:

http://www.manufacturing.fr/v/open-robotics-pour-industrie

Photos © B&R, Cognex, Comau and Festo

Food & Beverages

Hot tech

Photos © iStock.

The name of Opelka's new continuous pastry fryer says it all. The MagicBaker CleanFlex is much more versatile and convenient to clean than its predecessor – music to the ears of any baker. Despite the many new options it offers, the fryer is easier to use than ever. This has more than a little to do with the 100% B&R automation solution, which perfectly complements the system's modular architecture to ensure complete freedom throughout construction, operation and maintenance.

"We enjoy the look of surprise on the faces of industrial and craft bakers when they realize how easy it is to operate and maintain our fryers, despite the wide range of products they can make," smiles Stefan Weng, responsible for automation at Opelka. "It starts when we're going over the specifications and they hear that they don't need any software tools to get started up again after replacing a defective component."

When it comes to networking his pastry fryers, commercial cooking equipment manufacturer Josef Opelka relies on POWERLINK. Opelka particularly values the freedom to choose a line or star topology to automate his modular equipment. The B&R automation system also allows networked components to be removed without having to disconnect the power or worry about disrupting bus communication.

Central data storage speeds up commissioning

This is thanks to the B&R system's central data storage. The code and data for everything from motion control to the PLC and HMI applications is all stored on a single CompactFlash card in the controller. When the equipment is started up following maintenance, the system automatically copies the respective software – including any changes made by the user – to all the necessary B&R components. The seamlessly integrated, homogeneous design also allows for more thorough and helpful diagnostics than a hodgepodge of inconsistent components. For users of the MagicBaker CleanFlex, this means less time starting up and more time being productive.

To reap all the advantages of this approach, Opelka selected exclusively B&R products for the new controller generation introduced in 2013 – with integrated PLC/HMI functionality provided by a Power Panel 500 featuring a generous 10.4" touch screen, I/O from the X20 system and drives from the ACOPOSmulti series. The company's previous experience with B&R has given them the confidence to continue the partnership into the future.

More flexibility through B&R technology

"The versatility of the continuous pastry fryer is owed in large part to the new control architecture, which can easily be adapted via the HMI panel to accommodate different equipment configurations and the specific needs of individual bakers," praises Weng.

The ACOPOSmulti servo drives, which replaced the pneumatic drives used intensively in the previous generation, play a central role. "This upgrade eliminated a number of constraints that we used to

have with regard to both design and operation," notes Weng. Pastries are now transported through the system more gently and with greater precision. A key advantage of electrical servo technology over pneumatics is that different traverse paths can be implemented at the push of a button during operation without any major modifications. Taking advantage of these characteristics, Opelka's completely redesigned MultiFlex transport system gives bakers many ways to customize the process for different types of pastry. Simply selecting a recipe on the touch screen determines whether the pastries will be floated or tipped into the oil bath, for example.

Modularization made easy

Electric drive technology also made a substantial contribution to the MagicBaker FlexClean's modular design. Since the drives are synchronized electrically, the oil bath can be extended as needed without having to modify the power transmission system. This is one way that Opelka was able to further expand the range of applications for the continuous pastry fryer and establish it as a new standard in the industry.

The drives for the base unit are installed along with the Power Panel 500 in a control cabinet built into the body of the machine. The drives for other modules in the line – such as the loading module at the beginning of the line that separates the raw dough forms into rows or the filling station at the end of the line that injects jelly into the middle of the pastries – are housed in distributed control cabinets.

X20 in a class of its own

"Space is particularly limited in the distributed cabinets, so the compact dimensions of the ACOPOSmulti and X20 modules stood out from the very beginning as a key criteria," recalls Weng. The two-axis variant of the ACOPOSmulti proved to be the biggest

ETHERNET **POWERLINK**

When it comes to networking his pastry fryers, commercial cooking equipment manufacturer Josef Opelka relies on POWERLINK. Opelka particularly values the freedom to choose a line or star topology to automate his modular equipment. The B&R automation system also allows networked components to be removed without having to disconnect the power or worry about disrupting bus communication.

Opelka's new continuous pastry fryer, the MagicBaker CleanFlex, owes much of its exceptional versatility, usability and adaptability to its automation solution featuring exclusively B&R technology.

space saver of all. Opelka saved even more cabinet space by replacing dedicated power supply components with 24 V modules from the X20 system. The X20 system also provided digital and analog I/O slices, as well as PT100 input terminals for PID temperature control. X20 modules also control the stepper motors used to move smaller masses, such as pushers. "A clear advantage of the X20 is its three-part construction, with a separate terminal block, electronics module and bus module. This helps with installation and makes it possible to replace the electronics module without the hassle of rewiring," says Weng. "The way we see it, the X20 system sets the industry standards when it comes to ease of installation, maintenance and scalability."

Free selection of architecture

The X20 modules and the drives all communicate with each other and the central controller via POWERLINK. "The open communication bus doesn't restrict us to a certain topology, so we're free to set up a daisy chain or a star formation – whatever the situation calls for," explains Weng. "What's great about POWERLINK and the B&R solution is that you can remove a component – an X20 electronics module for example – without disconnecting the power and not have to worry about disrupting bus communication. That was a pleasant new experience for us." Another major improvement over the previous solution is that you can configure the components without having to connect each one individually to a PC. To prepare B&R components for bus communication, all you have to do is set the node number using the DIP switches before you install it.

The advantages of the B&R solution carry over into practical operation as well. The change to POWERLINK and electronic drive technology makes decoupling machine modules considerably easier, as Weng emphasizes: "Basically, all you have to do is disconnect the power cable and the POWERLINK cable, both of which handle repeated plugging and unplugging much better than compressed air hoses." Then the machine modules can be transported to the washdown room for thorough cleaning.

Exemplary support

By dealing exclusively with B&R technology, Opelka is able to develop and construct its continuous pastry fryers much more efficiently. At the same time, the new controller makes it easier for bakers to operate and adapt the line to their needs. B&R's local engineers were there for Stefan Weng and his team every step of the way. "Every time we needed support, B&R delivered." ←

To automate its new MagicBaker CleanFlex, Opelka used exclusively B&R technology. Users benefit from extremely fast startup after installation or maintenance.

Opelka programmed the PLC and HMI applications entirely in B&R's Automation Studio engineering environment. The seamless integration made programming, diagnostics and maintenance remarkably efficient.

Stefan Weng
Automation Engineer, Opelka

"The way we see it, the X20 system sets the industry standards when it comes to ease of installation, maintenance and scalability."

Photos © Opelka, F. Rossmann

Fast and fluid, steady and safe

Photo © iStock.

For its newest generation of painting robots, b+m surface systems asked automation partner B&R to help them accelerate the process of getting their custom-built, fully automated painting lines up and running – without compromising on the strictest of safety requirements. The results speak for themselves: Just 18 months into series production, the company had already built and delivered more than 100 robots featuring the new controller.

b+m generally has only 12 months to both design and implement a turnkey painting line. Specializing in painting plastic parts – particularly for the automotive industry and its subcontractors – b+m has one very clear advantage in its hotly contested market. Not only does the company offer full end-to-end solutions, it also controls the entire technology supply chain, enabling it to perfectly tune the components to one another.

The T1 series of b+m's six-axis painting robot plays a central role in this strategy and must therefore live up to some extremely high requirements. "Our robots are much different than handling robots," emphasizes b+m's head of robotics development. "To achieve the best results, our robots' movements must be rapid, fluid and uniform – at speeds up to two meters per second along a continuous path. On top of all that, they need to be prepared to operate in potentially explosive environments."

Painting robot: Fast and accurate

b+m began development of its 5th robot generation in 2010. Dubbed T1 X5, the new series was designed to serve as a new benchmark in efficiency, flexibility and reliability for years to come. One of the primary goals was therefore to take full advantage of the most advanced closed-loop and motion control available to achieve faster, more consistent path speeds while simultaneously minimizing wear. The new generation presented a perfect opportunity to streamline the control cabinet design by

reducing the number of electronic components, with the added benefit of cutting development and commissioning times.

With the heightened safety requirements from DIN ISO 10218:2011 taking effect right at the beginning of the project, these new specifications had to be accounted for when developing the new robot generation.

B&R scores big with its safety solution

"If you can master the extensive certification requirements of a safety solution, then a PC-based controller is no problem," reasons b+m's head of robotics development. "That's why we focused our search on suppliers whose portfolio includes safety technology."

By the end of the evaluation, B&R had emerged on top. The full integration of safety technology with the newly available software functions turned out to be the decisive factor.

The first step for b+m was to develop a range of high-speed safety functions based on POWERLINK, openSAFETY and SafeMOTION from B&R. These include integrated motion control functions like Safe Torque Off, Safe Stop 1 and 2, Safely Limited Speed and Safe Maximum Speed, as well as safe monitoring of axis positions. Functions for monitoring the position of the robot and for using safe machine options are also fully integrated in the control application. This allows the machine to be equipped with safety-related add-ons without excessive overhead for programming and recertification.

Safely limited speed at the TCP

The second step for b+m was to use the advanced SafeROBOTICS safety functions from B&R to implement safely limited speed at the tool center point (SLS at TCP) as well as a safe serial kinematic chain with safe parameter tables.

"Functionally, we've taken a huge leap forward with B&R's safety technology," says the b+m manager. "With SafeMOTION and POWERLINK, we no longer need a separate

ETHERNET
POWERLINK

B&R developed special robotic safety functions based on the real-time POWERLINK and openSAFETY protocols. b+m used these to equip its 5th generation of painting robots with advanced functions such as safely limited speed at the tool center point (SLS at TCP).

Built according to b+m's specifications, the control cabinet takes up less space and is faster to install and wire thanks to the B&R solution. The reduced number of moving parts and the use of cold plate cooling extended the service life of the system.

The control software is backward compatible with the previous generation, allowing users to continue running processing sequences created with the b+m editor.

safety bus, and installation and commissioning are much faster without all the tedious software configurations."

b+m has reduced both the size and number of components installed in the control cabinet by using two-axis ACOPOSmulti modules with integrated safety functions, which in turn further simplifies installation. The switch to a new cold plate solution has improved cooling performance. The ACOPOS servo drives communicate via POWERLINK with a SafeLOGIC safety controller, an X20 I/O system and the robotics controller – a powerful Automation PC 910.

90% of functionality comes from B&R

"With B&R, we've got 90% of our control cabinet functionality covered by one supplier – with no system inconsistencies or interfacing problems. That's a huge win for us," reports b+m's head of robotics development. "We were especially pleased that B&R was also able to provide us with motors for the kinematic chain, an operator panel for the robot and a custom control cabinet keypad with illuminated ring keys and a key switch."

b+m developed the HMI application for the mobile operator panel and the robotics application in-house using Automation Studio. The robotics experts at b+m also programmed the control application themselves using B&R's engineering environment.

Robotic functions for everyone

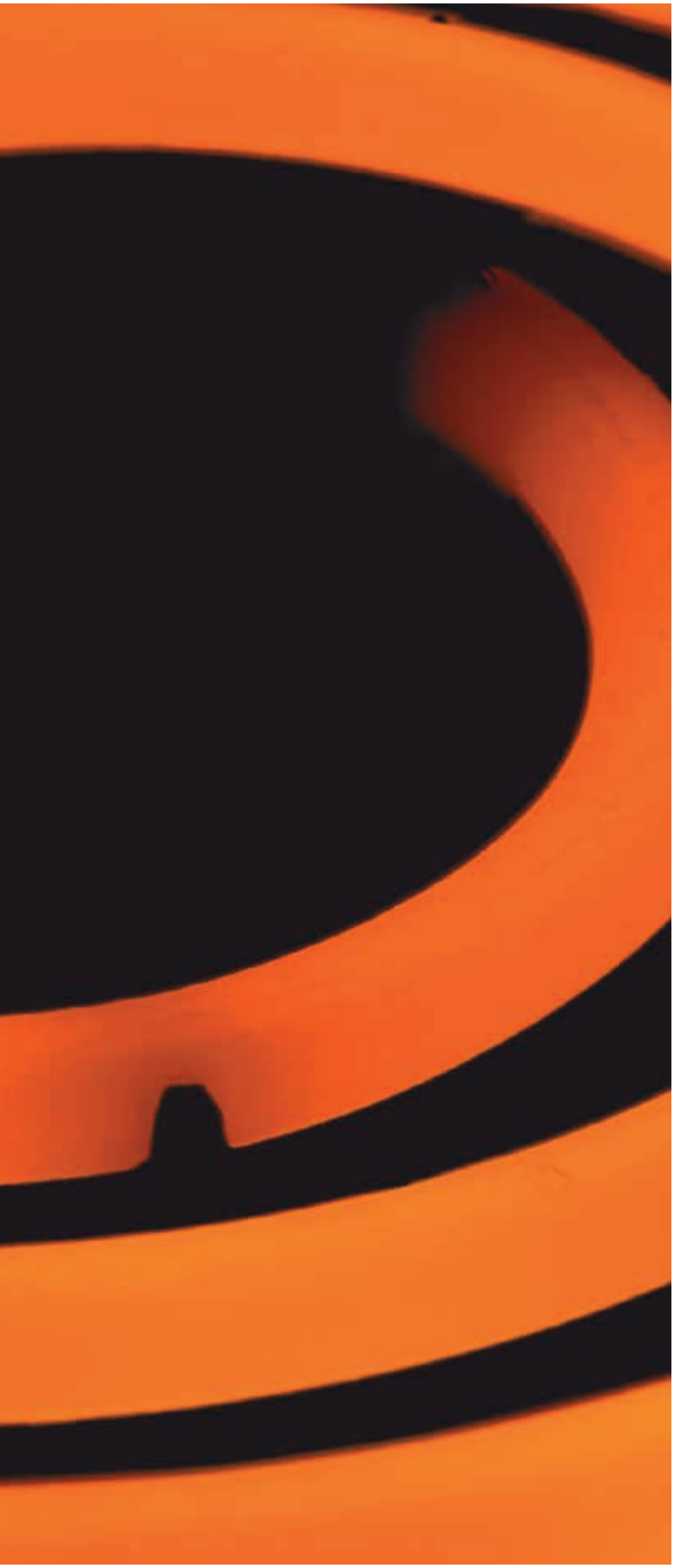
"When we first approached B&R, we quickly realized that, while Automation Studio does offer extensive CNC libraries, there were some important robotic functions that weren't completely covered," recalls the b+m robotics specialist. "B&R took this challenge and ran with it, delivering on every aspect of our comprehensive functional specifications." The resulting robotic functions, including transformations and interpolations, are now available to all users of Automation Studio. b+m used them to develop the control application for the painting robot. "We were able to achieve every goal we set for ourselves, and the result is a highly advanced and future-ready generation of robots," concludes the b+m manager. Thanks to the improved mechanical design with more sturdy gearing and the control architecture based on automation and safety technology from B&R, the new generation of T1 robots set new standards in productivity, reliability and service life. In light of the ongoing success of the T1 series, b+m is already working on a new series of robots with the same range of functions but somewhat smaller dimensions. This soon-to-be-released T2 series is specially designed for applications where space is limited and also supports mounting on walls or ceilings. Like the T1 before it, will rely on the proven solutions from B&R. ←

Photos © b+m surface systems GmbH, F. Rossmann

Induction heating

Engineered to order

Photo © iStock.



Induction heating is an extremely energy-efficient, non-contact and controllable process which uses a transformer effect to heat conductive materials without the byproducts of combustion or convection. Since the process generates heat into a specific, designated area with no open flames and no direct contact to the object being heated, it results in a safer environment for machine operators and avoids product distortion and contamination that can result from other conventional heating methods. This, coupled with its ability to deliver consistent results, has made induction an increasingly popular heating method among industrial manufacturers. Switching from a traditional control configuration consisting of components from various suppliers to a single, integrated control system from B&R helped Pillar achieve all of its ambitious goals.

As a key supplier of induction heating systems and services, Pillar Induction delivers solutions for heat treating, melting, forging, and tube and pipe applications. Heavy machinery manufacturers, heat treatment plants and foundries, defense, aerospace, automotive and medical industry manufacturers all rely on Pillar. Over the past several decades, Pillar has experienced continued growth and advancement in its equipment line. The Wisconsin-based company invented the first solid state power supply in 1966 and later developed the first transistorized induction power supply, both having significant influence on the induction heating industry and how it operates today.

Always striving for continuous improvement to meet and exceed its customers' needs, Pillar recently set out to enhance its product line, changing from analog meters and controls to an HMI with full interface capabilities.

Control switch

Requirements for the operator interface of an induction heating system included durability, reliability and performance, while also maintaining cost competitiveness. In addition, the system had to

ETHERNET
POWERLINK

The Power Panel HMI communicates seamlessly and directly with the X20 I/O system via POWERLINK. The automatically configured solution allows Pillar to perform installations without requiring additional modules or control cabinet space. It also drastically reduces customer downtime. POWERLINK is an open technology and defined worldwide as an IEC standard.

Pillar's equipment is often installed in extremely harsh, high-temperature industrial environments such as forging facilities, foundries and heat treating facilities with constant exposure to heat, moisture and other industrial conditions. To deliver the best to its customers, Pillar implemented an integrated controls solution that not only stands up under the intense environmental conditions, but that also features the durability, reliability and performance necessary at a price-point customers appreciate.

be backward compatible to service existing installations with the new technology. Lastly, having a control system that could withstand high ambient temperatures above 40°C during operation was a critical criterion for selecting the right controls partner. Pillar's equipment is often installed in extremely harsh, high-temperature industrial environments such as forging facilities, foundries and heat treating facilities with constant exposure to heat, moisture and other industrial conditions.

Individual control modules are now more compact and integration with external control systems is seamless. As a result, Pillar was able to improve spare parts delivery and reduce customer downtime, which in turn improved delivery times to end users. "We're able to completely retrofit existing controls on operational equipment in the field to the new platform in less than a day – which minimizes our customers' downtime," explains Rich Detty, Pillar's sales and marketing manager.

Service made easy

Using B&R automation technology gave Pillar advanced product traceability and helped achieve a single-piece flow environment for the induction power supply. The Power Panel HMI device has an internal serial number tied to the machine program, so Pillar can track hardware changes in the field and prevent unauthorized duplication.

Pillar now uses a single I/O arrangement, and additional functions can be implemented by simply adding more hardware modules. Its newly implemented X20 remote I/O system replaced hardwired, embedded and custom I/O boards which limited programmers, as well as the expansion of channel outputs. Pillar can now configure the hardware outputs to the exact requirements of the customer, or bypass them completely with a slave fieldbus interface. The Power Panel seamlessly communicates directly with the X20 I/O system via the real-time, deterministic Ethernet protocol POWERLINK, which uses an automatically configured solution that allows Pillar to perform installations without the need for extra communication modules. This saves cabinet space and reduces customer downtime.

I/O serviceability was also greatly improved within the machine thanks to the new B&R control system. The X20's unique three-piece design enables Pillar to service a module without having to undo any field wiring. The ability to separate the terminal block, electronic module and bus base allows the operator to simply remove the electronics module to be serviced without having to cut power off downstream.

Swift diagnostics

Pillar's customers have been able to reduce the time spent on troubleshooting, thanks to the extensive access that Automation Studio provides to historical alarm data, which allows them to trace any failures back to the source. The software's modular design allows for configurable options such as network interfaces, custom sensor setups, resonance tuning contacts and output switching – all in a single controls package.

Remote access capabilities have further simplified troubleshooting and afforded cost savings that are passed on to machine operators, who no longer need an onsite technician to address equipment issues. With B&R's System Diagnostics Manager paired with VNC capabilities, engineers can send updates to technicians in the field via the Internet, significantly increasing the speed of diagnostics and further contributing to reduced customer downtime.

Traceability features, like having the Power Panel HMI's internal serial number tied to the machine program, make it easy for Pillar to track hardware changes in the field and prevent unauthorized duplication.

Donald Wiseman
Vice President, Pillar Induction

"B&R is now our standard for industrial controls and we use B&R on all of our retrofit projects."

Pillar prides itself on providing turnkey solutions and has worked hard to create a power supply offering to exceed its customers' expectations. "Each customer is unique. They give us a problem statement and we will figure it out. We work with our customers to create and implement custom solutions ideal for their particular environment; we are ETO (engineered to order) and B&R helps us achieve that," states Detty.

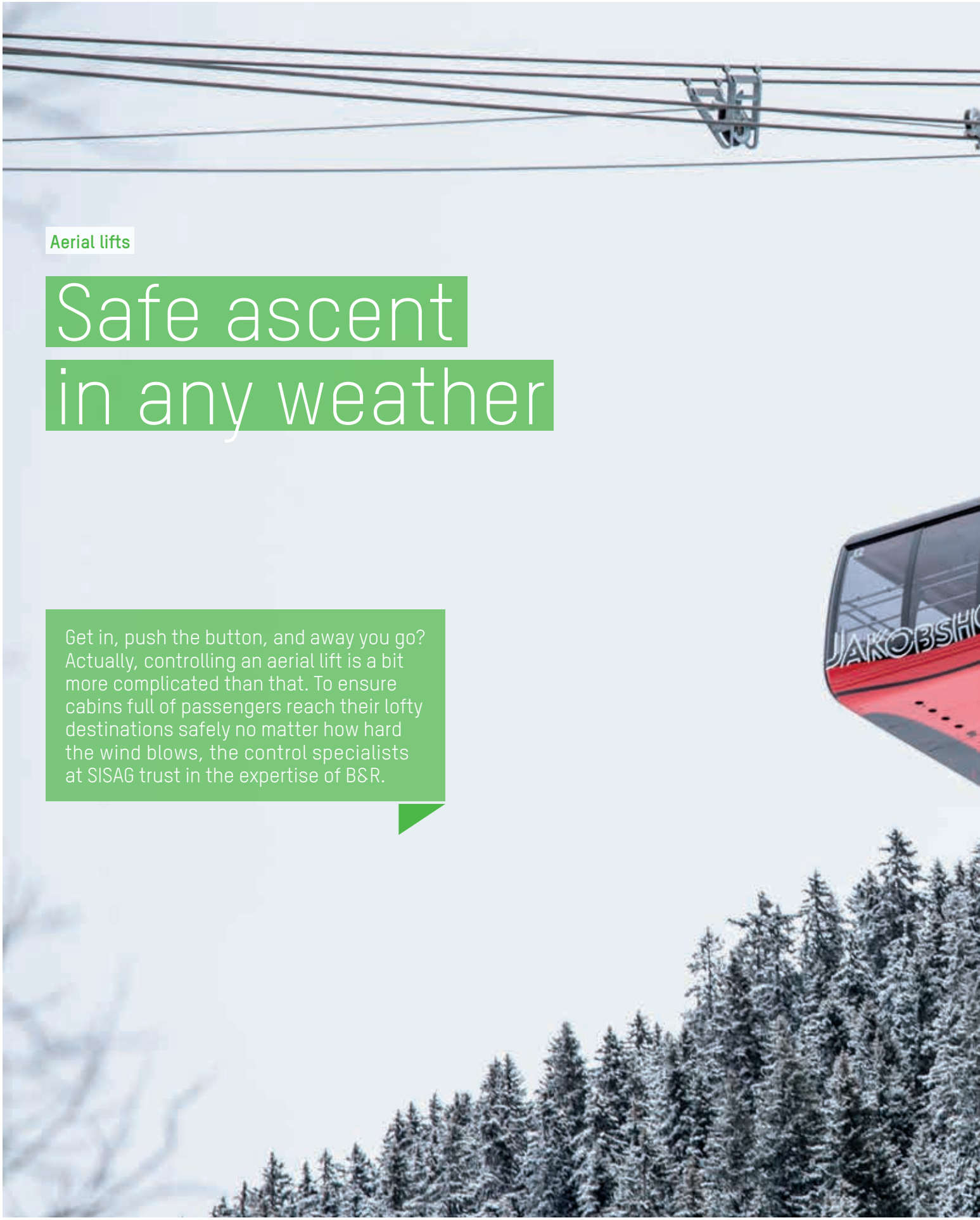
Due to the successful partnership with B&R, other applications are being converted to B&R control systems as well. "B&R is now our standard for industrial controls and we use B&R on all of our retrofit projects," remarks Donald Wiseman, vice president of Pillar Induction. ←

Photos © Pillar Induction

Aerial lifts

Safe ascent in any weather

Get in, push the button, and away you go? Actually, controlling an aerial lift is a bit more complicated than that. To ensure cabins full of passengers reach their lofty destinations safely no matter how hard the wind blows, the control specialists at SISAG trust in the expertise of B&R.



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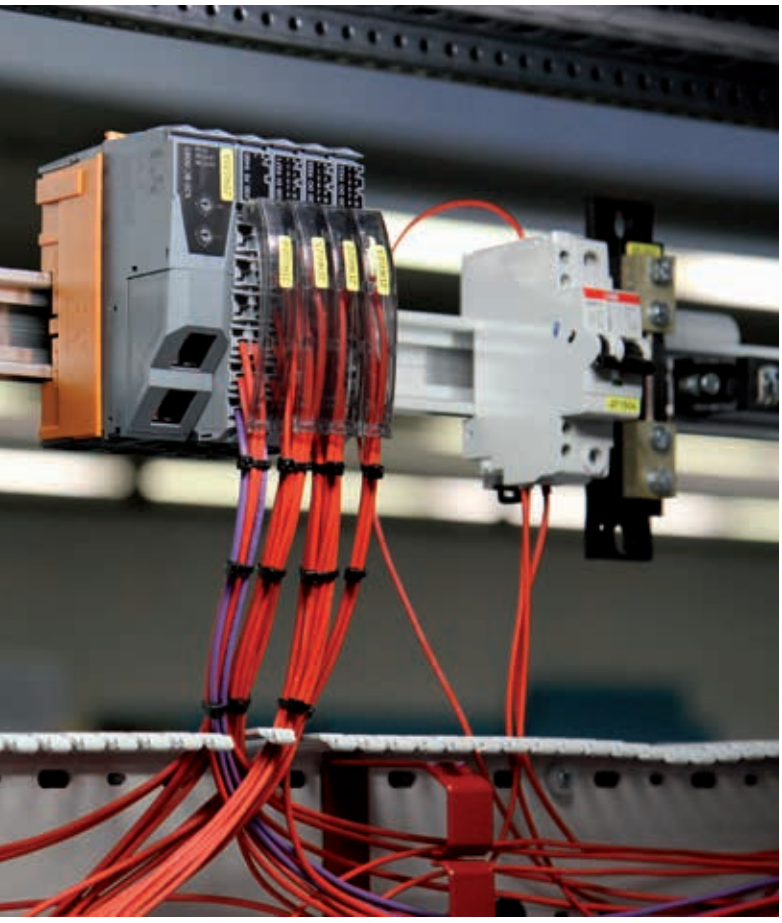


The new gondola lift at the Jakobshorn resort features a PLC, touch screen operator panels and frequency inverters from B&R.

The weatherman was right – the sun is just starting to peek over the ridge. A stiff breeze still holds the temperature just below freezing, but the first row of the parking lot is already filling up.

Skis shouldered, the early risers march with lumbering determination toward the ticket booth. The first gondola exits the station and begins its ascent, a sign that the operators have begun their daily routine of unparking the cabins from the garage, hanging them on the cable and performing their maintenance check. At the operator's station, they test the control panel and buttons to make sure everything is in order.

Six letters say it all

The acronym SISAG comes from the German for aerial lift and safety technology. As the name suggests, the Swiss company with around 100 employees at its headquarters in Altdorf and office in Monthey specializes in the area of control and safety technology for aerial passenger transport systems. "From intern to director, we all know each other here," says SISAG board member and marketing manager Erich Megert.

Expertise trumps cliché

The SISAG team includes six developers who create hardware and software solutions for a broad spectrum of passenger transport applications, including full-scale motion control and process control systems.

Customers include traditional lift operators like Weisse Arena, as well as international system manufacturers who also build gondola lifts and cable tramways for urban transportation.

SISAG was also responsible for the operations control technology in the Skymetro people mover at the Zürich Airport.

20 years of cooperation are explanation enough

When it came time to revamp its control systems in 1996, SISAG decided to make the move to programmable logic. Among the numerous industry players whose systems were evaluated, B&R stood out. "B&R's system is designed for multitasking and real-time operation," says SISAG's head of development, Nik Püntener. It also allows SISAG to program in high-level languages.

SISAG knows that without motivated and qualified employees, the lift will never leave the station.

In implementing the transition, B&R ensured that even 20-year-old systems could be retrofitted. "We're very happy with B&R. Their innovation shows in the frequency with which they introduce sophisticated new products. The B&R team in Frauenfeld provided outstanding support in close proximity to our customer," praises Püntener.

Networking the best of two worlds

The lift is controlled by X20 PLCs installed in the base and peak stations. A touch screen operator panel makes the whole system about as easy and intuitive to handle as a tablet PC. The frequency inverters that drive the cables communicate via the high-performance Ethernet standard, POWERLINK.

The general increase in networking in the passenger transport industry is making it easier to perform remote maintenance and diagnostics on aerial lift systems. "Until recently, the communication technology used in lift systems was very rudimentary," explains Püntener. "The attendant in the local station was able to see that someone had stopped the lift, but had no idea why. With the freezing cold and heavy winds you experience at 3,000 meters above sea level, WLAN communication is prone to failure. That's why we produce our own communication systems that link directly to B&R's solutions and send E-stop signals straight to the drive control system."

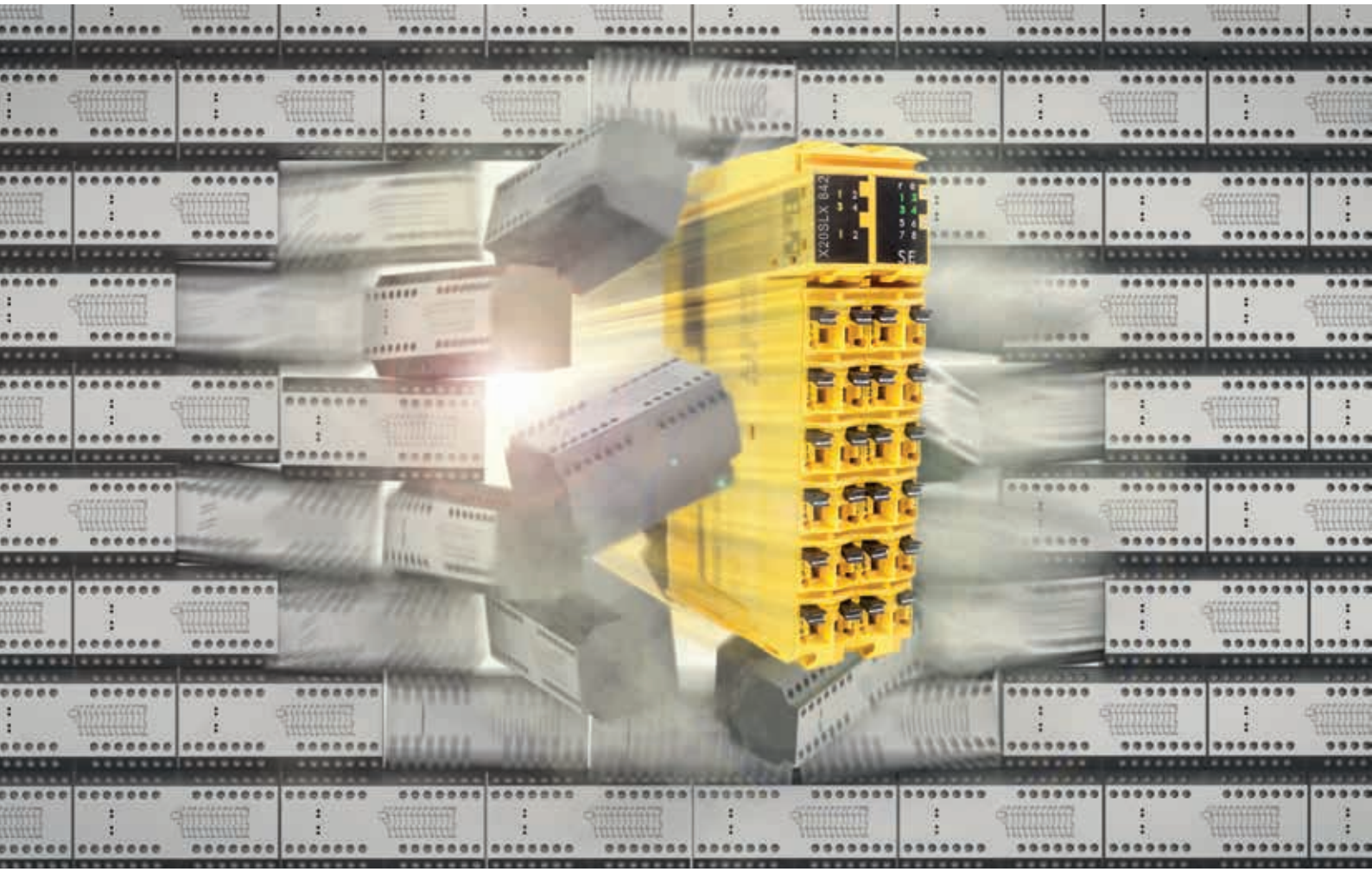
Nik Püntener
Head of Development, SISAG

"We're very happy with B&R. Their innovation shows in the frequency with which they introduce sophisticated new products. The B&R team in Frauenfeld provided outstanding support in close proximity to our customer."

In 2006, SISAG developed a new control simulation using B&R's Visual Components. The transition to Visual Components and PLC technology have brought further significant improvements in communication. "We've got a whole new range of possibilities, even up in the deep snow and biting cold," says Püntener. ←

Photos © Eugen Albisser, Sisag

Break free from hardwired safety



B&R's new digital mixed modules break through the cost barrier: Programmable safety technology is now no more expensive than a conventional relay solution.

B&R makes programmable safety technology profitable for small applications

At the Hannover Messe, B&R presented a new series of safe digital mixed modules from its X20 SafeIO family – breaking down the barriers to entry for programmable safety technology. Even in the smallest applications, integrated safety technology is now no more expensive than a conventional relay solution.

B&R's commitment to absolute scalability is nothing new. From entry level to high end – all B&R products are fully interchangeable without having to make any major functional changes. The new mixed modules take scalability one step further on the low end of B&R's safety portfolio. Safety solutions on the smallest scale can now be implemented with a single X20 SafeIO module.

Wear-free semiconductors

B&R's programmable safety technology is based on semiconductor components that are not subject to wear like conventional electromechanical relays, which have to be replaced periodically to maintain the functionality of the safety application. Semiconductor-based safety technology is also considerably faster than relay-based solutions.

Photo © B&R

POWERLINK approved as Korean Standard

Yniong Lee, managing director of B&R Korea (on left) receives certification of POWERLINK as Korean Standard from Sung-ho Hong, Professor at Hanyang University and head of IEC / TC 65 Korea.

Photo © B&R

Open source communication for the future of Korea's smart factories.

POWERLINK has become the first 100% open source protocol to be registered by the Korean Industrial Standard Commission under the KS C IEC 61158 and 61784 standards for industrial communication networks. The Ethernet POWERLINK Standardization Group (EPSG) plans to follow up on this accomplishment by founding a POWERLINK Korea User Group in order to provide improved technical support and create a joint marketing platform for all partners in the region. As manufacturer-independent, open source technology with no licensing fees, POWERLINK provides an international standard that will allow Korea's semi-conductor, automotive, shipbuilding and renewable energy industries to create flexible, high-speed communication networks equipped to meet the challenges of smart factories and the industrial Internet of Things.

POWERLINK has been registered in a total of five Korean standards: KS C IEC 61158-3-13, KS C IEC 61158-4-13, KS C IEC 61158-5-13, KS C IEC 61158-6-13 and KS C IEC 61784-5-13.

More OPC UA in APROL

OPC UA now makes it even easier for controllers, HMI panels and SCADA systems from any manufacturer to exchange data within B&R's APROL process control system.

B&R process control system facilitates vendor-independent data exchange
Users of B&R's APROL process control system can now enjoy more of the benefits provided by OPC UA. An OPC UA server and OPC UA client are now available directly on APROL's Linux-based runtime servers to allow open, vendor-independent communication.

All APROL variables that make the OPC UA server available to other OPC UA clients via read or write access can be defined through a simple selection process. All data points that should be linked can be easily selected via integrated browser functionality for the OPC UA client. Important attributes such as read or write access are made available automatically.

Communication between systems
Motor management and control units, compact OPC controllers and other devices can directly exchange all important operating, service and diagnostic data with the OPC UA client. In addition, an OPC UA server can be used to connect any number of HMI panels or SCADA systems to the APROL process control system. Communication can also be set up between APROL runtime servers. This is also possible between different APROL systems with different software versions.

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