automotion INDIA

The B&R Technology Magazine

B&R India

Your partner in success

Scalability+ The solution program for next generation automation

Process Absolute safety with redundant valves

Automotive Shifting gears with perfection

What Indian manufacturers say about us ...

PERFECTION IN AUTOMATION
www.br-automation.com

पर्फेक्शन इन ऑटोमेशन

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Perfection in Automation

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ਪਰਫੈਕਸ਼ਨ ਇਨ ਔਟੋਮੇਸ਼ਨ

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பெர்ஃபெக்ஷன் இன் ஆட்டோமேஷன

editorial

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t +91 20 41478999
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Dear Reader,

Indian manufacturing has certainly come a long way! Today, manufacturing plants are safer and more productive than ever. Undoubtedly, automation has contributed not only towards making them a better place to work but also helped improve the quality of life for millions of Indians.

At the heart of this evolution is the rapidly changing lifestyle of aspiring consumers as well as the dynamics of the global market. We see clear evidence of this every day. When we visit a grocery store, we are spoiled for the choices in every product category – brands, colours, shapes and prices.

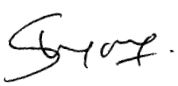
Excellent intuition regarding market developments and trends, combined with the ambition to offer innovative solutions that benefit customers, are the qualities that have made B&R a trend-setter in its field. Today, with over 35 years of experience, B&R is a global automation company operating out of 75 countries.

"automotion INDIA" is a unique magazine that brings together the latest customer applications, the most innovative automation technologies and a glimpse into B&R's extensive portfolio. You will discover how B&R has carved its niche in the market with its unparalleled approach to building automation solutions for its customers. You will learn what OEMs value most about their B&R solutions – such as machine safety, continuous energy monitoring, ultrafast automation, fast CPU redundancy, advanced process control and real-time deterministic POWERLINK communication.

One of the features introduces B&R's "Scalability+" program, which takes scalability to a whole new level – allowing automation solutions to be tailored to machine requirements with greater efficiency and freedom than ever before. Interviews with B&R managers offer a range of perspectives on topics such as emerging trends in automation and how manufacturers can gear up for Industry 4.0. We also take an opportunity to talk about how B&R has grown in India over the years. We trace its journey through infrastructure development, product launches and unique solutions developed for our customers.

We thank you for your interest in this technology magazine and invite you to contact us for any assistance at *marketing.in@br-automation.com*

Happy reading!



Shyam Padwal
Marketing Manager

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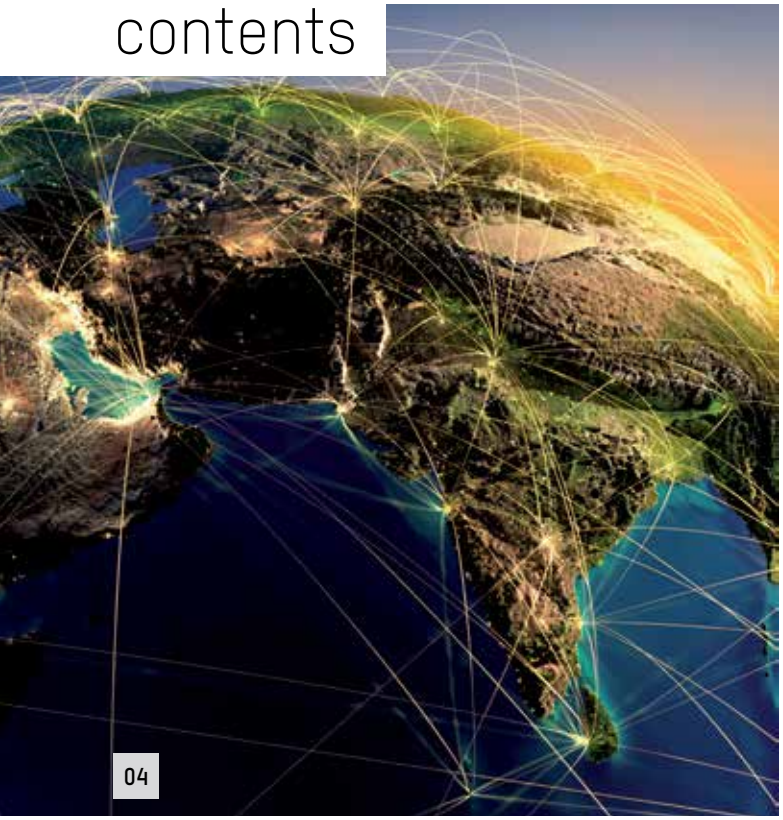
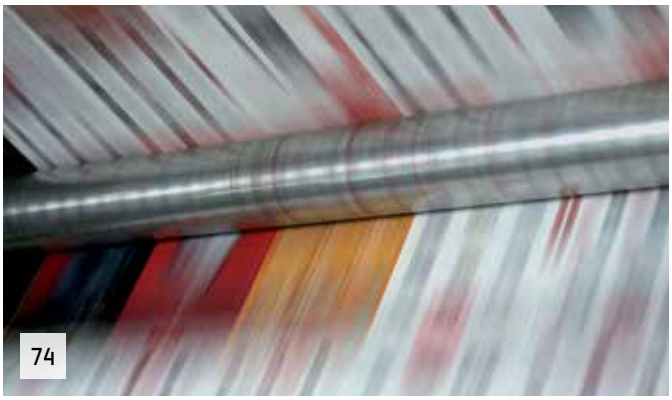




B&R India

Your partner in success

"Perfection in Automation"
When a complex problem of automation and control needs to be solved, B&R is the name that springs to mind. The trust reposed in B&R has inspired us to go all out and seek ever more complex assignments and continuously exceed our customers' expectations.

Integrated automation solutions form B&R for machine and process control cover all aspects of PLC, motion control, HMI, industrial PCs and integrated safety technology for every industry. With high-performance industrial fieldbus communication standards like Ethernet POWERLINK and openSAFETY as well as the versatile Automation Studio software development environment, B&R is constantly redefining the future of automation engineering. B&R is headquartered in Austria and provides local expertise on-site in 75 countries.

Recognizing the strategic importance of the Indian market early on, B&R began commercial operation here in 1998. Today, B&R Industrial Automation Pvt. Ltd. is a trusted name amongst Indian manufacturers looking for "Perfection in Automation".

"By Indians, for India"
In a time of global competition and disappearing trade barriers, the uniqueness of a solution makes all the difference. For a final product to perform up to its full potential, it must be built on a foundation of outstanding technical expertise.

This need is well addressed by our young and dynamic team of application engineers. B&R also maintains full-fledged training centers for customers and partners in Pune, Ahmedabad and Bengaluru.

As an integral part of a global technology leader dedicated to its OEM customers and partners, B&R India can guarantee application confidentiality as well as an extensive support network.

The growth story of B&R India

	1998	2000	2002	2004	2006	2008	2010	2012	2014
Infrastructure	B&R India moved to own premises of around 3,500 sq. ft. in Pune. ↑ B&R India began commercial operation	Pune office expands to 7,000 sq. ft. ↑ Ahmedabad regional office formed		B&R launches itself in North India with ELECRAMA show ↑ SAP system rolled out in B&R India	Training centers opened at regional offices ↑ Local support established in Delhi	Ahmedabad and Bangalore offices moved to bigger premises ↑ B&R celebrated 10 years in India	Logistics & repairs center opened up in Chakan Area 11,000 sq. ft ↑ Delhi and Chennai branch office formed ↑ Advance Training facility with miniature machines (E Camp)		**B&R India** 65 people 5 offices 1 Logistics & Repair center 3 training centers 40,000 sq.ft. total office space
Solution	Automation Studio: Universal software platform ↓ First project "Injection Molding Machine"	High speed web printing application developed ↓ Multi-axes servo based packaging application developed	3 axes FFS machine developed ↓ Power Panel: HMIs with integrated PLC for verious applications ↓ Revolutionary solution for injection molding introduced	Ethernet based communication bus POWERLINK introduced for remote IOs, Motion applications ↓ Motor winding application developed	Flexible and integrated CNC solution for Induction heating application ↓ All electric Injection Molding Machine application developed	High speed Candy wraping application ↓ CNC based hybrid Pipe bending & Transformer winding application	Wind turbine control application developed ↓ High Speed Tableting machine with 50 us data acquisition and advance control	Network redundancy for an Oil & Gas application ↓ Integrated camera system on Ethernet POWERLINK for a packaging machine	Ultra fast automation ↓ Fastest Controller redundancy

Our people are our strength

P V Sivaram,
Managing Director, B&R India

We are thankful to our Indian customers, who have shown such faith in B&R's technologies and capabilities. We are proud to have such a broad base of satisfied customers from such diverse industry sectors. Providing innovative products and working closely with our customers are our mantra for success. With the combination of a loyal customer base and a strong product line that covers all the automation needs of machines, factories and processes, we look with great confidence to a future of strong and sustained growth in India.

We firmly believe that a product is only valuable when it delivers a benefit to the customer. This belief influences us right from the specification and design stage. Yet, most important is our ability to implement the product in a manner that provides maximum utility and added value to the machine or process where it is used.

One unique feature of B&R's product spectrum is our ability to assure long-term availability. Beyond this, we also have a built-in assurance of scalability. B&R's Scalability+ means that our products are compatible with each other not only on the time scale (newer products can interface with products of previous generation), but also on the performance scale.

David Hemetsberger,
International Sales Manager, India

Long-lasting and effective partnership with our customers is the key focus at B&R. Cutting-edge technology coupled with service and support forms the foundation of such partnership.

It is essential for International Sales to understand the local needs of the Indian market and our customers there, and it is also equally important to provide vital updates from Austria to India without delay.

Our regular face-to-face meetings – both in India and Austria – in areas such as application development, sales, marketing and logistics, plays a pivotal role in delivering the right information at the right time. This way we are able to standardize processes and offer simultaneous release of new automation solutions.

B&R headquarters in Austria houses International Sales along with all other business units, which ensures quick and effective responses to urgent situations. For our multinational customers with manufacturing bases in various countries, it is essential to have similar structures and processes at B&R, which is ensured by our International Sales team. ←


Archana Amarnath


Deepak Phegade


Dharmendra Patel


Kiran Aaradhye


Mukund Patil


Magdalena Menezes


Praveen Vaidya


Rajalakshmi Hegde


Rajneesh Arora


Ravi Gawhade


Ritesh Raka


S Ragothaman


Shyam Padwal


Venkat Ram


Bhavin Umrania


Dinesh Mungi


Pravin Patel


Kirti Bhalerao


Krishan Bansal


Laxmi Kanojia


Manish Patel


Prachi Harshe


Pramod Patil


Prashant Rasal


Rajesh Gurav


Ramesh Nair


Sachin Deshpande


Sandip Taware


Vikas Meghani

Interview

Mr. Peter Gucher,
General Manager International, B&R

How important is the Indian market for B&R?
India is a country of high importance for B&R, as the manufacturing industry has a huge potential for growth and we witness a continuous rise in the implementation of automation technology. Recognizing this, we started operations in India as early as 1998. The excellent growth of B&R India in the years since has justified our vision.

From our start in India in 1998, we focused on the machine building market. Having established ourselves as a major supplier to the Indian machinery industry, we now begin the next strategic expansion phase into process and factory automation as well as a network of value adding integrators to expand our project business.

With this in mind we are planning big investments in India. We are expanding in the five centers, namely Pune, Ahmedabad, Bangalore, Delhi and Chennai. We have all the facilities to serve our customers, including our Automation Academy Centers. To ensure prompt and smooth delivery of material we have a stock and logistics center in Chakan near Pune with a capacity to stock over ten crore rupees worth of material.

How has B&R managed to grow so impressively year after year despite the various low cost automation suppliers in the market?
Leading a competitive market demands innovation in the system design as well as in the deployment of the product. Our spirit of being the technology leader in industrial automation has fueled an impressive growth over three decades, and today B&R has created a distinct position for itself. We have consciously worked on this aspect by staying at the forefront of the innovation cycle, maintaining continuity of product platforms and providing unmatched scalability to accommodate the changing complexity of the end product. Our customers have gained a competitive edge over their counterparts. We're not only setting ourselves apart from the low cost automation suppliers, we're setting benchmarks for traditional bigger players as well.

As a technology leader, what future trends in industrial automation are on B&R's radar?
The increasing importance of software in industrial automation is a clear future trend. In machine building, the emphasis has traditionally been on the mechanical and electrical aspects of design. Today, however, a machine's distinguishing features reside more and more in its software. Several factors like development of faster controllers and increasing process know-how have strengthened the role played by software in machine automation. Accordingly, software development has quickly gained importance. Incorporating expertise and know-how into software allows for quick innovation and improvements – even for machines and plants that have already been delivered. Powerful simulation tools, both pure software simulation as well as hardware-in-the-loop simulation, are reducing implementation time.

Modular machines that have add-on mechatronic units can be installed even after the machine is commissioned and running. This approach to customization is very quick, easy, cost effective and can be implemented for every manufacturer. We see a clear trend in modular machine concepts which will intensify in the future for sure.

Open technologies such as USB, Linux and Android have gained great importance in consumer products. Industrial automation as well as modern machine design are definitely on the path to embracing more and more open standards and technologies. This allows more competition and provides the owners with more choices

of vendors. This in turn ensures the long term availability of products and a secure upgrade path for successor technologies. Ethernet POWERLINK, a real-time Ethernet protocol promoted by the EPSG, is a perfect example of this. POWERLINK is a multi-vendor protocol administered by a not-for-profit organization where the stack for implementation is available for free on Internet.

What is the significance of Industry 4.0 in the global manufacturing industry and in emerging countries like India?

Industry 4.0, or the fourth industrial revolution project, promotes the computerization of manufacturing with the goal of achieving resource efficiency and value chain integration. According to the Industry 4.0 working group, Smart Factories and the Internet of Things will be reality by 2025. Manufacturers will be able to react to future market trends with mass customized products, while keeping costs steady and reducing time-to-market.

Manufacturers and technology suppliers in developed countries have already started taking the initial steps by embarking on new development projects. Manufacturers in emerging countries like India will benefit by understanding the advantages, considering the ongoing developments and linking it to their expansion plans. They will definitely gain by specifying at least for the affordable and readily available technologies in the market to start with.

How is B&R helping to facilitate realization of smart factories and increasing flexibility in factories?

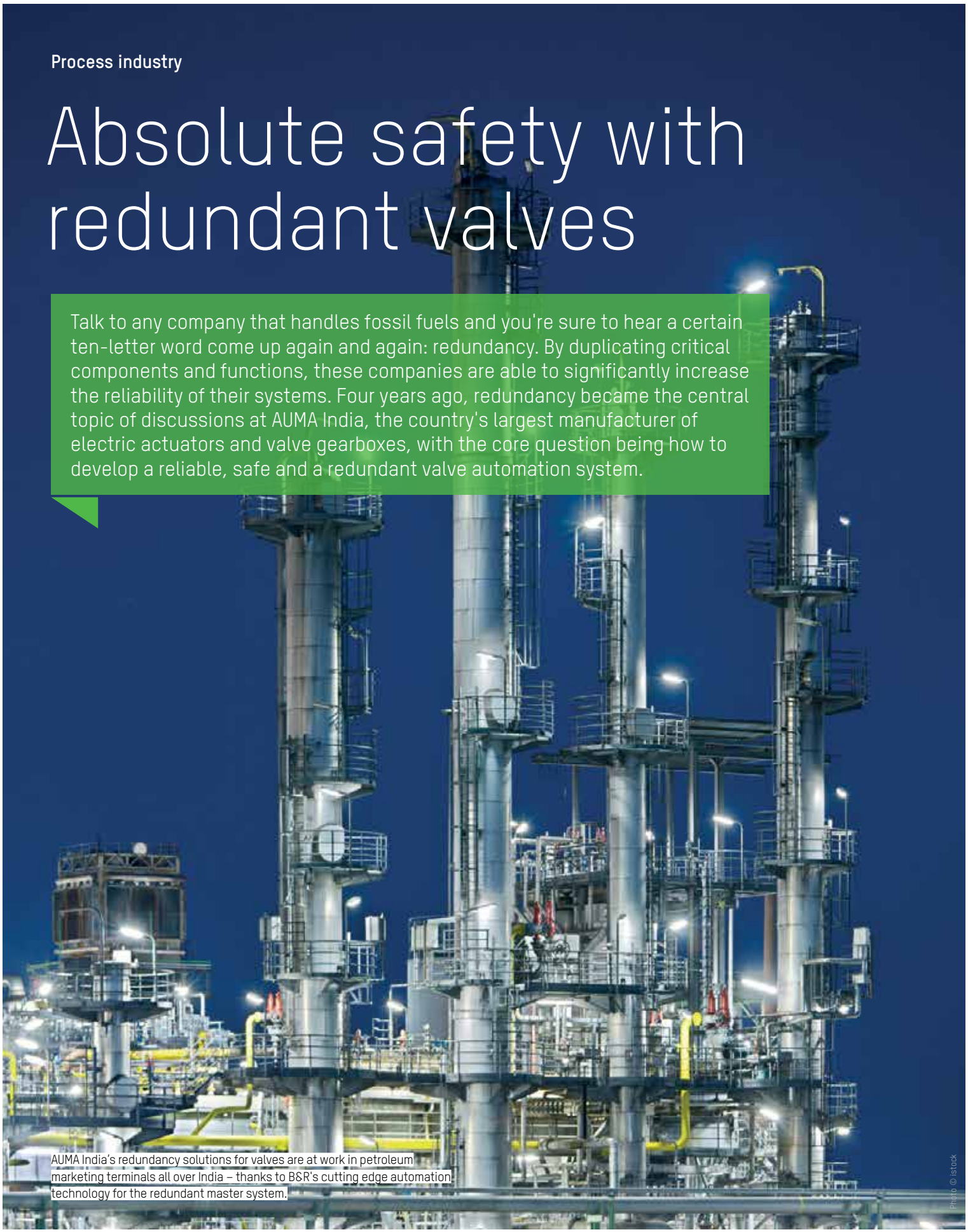
Building smart factories calls for newer automation solutions for machines and plants with capabilities of self-configuration, self-diagnosis and self-maintenance. B&R customers will not have to wait any longer.

Our APROL process & factory automation system allows any equipment to be interconnected quickly, transparently and safely. This is an important step in order to optimize maintenance intervals, overall energy efficiency and the load on individual machines. We have already started deploying technologies such as open-source Ethernet POWERLINK and openSAFETY standards connecting production to IT.

With B&R's concept it's already possible to eliminate many of the interfaces in the traditional automation pyramid and move faster to an open and more "cloud oriented" automation architecture which increases flexibility in factories. ←

Absolute safety with redundant valves

Talk to any company that handles fossil fuels and you're sure to hear a certain ten-letter word come up again and again: redundancy. By duplicating critical components and functions, these companies are able to significantly increase the reliability of their systems. Four years ago, redundancy became the central topic of discussions at AUMA India, the country's largest manufacturer of electric actuators and valve gearboxes, with the core question being how to develop a reliable, safe and a redundant valve automation system.



AUMA India's redundancy solutions for valves are at work in petroleum marketing terminals all over India – thanks to B&R's cutting edge automation technology for the redundant master system.

Photo © iStock

When it comes to providing valve automation solutions for critical processes, AUMA India is a frontrunner, offering solutions for virtually every electric actuation requirement encountered in process industries. When the actuator specialist wanted to develop a redundancy solution for the valves used in petroleum distribution and storage systems, it called on the automation expertise of B&R. Today, this technology is used by large number of petroleum marketing terminals all over India.

Redundant master system for valve control

Valves perform critical functions in hazardous environments, so unforeseen failures are absolutely unacceptable. With this in mind, AUMA India decided to develop the AUMA India Master Station (AIMS) whose task is to monitor and report the status of field actuators to the DCS system, thus reducing the DCS overhead. Key requirements of the station's architecture would be complete control redundancy as well as a redundant network for communication with the valves and DCS system.

Tough challenge, easy solution

AUMA India performed a thorough evaluation of the control systems available on the market. Though the process was exhaustive, B&R ultimately made selecting a winner quite easy. With its X20 control system, B&R offered unrivalled performance with a virtually limitless range of options. The powerful X20CP1586 controller, featuring an Intel Atom processor and cycle times as low as 200 µs, provided the high performance the application required. The field valves are connected to the RS485 Modbus network using the X20CS1030 communication module. Two communication modules provide ring redundancy for each of the system's three loops, with up to 80 valves per loop. Another set of communication modules and a controller remain in standby, ready to assume control in the event of failure. It is also possible to switch manually between the master and standby systems using the HMI. AUMA India is now evaluating B&R's newest controller redundancy solution, with Ethernet POWERLINK as the communication bus to drastically reduce switchover times.

The controllers also communicate, via Ethernet, with the Power Panel 320 HMI. The panel provides comprehensive status information of all of the valves, allows commands to be sent to the valves, and displays actuator feedback. The overview screen shows each valve's active/inactive, local/remote control and fault status. Redundant communication to this operator visualization station is also provided, with master and standby controllers communicating to a DCS system.

More all around

AUMA India was able to develop a flexible yet highly reliable solution thanks to the controllers and communication modules from B&R's X20 control system. The result is a system with unparalleled performance and modularity. Further advantages were provided by the built-in diagnostic features included in B&R systems, like System Diagnostic Manager and Web server technology.

With complete controller and network redundancy, the AUMA India Master Station (AIMS) is used as a buffer between field actuators and the DCS system. It monitors and reports the status of the field actuators to reduce DCS overhead.

With performance options ranging all the way to Intel® Atom™ CPUs, the X20 system can handle all tasks, large or small. The system's slice-based design makes it extremely compact and highly modular. Perfectly integrated fieldbus connections provide maximum freedom for decentralized architectures.

K.M. Chandrashekar
Senior Manager – R&D, AUMA India Private Limited

"We provide fully redundant, highly precise, explosion-proof actuators for the Terminal Automation Systems (TAS) used by oil companies. B&R has supported us all the way from selecting the master control station through to software development for the AUMA India Master Station with a very flexible and cutting edge automation solution. Our partnership gives us the confidence to take on many more such challenging projects in the future."

Water is life – Better treat it right

Photo © iStock

Water is an essential resource for agriculture and industry, and more importantly for the survival of all life on Earth. In response to ever-increasing pollution that endangers the quality of our already scarce supply, new textile industry regulations have been introduced with strict "zero discharge" requirements. Considering the vast quantities of water used in textile processes each day, the effluent treatment plants used to meet these standards must be extraordinarily efficient. Confident Engineering provides intelligent and sophisticated water treatment plants featuring the company's patented electrocoagulation technology and automated by high-performance B&R technology to achieve unprecedented levels of efficiency.

Water and chemicals: a combination that works wonders in textile plants and wreaks havoc on the surrounding environment. Hundreds of different chemicals are mixed with immense quantities of water throughout the dyeing and finishing stages of textile production – making wastewater treatment a daunting challenge in terms of both volume and composition. The serious dangers posed by increasing levels of wastewater pollution have led to new regulatory standards that will push textile producers to make drastic changes. With 35 years of experience producing wastewater treatment and recycling solutions for the textile industry, Coimbatore-based Confident Engineering recognized that conventional treatment processes lacked the continuous monitoring and advanced control technology that would be required to meet these needs. Together with B&R, they designed an effluent treatment plant with the sustainable performance to help textile producers prosper in harmony with their environment long into the future.

Automation Studio is the ultimate integrated automation software for every industry. It provides uniform solutions for control, HMI, diagnostics and unparalleled connectivity with the plant-level infrastructure. Automation Studio helped Confident accelerate time to market and simplify diagnostics and maintenance.

Sophisticated process with zero discharge

Confident's effluent treatment plant passes wastewater through eight different treatment processes to recover the maximum amount of recycled water and ensure that no unsafe waste is discharged into the environment. These processes are performed in five stations – dedicated to pre-treatment and electrocoagulation, ultrafiltration, reverse osmosis, nanofiltration and evaporation. The first station pretreats the wastewater through aeration, equalization and acid dosing before it is passed on to a clarifier and sludge recirculation system. Then, electrocoagulation effectively removes suspended solids at a submicron level, breaks down emulsions and oxidizes and eradicates heavy metals.

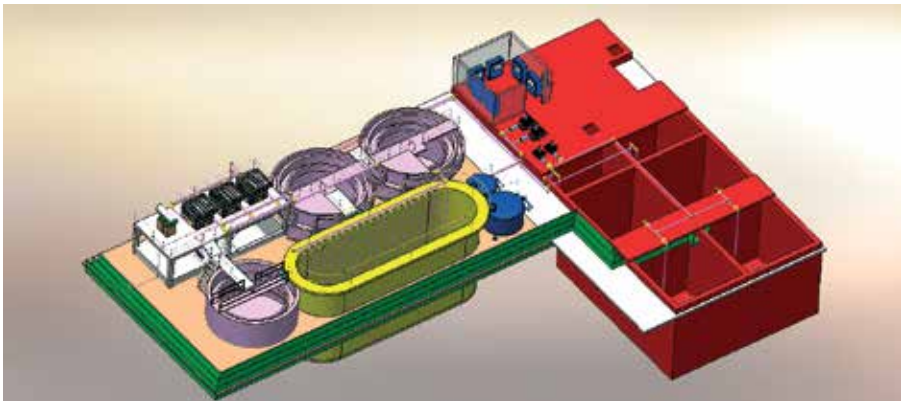
The second station passes the wastewater through special membranes to remove macromolecules and components with a high molecular weight in a process known as ultrafiltration. This serves as a preparatory stage for reverse osmosis and nanofiltration, which are handled by the third and fourth stations. At this point, the majority of the wastewater has been converted into pure reusable water. The remaining waste is fed to the last station, the evaporator, where it is heated to extract any remaining water in the form of vapour.

The whole plant follows a "Zero Discharge" policy that prohibits the release of any liq-

Mr. Ratnakumar
Partner, Confident

"B&R's advanced software tool, Automation Studio, and built-in support for a high degree of integration make B&R systems the clear choice for our automation needs. With its best-in-class product portfolio and the skilled support of its expert engineers, B&R is a valuable and reliable automation partner."

uid waste. The pure water that the system extracts is reused within the plant, and the only waste that leaves the plant does so in the form of solid sludge cakes. To make maintenance easier, routines like recovering permeate water, recycling reject water and cleaning the filtration membranes are also completely automated.



One of the key stations: the ultrafiltration system. A total of five stations treat the wastewater through processes including pre-treatment and electrocoagulation, ultrafiltration, reverse osmosis, nanofiltration and evaporation.

Intelligent stations with B&R technology

Each station is locally controlled and monitored, allowing operators in the field to view the current status of each process and adjust any necessary settings. This system makes use of the compact design and high performance of B&R's X20 I/O modules with IP20 protection, which provide a smart and easy interface to field equipment. These modules communicate via X2X with a powerful B&R Power Panel. The Power Panel combines control, HMI and motion control technology in a single device, making it an extremely flexible solution that can be easily integrated in virtually any automation infrastructure.

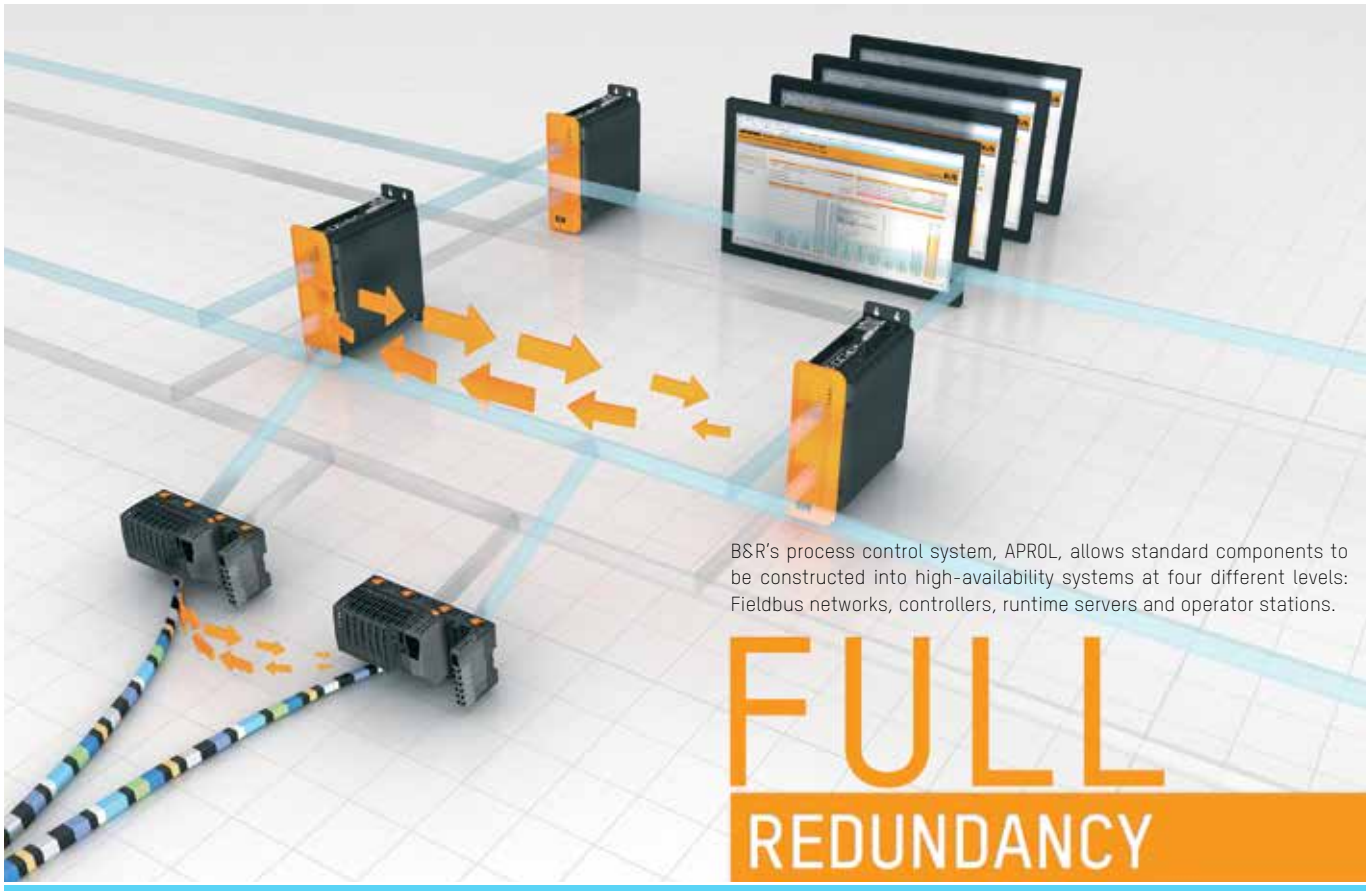
Automation PC for impeccable performance

Centralized control and monitoring of the entire plant is handled by SCADA software running on a powerful industrial PC from B&R's Automation PC series. Operating on 24V DC and supporting fanless operation, the Automation PC provides a robust architecture with absolute reliability. The powerful Intel Core processors give the Automation PC the best performance in its class. B&R controllers' default support for Modbus/TCP made configuration and setup of communication between the SCADA system and local controllers very fast and easy.

Close cooperation for a futuristic solution

Though B&R's systems were selected for their unparalleled performance, the real game changer was the integrated development concept made possible by B&R's Automation Studio engineering environment. With its integrated PLC simulation tools, Automation Studio allowed Confident to test the entire system in advance and accelerate its time to market. Having the control and HMI applications running on a single platform greatly reduces development times, while features like System Diagnostics Manager and a Web server included as standard with no extra programming make maintenance and troubleshooting considerably easier as well. ←

APROL – High availability at all levels



B&R's process control system, APROL, allows standard components to be constructed into high-availability systems at four different levels: Fieldbus networks, controllers, runtime servers and operator stations.

B&R process control with redundant servers, fieldbus networks and controllers

Starting with Release 4.0, B&R's APROL process control system provides maximum protection against system failure. APROL allows redundant systems to be set up at four different levels: fieldbus networks, controllers, runtime servers and operator stations. If the active system fails, an identical system running in parallel takes over all of its tasks. This prevents production downtime, improves process reliability and ensures products with consistent quality.

Redundancy with standard hardware

For some time, B&R has provided the option of using standard components from the X20 control system to establish controller redundancy. This eliminates the need for costly specialized hardware. Standard control computers from B&R's Automation PC series are also well-suited for constructing redundant server systems. Since the servers hold not only historical archives but also critical applications such as the real-time database and the alarm and trend servers, their failure would have severe consequences.

Changeover within a few milliseconds

The primary and secondary controllers or servers exchange data constantly via a redundancy link. Should the primary unit fail, the powerful real-time Ethernet POWERLINK provides a fast and seamless transition to the secondary controller within a few milliseconds.

APROL allows operator stations, which are typically redundant, to be designed using standard components. With POWERLINK, B&R offers flexible options for redundant fieldbus systems. APROL makes it possible to implement fieldbus redundancy using third-party systems. Configuration options can be used to enable or disable redundancy.

Photo © B&R

Interview – Haldiram Snacks (P) Limited

Shivraj Choudhary
General Manager - Technical

What areas should automation vendors focus on to help manufacturers achieve better productivity?
Simply understanding the packaging process is not sufficient for any automation vendor. It is very important to plan for the packaging process all the way from ingredients processing to end-of-line packaging. Maximum efficiency can only be achieved if the entire process is automated. The automation process should also include a robotics interface so as to provide the high level of hygiene required for packaged food. It is essential to use an open protocol like Ethernet POWERLINK to provide uniform integration of all automation components on a single network. PackML is an excellent way to integrate the complete line, independently of the various OEMs and automation solution providers involved.

How has Haldiram Foods leveraged automation technology to improve productivity and reduce downtime?
Haldiram Foods are well-known in the packaged snack food market. This highly competitive market challenges us to constantly work toward higher productivity and reduced costs. Haldiram has always demanded exceptionally fast and user-friendly machines from its OEMs. We have always opted for integrated solutions and user-friendly machine interfaces. Reducing downtime has also been a consistent motive for seeking the best automation systems and training for our operators.

Haldiram has trusted B&R as an automation partner for many years now. What differentiates B&R's offering from the rest?
B&R's reputation as an innovative automation partner is evident from its vast installed base of machines all over India. We have more than 450 machines with B&R systems in various manufacturing sites all across the country. These machines include intermittent collar type, continuous collar type, top filler, vertical filler sealing and pick film sealer machines.

B&R has helped us make great progress in terms of productivity. The support offered by B&R has been one of the main reasons for our long and successful partnership. The single software tool which facilitates programing, diagnostics, and maintenance features for all products offers immense flexibility. The B&R portfolio consists of reliable and robust hardware and the fully integrated design helps us future-proof our plants.

Haldiram is one of the leading players in the snack food industry with delicacies ranging from sweets to tangy and spicy snacks.

"B&R has always been our preferred solution provider for our packaging machines contributing with their seamlessly integrated hardware and software. B&R's approach with Ethernet POWERLINK and PackML standards are influential in Haldirams success and have given a boost to the packaging machines and line integration."

Shivraj Choudhary
Haldiram Snacks (P) Limited

Photo © PSA (1), Haldiram (1)

Interview

Photo © B&R

Mr. P. V. Sivaram,
Managing Director, B&R India

What is the medium-term outlook for the Indian manufacturing industry, and what role does industrial automation play in manufacturing?
With the growing purchasing power of India's population, demand for consumer products and durables will increase rapidly. This increasing affluence will also require huge expansions in infrastructure such as power, roads and telecom. This provides both a capacity and a demand for increased manufacturing. Indian manufacturing is still highly under automated in all but a few sectors. This provides a huge potential for automation, not only in sunrise industries, but in traditional ones as well.

Demand for features like track-and-trace, in-process testing and integrated safety will also increase – especially in order to cater to the export market. For such implementations there is no alternative to automation. Automation will help in implementation of good manufacturing practices, and can provide the continuous documentation required for compliance with standards. We have already seen industries like automotive and pharmaceuticals leveraging industrial automation to produce higher quality goods for their respective customers, which results in a win-win situation for all stake holders.

How is B&R India preparing to handle the changing demands for automation?
We have already started working on the future needs of our customers. B&R's commitment to innovation, combined with close ties to our customers and their markets is what helps us maintain our position as the technology leader in industrial automation. We set trends by bringing solutions to the market that help our customers improve processes for ultimate efficiency.

Productivity improvement is undoubtedly the prime demand that we are catering to. This not only includes increasing throughput, but also reducing machine downtime, improving quality and achieving faster batch changeover. All these factors contribute directly to the success of our customers. That's why B&R India is setting up more and more offices to bring us closer to the manufacturer and help us better understand these needs.

B&R's predictive maintenance technology and built-in diagnostic tools help our customers reduce machine downtime. Intuitive, customized and multi-touch HMIs improve operator efficiency. On top of all that, we support machine builders in the development of modular machines with our engineering software Automation Studio. This allows them to build custom-tailored machines for each end user in an exceptionally cost effective way. We have also already begun providing solutions to help customers take the initial steps towards compliance with ISO 50001 energy management, helping them monitor energy consumption closely around the clock.

B&R India has shown excellent growth over the last decade. How do you plan to sustain this trend in the future?
We are thankful to the Indian customers who have shown faith in B&R's technologies and capabilities. We feel proud to have such a base of satisfied customers from different industry sectors. Providing innovative products and working closely with our customers are our mantra for success. With the combination of a loyal customer base and a strong product line that covers all needs of machine, factory and process automation, we can look ahead with confidence. We are very optimistic and looking to India for strong and sustained growth.

We firmly believe that a product is only valuable when it delivers a benefit to the customer. This belief influences us right from the specification and design stage. Yet most important is our ability to implement the product in a manner that provides maximum utility and added value to the machine or process where it is used.

One unique feature of B&R's product spectrum is that we are able to assure long-term availability. Beyond this, we also have a built in assurance of scalability. B&R's Scalability+ means that our products are compatible with each other not only on the time-scale (newer products can interface with products of previous generation), but also on the performance scale. This means that if today we implement a solution using a low-end CPU, tomorrow we can easily upgrade to a high-performance CPU with minimum effort. Or, we can upgrade to the next generation CPU!

What differentiates B&R from other suppliers of industrial automation?
In a time of global competition and disappearing trade barriers, the uniqueness of a solution makes all the difference. For an automation solution to perform up to its full potential, it must be built on a foundation of outstanding technical expertise. This need is well addressed by our young and dynamic team of application engineers and equally competent sales team. These highly qualified specialists receive extensive training at the corporate headquarters in Austria. B&R also maintains full-fledged Automation Academy Centers for customers and partners in all of the offices in India. Soon we will have a competency center for APROL, B&R's process control solution.

Our technologically advanced, state-of-the-art products give our customers a decisive edge over their competitors. B&R's integrated and scalable automation solutions for machine and process control cover all aspects of PLC, motion control, HMI, industrial PCs and integrated safety technology for every industry. With high-performance industrial fieldbus communication standards like Ethernet POWERLINK and openSAFETY as well as the versatile Automation Studio, B&R is constantly redefining the future of automation engineering.

Fundamental to the success of our solution is that the state-of-the-art electronics hardware is complemented by equally flexible software and supported by B&R India's combined 400 years of experience.

Interview – Ferromatik Milacron India

Mr. Shirish Divgi,
Managing Director

What are Ferromatik Milacron India's latest solutions for the plastics industry? What advantages do they offer for users?
Our most recent innovations are targeted towards reducing energy consumption and increasing productivity, consistency and reliability while also lowering operating costs. These are precisely the advantages that Ferromatik Milacron India's high-quality servo-driven injection molding machines provide at competitive prices.

Major developments have been made with fully-electric, servo-driven machines that save energy and boost productivity, as well as two-platen machines whose greatly reduced footprint brings huge savings in floor space.

For new market entrants with specific application requirements, our new energy efficient Nova Servo series offers a range of cost-effective solutions. Our existing lineup of injection molding machines caters to a wide range of applications including PVC Line Servo, CPVC Line Servo, PET Series, Bubble Top PET Preform, Two Colour Injection and many more.

What would be your advice to plastic manufacturers when selecting a machine supplier?
Plastic processors may base their selection on various criteria and standards. Machine quality, output and consistency of produced parts over the years, as well as a good price/performance ratio are some of the most common priorities. Machines with more uptime and better productivity with lower rejection rates and low operating costs are also preferable over others. Apart from these factors, the most important thing to look for is strong after-market support and training, which are key to a satisfying customer experience.

FMI offers full range of injection molding machines from 50 to 3200 Ton. These high performance machines are precise, energy efficient and are based on servo mechanism.

Ferromatik Milacron India's injection molding machines have become well-known among plastic processors through their decades of proven high standards.

What do you consider to be the role of automation in plastics processing and manufacturing?

Automation is directly linked to the productivity of an injection molding machine. Reducing the amount of human intervention required increases the machine's uptime while also speeding up the machine and increasing productivity.

Ferromatik Milacron provides fully automated, energy conserving machines that can easily be fitted with automation auxiliaries for mould area or feeding of raw material. In larger machines for automotive applications, Ferromatik Milacron provides automation for all auxiliary equipment.

B&R has always been considered an innovative automation partner for the cutting-edge machines provided by FMI. What are your thoughts on this successful partnership?

It is a collaboration between an injection molding machine manufacturer dedicated to high-precision and top performance and an automation partner with the innovative solutions. B&R has been our technology partner from many years and has continually helped us to have the leading edge of the market with their state-of-the-art solutions. They have provided excellent engineering support and I can say very confidently that having B&R as a strategic partner has played a significant role in our successful progress. The partnership guarantees our customers excellent performance and all-round satisfaction. ←

Scalability+
Next generation automation

08 Open communication
- Open for all fieldbus systems
- Seamless integration of fieldbus devices (FDT/DTM, EDS, GSD)
- Maximum flexibility through standardized communication with MES, ERP and SCADA systems
- Integrated communication with OPC UA directly on controllers

07 Control
- Complete integration of control, HMI, motion and safety technology
- Sustainable development thanks to software compatibility with all hardware platforms
- Dynamic updating of plant components using software modules
- Safe hardware replacements with centralized management of configurations and firmware

06 Operation & Monitoring
- Fast creation of integrated HMI applications directly in Automation Studio
- Greater flexibility due to local, remote or VNC visualization
- Simple translation workflow
- Open for connecting SCADA packages via OPC UA or PVI

05 Integrated safety technology
- Access to safe I/O data from the safe and standard application
- Safety through the use of certified PLCopen function blocks
- No effect of functional modifications on the safe application
- Openness achieved by fieldbus-independent, systemwide safety with openSAFETY

Open at every level

- **Seamlessly integrated**
  IEC 61131, C, C++, CFC
- **PLCopen**
  Motion control and safety technology
- **Simulation**
  MATLAB, MapleSim

- **ECAD systems**
  Round-trip engineering with EPLAN Electric P8
- **Internet**
  Web server, HTTP client, remote diagnostics system

Software engineering with Automation Studio

01 Project management

- Accelerated time to market with parallel development
- Maximum software reusability resulting from hardware-independent programming
- Early start to software development with extensive simulation options
- Efficient and integrated engineering by completely integrating all products
- Open for hardware comparison with E-CAD systems and round-trip workflow
- Traceable software versions through the use of source control systems

02 Programming

- Maximum compatibility with IEC 61131-3, CFC, ANSI C, C++ and PLCopen languages
- Fast, parallel software development achieved through modularization
- Efficient software development with extensive technology libraries
- Automatic code generation with MATLAB(/Simulink) and MapleSim

03 Diagnostics & Remote maintenance

- Maximum machine availability due to intuitive diagnostic options
- Fully automatic diagnostics of the entire automation system
- Simple, web-based remote maintenance access

04 Drives & Motion control

- Maximum dynamics and precision with a perfectly orchestrated complete system
- Fast engineering achieved by uniform access from the stepper motor to the servo drive
- Simple operation thanks to a single homogeneous system for individual axes, CNC and robotics
- Simple programming with standardized PLCopen function blocks
- Fast projection development, configuration and commissioning with Automation Studio

- **POWERLINK**
  Open real-time Ethernet protocol
  ETHERNET POWERLINK
- **openSAFETY**
  fieldbus-independent safety protocol
  open SAFETY

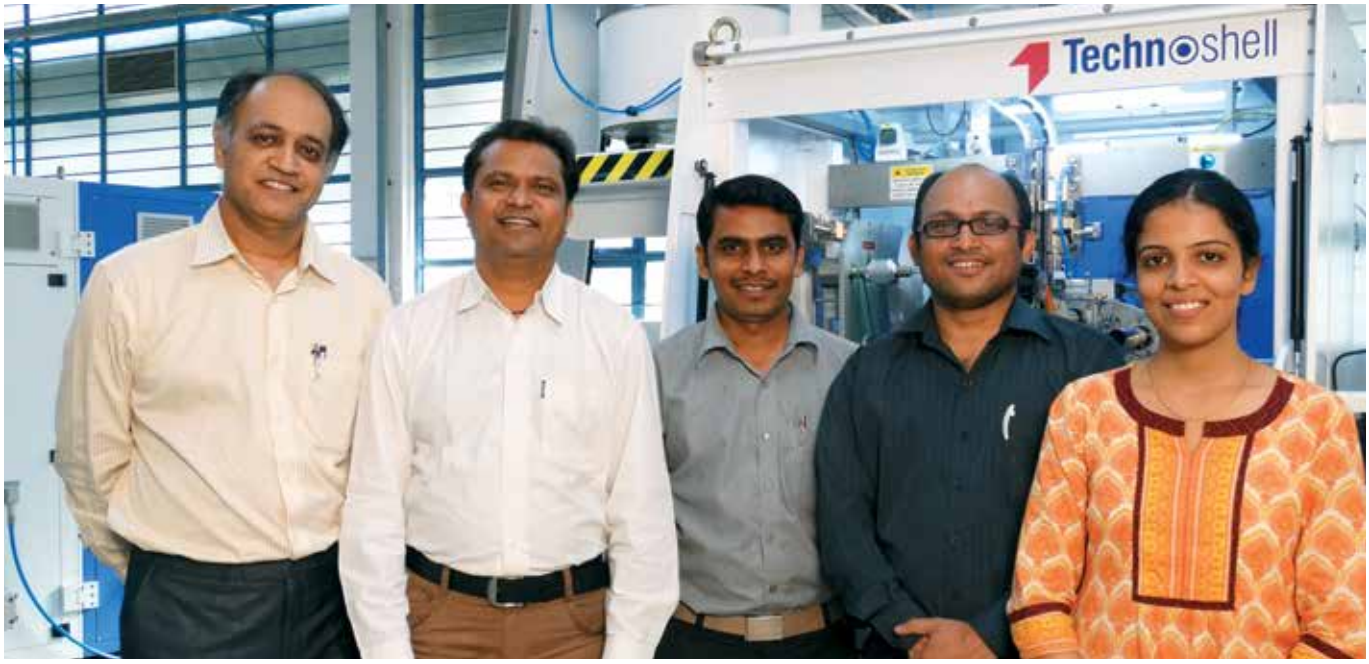
- **Fieldbus systems**
  POWERLINK, Modbus, CANopen, DeviceNet, Ethernet/IP, Profibus, Profinet, FDT/DTM
  PROFINET, EtherNet/IP, CANopen, Modbus
- **ERP / MES / SCADA**
  Direct link to supervisory level, OPC UA
  OPC Unified Architecture

Photo © iStock.

Packaging & Printing industry

A feather in your cap

An essential element of any tube packaging is its cap, which keeps the contents fresh, contaminants out and quite simply allows the goods to be transported, stored and finally used without making a horrible mess. Technoshell Automation Pvt. Ltd. is a trusted name in capping and stamping technology, supplying customers around the world with complete printing and packaging solutions. When it comes to automating its machines, Technoshell relies on the fully integrated platform of uniquely robust and modular hardware and software from B&R.



Nikhil Baste (standing leftmost) with the team Technoshell.

Every family has one – that one person who is always leaving the cap off the toothpaste. You wonder: are they lazy, inconsiderate, simply forgetful? Next time you catch them, rather than wasting your breath on yet another scolding, try reminding them of the important role these caps play – and the sophisticated technology that went into producing them.

Thanks to its highly efficient engineering capabilities, Technoshell offers streamlined machines with an excellent cost to performance ratio. "With rising labor costs and the shortage of labor due to the overall growth the tube industry, sales were suffering and the options available on the market were either expensive or failed to meet quality expectations," says Technoshell director Nikhil Baste. "With B&R's help, we have developed a very promising solution. Our tube capping machines CP-60+, CP-60 OR now offer high speed and accuracy at a reasonable price."

Nikhil Baste
Director, Technoshell Automation Pvt. Ltd.

"B&R's hardware and software platform is completely aligned with our focus on designing and manufacturing machines with a high performance to cost ratio. Having POWERLINK as a single network for all communication has given us a fast and deterministic performance across the entire system."

Technoshell Automations Pvt. Ltd.

Synchronized motion

Technoshell's CP-60+ capping machine accommodates tubes of various shapes, diameters, lengths and cap designs. The process is executed on 12 mandrel stations mounted on a vertical rotating turntable. An infeed conveyor equipped with a VFD transfers the tubes to the two loading stations, set up redundantly to ensure complete loading. From there the tubes are sealed with metallic foil in a two-stage process involving a stepper motor with tension control.

The capping station consists of two servos, whose movement is determined by the type of cap to be applied. Threaded caps are tightened in torque mode to ensure the cap is secure yet also able to be removed easily by the customer. Snap-on caps are first aligned using registration mark detection before being pushed onto the tube with a linear motor. Finally, the unloading station passes the capped tubes to the outfeed conveyor once correct assembly has been verified by a rejection mechanism.

One network for all

The challenges of the machine's complex operation were solved using robust and modular B&R hardware, all communicating via POWERLINK. The solution includes a high performance Power Panel 520 that combines HMI and PLC functionality in a powerful and compact unit, as well as perfectly synchronized ACOPOS servo and stepper drives and distributed X20 I/O modules. POWERLINK proved to be an excellent solution for the machine's complex synchronization, providing a common network for real-time deterministic communication across the entire system and facilitating easy diagnostics and fast maintenance. The registration mark detection and tube positioning features utilize Cognex cameras with integrated POWERLINK interfaces.

ETHERNET
POWERLINK

POWERLINK is a real-time open source solution used as the communication backbone in all B&R hardware. Performance without limits, flexible topologies, machine modularity, and advanced interaction of sensors and controls are requirements of modern automation which are fully satisfied by POWERLINK.

With not only the B&R hardware, but also third party components communicating on the same POWERLINK backbone, Technoshell was able to achieve a tightening accuracy for threaded caps of around +/- 2 Kg/cm2, while snap-on flip top caps are positioned within +/- 1 mm of the registration mark.

Smart and efficient engineering

All this was only possible thanks to the high performance of B&R's servos equipped with integrated cam automat functions. "The production requirements are very high, and our CP-60+ and CP60 OR machines perform at 75 cycles per minute thanks to B&R's intelligent hardware," praises Baste. B&R's Automation Studio software development environment made the programming of different machines and their diagnostics very easy. The ability to create fully reusable code and function blocks irrespective of the hardware has given Technoshell's customers new machines with a very short time to market. Automation Studio's support for integrating third-party devices via POWERLINK further adds to the ease of configuration.

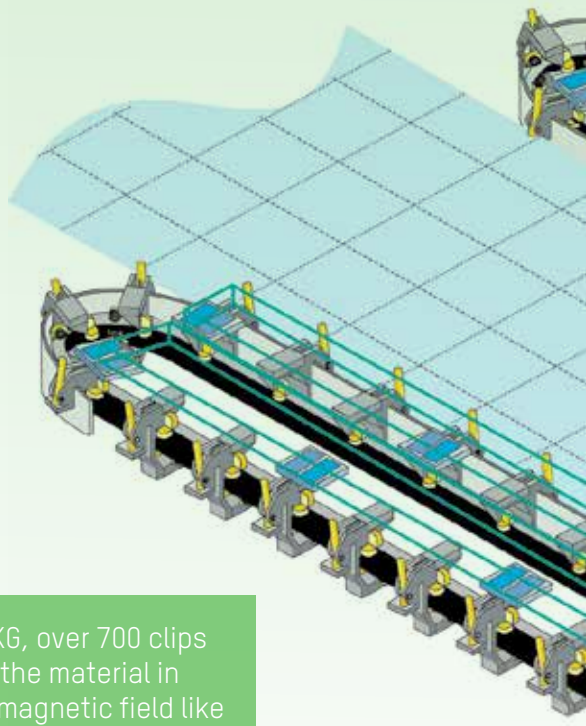
A decade of collaboration

Technoshell has been closely associated with B&R for the past 8 years and has many more plans in place with the automation solution provider to enhance the versatility of its machines. Technoshell is also a leader in the design, manufacture and export of high quality automated hot foil stamping machines, tube lacquer and labeling machines. A total of around 35 different Technoshell machines are already 100% automated by B&R. "B&R's hardware and software platform is completely aligned with our focus on designing and manufacturing machines with a high performance to cost ratio," says Baste. "By committing to B&R's expertise rather than a multi-vendor solution, we reap the full benefits of their integrated approach." ←

Technoshell's tube capping machines CP-60+ and CP-60 OR now offer high speed and accuracy at a reasonable price. This capping machine accommodates tubes of various shapes, diameters, lengths and cap designs.

Ethernet POWERLINK

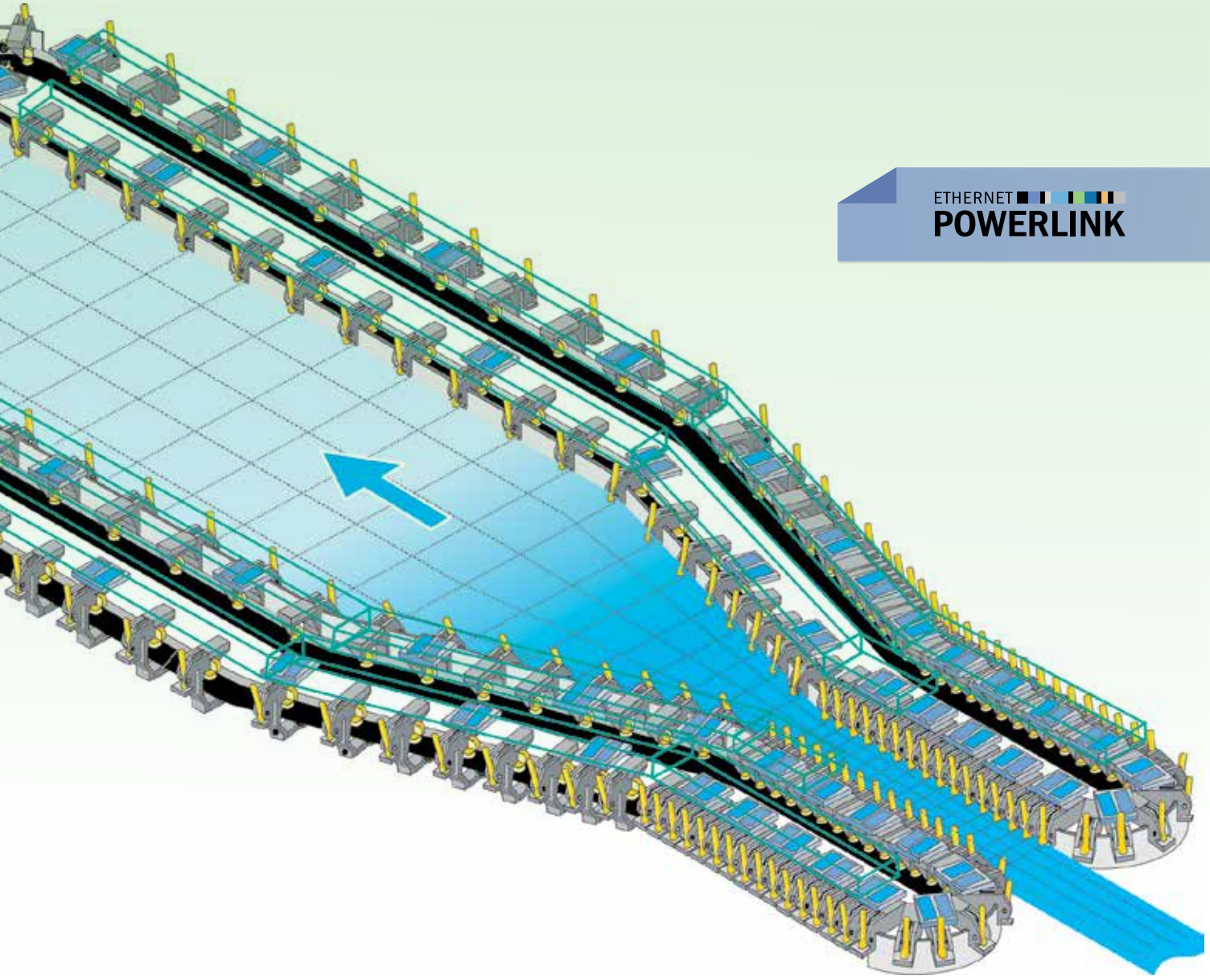
728 axes in 400 µs



On the LISIM® lines produced by Brückner Maschinenbau GmbH & Co. KG, over 700 clips pull the plastic film through the machine and simultaneously stretch the material in the machine and cross-machine directions. The clips are pulled by a magnetic field like the railway cars on a magnetic levitation train. Linear motors with 728 windings generate the moving magnetic field that makes this possible. Since recently, motion control is handled by drives from B&R's ACOPOS series, which are synchronized via POWERLINK. With the transition to B&R technology, the Chiemgau-based machine manufacturer was able to reduce the cost of the drive equipment, significantly shorten the cycle time, simplify maintenance of the hardware and software and replace proprietary drive and bus technology with an off-the-shelf solution.

At up to 6.6 m/s, hundreds of clips speed through the linear motor-driven simultaneous stretching system – LISIM® for short – on two opposing ring-shaped rail lines. They grip the plastic film, which has been produced using an extruder and a casting roller, along its left and right edges and pull it through the system at increasing speed, stretching the film in the machine direction. The rails are not parallel; instead, the distance between them increases along the length of the line. This simultaneously stretches the film perpendicular to the machine direction with absolutely no scratches. During this stretching process the film is also passed through an oven. The high temperature binds the molecular structure and permanently defines the film's physical properties, such as shrink, which were affected by the stretching. After completion

Equipped with modern B&R drive technology the Brückner machine is distinguished by extremely short cycle times.



of the stretching process, the clips release the film and travel empty back to the beginning of the system. A rack transports the film from the system where it is wound up after trimming off the unusable edges.

Only a certain number of clips are actually driven; hundreds of non-driven clips improve force distribution and prevent the film from sagging as it is stretched. The driven clips are designed as a secondary side (rotor) of the linear motor and are therefore equipped with permanent magnets on the traction surfaces. The linear motor is split to improve force distribution, with the primary elements (stators with windings) positioned symmetrically above and below the permanent magnets on the traction surfaces. The windings are distributed along the rail in zones of different lengths so that no more than one powered clip is present in each zone.

728 individually controlled windings

Each of the zones is controlled separately using an inverter. This new LISIM® system from Brückner relies on B&R drive technology: The power for the 728 zones along the approximately 65 m long machine is supplied by 384 single and dual-axis inverter modules in conjunction with 14 power supply modules from B&R'S ACOPOS device series that are synchronized via POWERLINK. The electrical power must be higher in longer zones, so drive types ranging from 2.6 A to 22 A with a power rating of 5 kW must be used.

"The machine concept, which is based on linear motors, was invented by us over 15 years ago, but it is still state-of-the-art and is experiencing a renaissance because of the rapidly increasing demand by the packaging and flat panel display industry for film with special film properties. The drive technology that we've used up to now is getting on in years however," says Dipl.-Ing. Günter Oedl, Electrical Engineering Manager for Automation and Development at Brückner Maschinenbau GmbH & Co. KG, regarding the changeover to a B&R system. "It was also developed specifically for us and took advantage of a proprietary bus, so a new development would be difficult and expensive."

Through the use of ACOPOS modules in combination with POWERLINK, the machine manufacturing company was able to replace the proprietary products with cost-effective standard solutions. The further

398 ACOPOS modules control the clips through precise synchronization with POWERLINK.

development of these standard solutions is of course required and funded by all users.

Precise synchronization with POWERLINK

"This was possible because POWERLINK allows precise synchronization of hundreds of network nodes and simultaneously provides high data throughput. On one hand, we were able to reduce the cycle time significantly - it is now only 400 µs. On the other hand, we were able to move large chunks of software from the drives to a central drive controller," explains Günter Oedl. "This significantly simplifies servicing and maintaining the software."

All of the 398 ACOPOS modules (power supply modules and inverters) in the system are synchronized by twelve industrial computers from the APC810 series. They are each equipped with three POWERLINK cards that control up to 13 modules. Using another POWERLINK card, the industry computers communicate with each other or with a higher-level APC810 that is running Brückner's motion control software. The plant control system, which for example is responsible for controlling the oven, is connected to this B&R industrial computer using a PROFIBUS interface.

POWERLINLK's short cycle times and minimum jitter allowed Brückner to position the zones very closely, as confirmed by the head of the electrical engineering development at the company: "The individual zones are grouped in a very homogeneous manner. The error tolerance is significantly less than a millisecond as stipulated by the application." Advantageous for machine manufacturers is also that POWERLINK is not a proprietary bus system; instead, it is an open source solution and is therefore supported by many producers. Thus the number of solutions available is very large, and they include professional diagnostic tools.

Saving energy and space

Brückner managers were impressed by the wide range of products in the ACOPOS series. They were also impressed by the possibility to control two axes or windings with one inverter, as stated by Günter Oedl. "Instead of having to use 728 inverter modules, 398 were sufficient to get the job done. This clearly reduced costs and saved space."

There are a total of 398 ACOPOS modules in the LISIM line control cabinet. They are synchronized using twelve industrial computers from the AOC810 series.

The Brückner managers also paid special attention to the cooling technology. "With air cooling, the risk is that a clogged filter will not be exchanged in time, or worse, removed and no longer be replaced," warns the Brückner engineering manager. "This is why we wanted to go with cold plate cooling. B&R proved themselves to be very cooperative in preliminary discussions and developed an ideal solution." Even later during the project, B&R took service aspects very seriously: The company replicated the entire drive system at their own technology center in Eggelsberg and made it available for development activities.

This and a further detail regarding the ACOPOS inverter supported the decision to use B&R drive technology: The devices does not require heat-conductive paste. "Changing an inverter during service work can now be done in a half hour and not an hour as previously," says Günter Oedl.

But that's not enough: For drives with a cold plate, heat is transported from the cabinet much more effectively with the help of water or oil. Peak temperatures and large temperature fluctuations can be avoided, which extends the lifespan of the electronics. If the coolant is fed into an existing cooling system, higher overall efficiency is achieved compared to conventional cooling methods.

Closed loop control without sensors for greater efficiency and robustness

The planned switch from open loop to closed loop control of the windings will result in a significant increase in energy savings. For this purpose, Brückner must rely on a sensor-free method because sensors cannot be mounted near the oven. "Thanks to sensor-free control, we are able to reduce the power used by each system by 100 to 150 kW," states Günter Oedl.

Another plus point of this control method is much higher damping compared to a weakly damped magnetic shaft mass system. Machines with sensor-free control are therefore more resistant to disturbances such as process variations or film rips. "The advantages of the sensor-free closed loop control are clear. We therefore welcome the fact that we will be able to obtain ideal solutions from B&R in the future, "concluded the Brückner engineering manager. ←

Software

Modular efficiency – Integrated performance

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

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

Process data pays dividends

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

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

On-the-fly optimization

Thanks to B&R's fully integrated automation solution, machines from GEA Food

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

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

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

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

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

Easy-to-use software for both developers and users

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

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

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

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

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

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

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

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

A single software platform for all machines

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

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

Simulation accelerates engineering

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

Photo © B&R

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

Packaging industry

Every drop counts

In today's highly competitive global markets, users of filling machines know that every drop counts. As they tighten the reins on waste and look to maximize utilization, these users seek out OEMs who are able to deliver the highest performance with the greatest precision. These qualities are particularly critical in rotary gravity fillers, where weight measurements must compensate for vibrations and centrifugal forces and the timing of dosing nozzles must be extremely precise. Span Filling Systems has become a prominent name in the packaging industry by offering a range of filling and capping machines with the outstanding automation performance and precision that users have come to expect from B&R.

Span Filling's rotary gravity filling machine is well-known for its unmatched accuracy and repeatability complimented by easy operation and low maintenance.

Laboratories need acids and chemicals; automobiles, pharmaceuticals, drycleaners and adhesives need solvents; printing presses need ink; buildings need paint. Before these day-to-day items can be transported, stored and used, they must first be packaged. Span Filling provides liquid packaging solutions for industries ranging from dairy to pharmaceutical, personal hygiene to paint and lubricants to beverages. Known for its quality solutions for high-speed production, this packaging industry leader relies on B&R's impeccable design and technology to outclass market needs for net weight liquid gravity filling in all types of containers – with a level of precision that makes every drop count.

Synchronized precision in motion

Span Filling offers inline fillers that can be adapted to specific customer requirements. To meet the stringent market demands of consistency, Span Filling had to think of a solution to deliver higher speed with increased accuracy. This gave birth to the idea of a rotary gravity filling machine.

With their speeds synchronized, a conveyor feeds bottles to a rotary disc so that each bottle fits into a specific position. The filling mechanism is mounted on a second rotary disc, with a nozzle aligned directly above each bottle. The filling process is completed as the station rotates 180 degrees, after which the outfeed conveyor carries the bottles on to the capping process. Fill quantity is determined by weight, which is measured by load cells that com-

Kumar Darara
Managing Director,
Span Filling Systems

"B&R's solution for weight measurement has been a major factor in helping Span Filling achieve its development goals and has played a significant role in our continued growth."

Span Filling Systems Pvt. Ltd.

The robustness and modularity offered by B&R's X20 control and I/O modules is best-in-class. It is one of the most innovative products available on the market. The modular design makes it flexible and very easy to use.

municate with robust B&R hardware. The drives for the conveyor and two rotary discs have to be perfectly synchronized to avoid system failure. ACOPOS servo drives from B&R ensure precise control with easy synchronization and guarantee that the required performance levels are met.

A solution for every design obstacle

The most critical design challenge was achieving accurate weight readings using highly sensitive equipment mounted on a continuously rotating station. B&R's highly efficient weight measurement solution made it the clear choice for Span Filling's application. The input filters onboard B&R's X20AI1744 module provided a cost-effective standard solution for the strain gauge cell that cancels out the effects of centrifugal forces and mechanical vibrations.

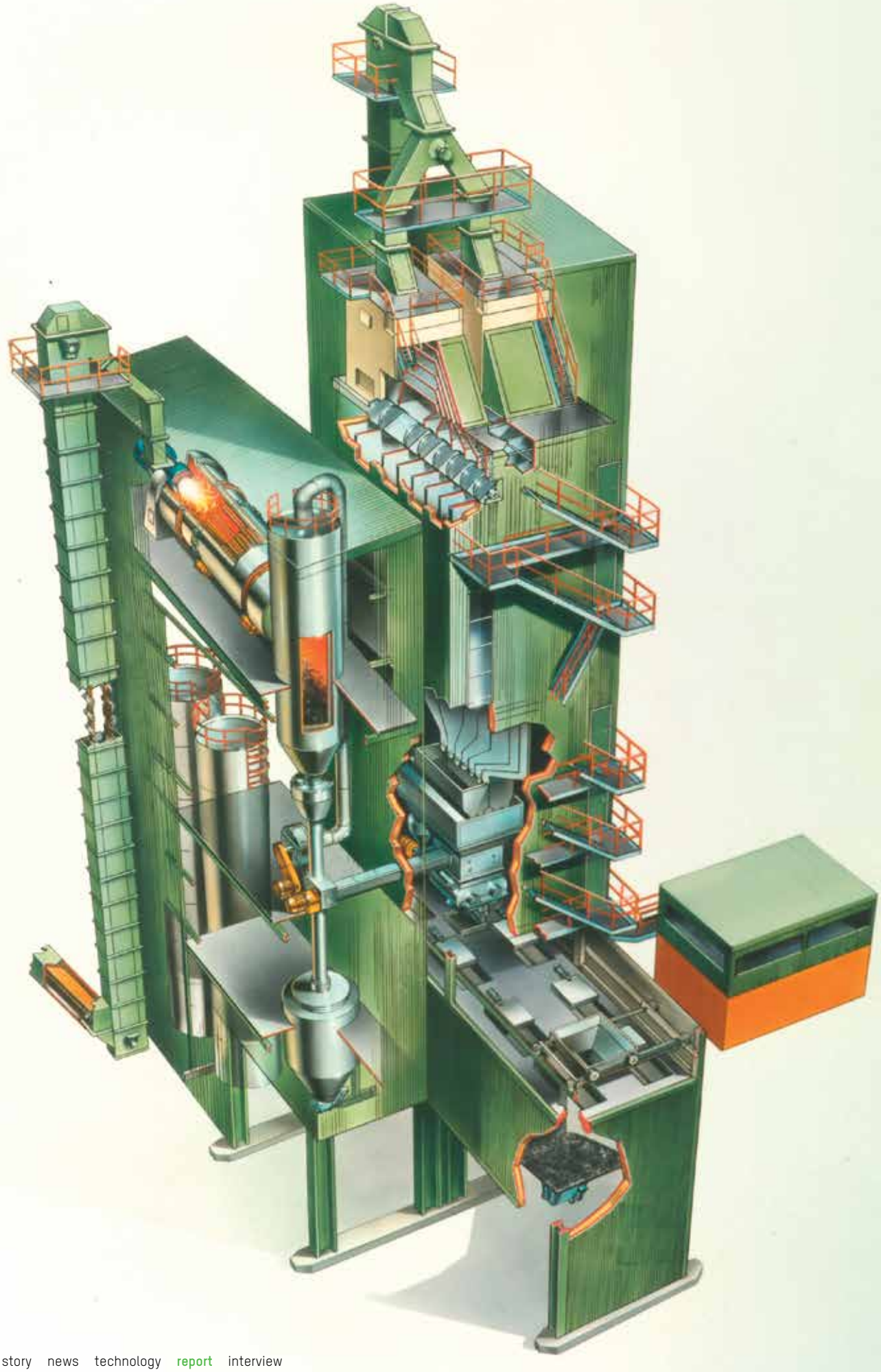
The application also demanded a design able to accommodate both the control and feedback systems on the rotating structure. With the filling nozzle controls and weight sensors in constant motion, the hardware would be subjected to relentless vibration. B&R's X20 series of control and I/O modules handled the situation with ease.

Communication was another obstacle, as it would have to link the rotating components with the HMI panels and other stationary field devices. The Power Panel HMI that provides visualization and operation of the entire system – as well as other field devices – communicate with the X20 controller via a slip ring, providing maximum performance with minimum wiring.

Accuracy down to 0.1%

The main objective for the machine was to control the process at an optimal speed that would allow increased production rates while maintaining the necessary precision. The innovative closed loop control algorithms successfully achieved a maximum production rate of 40 containers per minute filled to 5000 g with an accuracy of +/- 1 g.

After years of reliable hardware, software and service from B&R, Span Filling has grown to rely on the partnership as a key component of its continued growth. The effective merging of mechanical design with electronic control was vital to the successful completion of this project. A joint effort from Span Filling and B&R has proven to be a formula for success. ←



Construction industry

Mixing with the right crowd

Over 800 Benninghoven asphalt mixers are churning away around the world. Based in the Reinland-Pfalz area of Germany, this company wins over its international clientele with their state-of-the-art, energy-saving technology. Their mixers are based on frequency-controlled drives, a high-speed communication bus and last but not least, high-performance visualization and control technology from B&R. Together with the APROL process control system, this gives Benninghoven a fully integrated and comprehensive automation package for the processing industry. Thanks to the open nature of this solution, it can be flexibly adapted to the demands of today and tomorrow, thereby ensuring investment security.

Germany's road network covers a total distance of 626,000 km. Harsh winters, high traffic volume and empty state coffers have left asphalt surfaces riddled with potholes in many regions. The projected growth in annual mileage for private motorized transport of up to 1,029 billion kilometers by 2025 means an increase of 16 percent compared to 2004. This rising volume of traffic and the current state of the roads hold much promise for the asphalt industry. The international outlook for the industry is similarly positive. In China alone, 11.3 million cars were sold in 2010, which is 33 percent more than the previous year. There is no doubt that this rapid expansion will continue to push the construction of more roads in order to prevent massive gridlock. Many other emerging countries face similar challenges.

The German specialists for all things asphalt, Benninghoven GmbH & Co. KG, are already well-prepared to meet this growing demand. The company, headquartered in the German municipality of Mülheim an der Mosel, manufactures complete asphalt mixers, including all of the necessary components. Their extensive spectrum ranges from burners, drying cylinders and bitumen storage tanks to conveyor belts and control cabinets. One major benefit for Benninghoven's customers is their in-house production, which ensures the availability of replacement parts, even many years later. This is particularly important in the asphalt industry, where systems are typically operated over many decades. For example, Benninghoven's first mixer was delivered back in 1988 and is still going strong today. The high level of vertical integration guarantees not only long-term availability of replacement parts, but also enables Benninghoven to react quickly to individual customer demands.

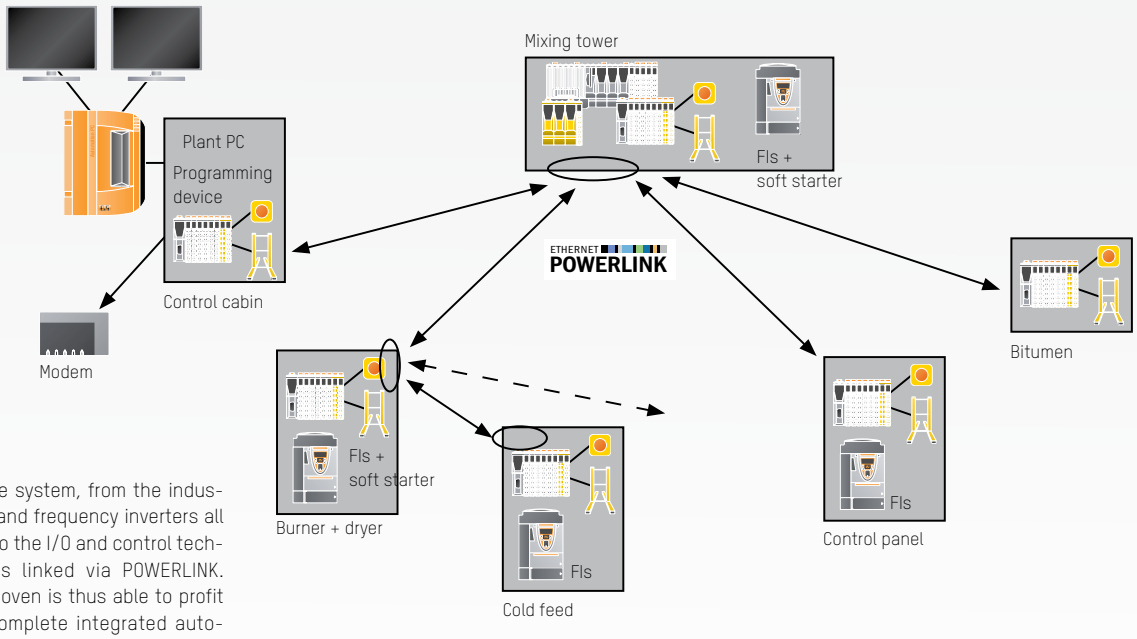
Old and new systems benefit alike

When the company decided in 2007 to replace the system and process control technology they had been using until then, they logically began searching for an open, flexible and high-performance automation solution that could be quickly adapted to new demands while remaining compatible with older systems. The aim was for old and new systems to benefit equally from the current and future technological advances. "We spoke with and evaluated a number of potential suppliers before ultimately choosing B&R," explains Hans Adam, head of the electrical engineering department at Benninghoven GmbH & Co. KG. "One of the main reasons was that B&R's APROL process control system, combined with the B&R hardware and system bus POWERLINK, makes up a fully integrated automation package from the control room to the field level."

One of Benninghoven's in-house developed asphalt applications, programmed in a high-level language for the Windows operating system, handles recipe and order management as well as the visualization of the dosing procedures, which of course make up the company's main area of expertise. This involves determining, measuring and monitoring which ingredients (mineral rock, filler, additive, bitumen, etc.) are to be processed and in which quantities. The process culminates in the production of asphalt, which can have very different properties depending on the selected recipe.

Interface for integrating Windows programs

To avoid having to rewrite the asphalt application, the new process control system had to provide a corresponding interface for integration. Not a problem for Linux-based APROL: The integrated IOSYS driver frame enabled the software experts at Benninghoven



The entire system, from the industrial PCs and frequency inverters all the way to the I/O and control technology, is linked via POWERLINK. Benninghoven is thus able to profit from a complete integrated automation package, from the management level to the field level.

to write a driver that would work perfectly. As a bridge to the Windows platform, the programmers then used the open-source .NET implementation Mono and the corresponding Just-in-Time compiler (JIT). "This allows us to run our asphalt application regardless of what operating system is on the control computer and thereby bring our existing systems up to date. The result is that the operators of existing systems can benefit from the latest advancements right away," explains Markus Mende. The APROL process control system implemented by Benninghoven with the close support of B&R handles visualization and control of the system, which encompasses many different system modules according to the type of system and desired range of functionality. "This illustrates another decisive advantage of the APROL concept," points out the software specialist from the system manufacturer: "On the one hand, our work is made easier by the object-oriented engineering environment provided by APROL, the CAE Manager, and the ability to reuse code sections. This enables uniform project engineering and, in turn, minimizes the associated effort of project planning as well as the amount of potential sources of error. On the other hand, and this is particularly important for our series production, we now have to maintain just one library and just one database that contains all of our projects." This means a separate process control system must no longer be developed and maintained for each type of system. Instead, customized systems can be put together based on the building block principle, without extra programming.

Rapid commissioning

All configurations are made and saved in a central engineering database. Consistency of the configuration data is guaranteed because the database contains all of the configuration data required for the process control system's hardware resources, such

as the control computer, the controller or variable frequency drive. During commissioning, the data is downloaded to the connected automation components via the industrial POWERLINK system bus used throughout the entire system. Markus Mende sums up his positive experience from nine different systems that are already running APROL: "B&R's automation package allowed us to significantly reduce our commissioning times."

An APC810 serves as the hardware platform for the control computer, which is networked via POWERLINK with the substations (X20 system) that are remotely distributed on the system modules. Communication between the system's variable frequency drives and the control computer also takes place solely via POWERLINK. "A particular bonus for us was that B&R was adding the variable frequency drives to their product portfolio at just the right time and had equipped them with a POWERLINK interface. We had already used these devices before, which meant that our maintenance personnel already had the necessary experience," reports Markus Mende.

"The bottom line is that the B&R automation package allows us to offer our customers a control system which provides a clear overview for monitoring the processing stages in the asphalt mixer in real-time and above that, is highly stable. Combined with the automation solutions from B&R, this gives us top-notch availability, reliability and energy efficiency - in perfect line with our corporate vision.L With the quality we provide today, we're confident that we'll be partners well into the future," concludes Hans Adam. ←

One of Benninghoven's in-house developed asphalt applications, programmed in a high-level language for the Windows operating system, handles recipe and order management as well as the visualization of the dosing procedures, which of course make up the company's main area of expertise. This involves determining, measuring and monitoring which ingredients (mineral rock, filler, additive, bitumen, etc.) are to be processed and in which quantities. The process culminates in the production of asphalt, which can have very different properties depending on the selected recipe.

Packaging industry

Real solutions in action

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

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

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

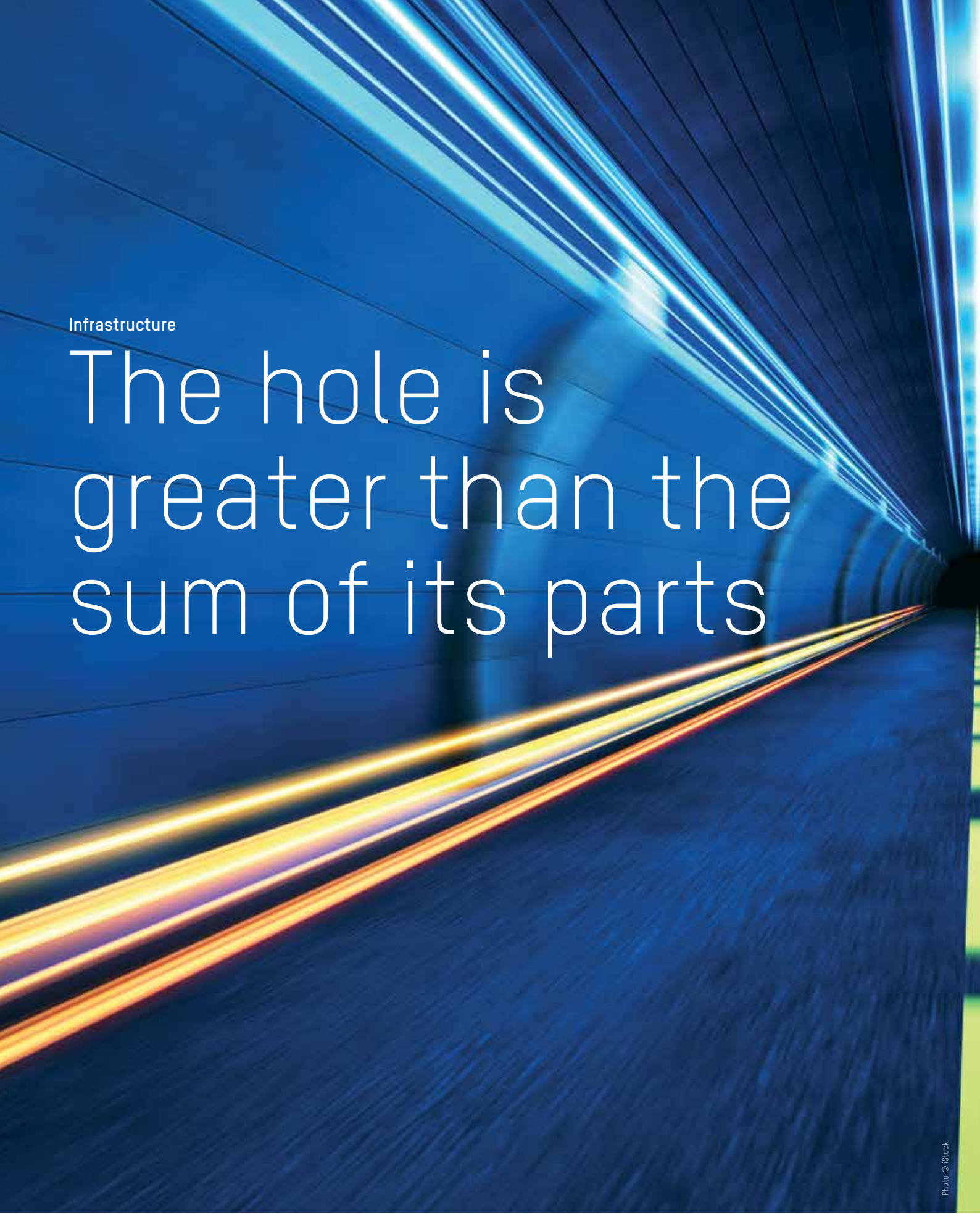
Fotos © Youtube [5]

Link: B&R on YouTube

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

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

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



Infrastructure

The hole is greater than the sum of its parts

Photo © iStock.

A highway tunnel like the Pfänder Tunnel in Bregenz, Austria, is more than just a hole in a mountain – it is also a complex network of very important technology. If you have ever driven through one, you surely noticed the lighting and ventilation units, and maybe even the signaling equipment and life-saving emergency systems. Behind these lie state-of-the-art automation systems like those provided by Dürr Austria, built using Automation PCs and X20 control systems from B&R and the XAMControl process control system. Seamless integration into this process control system from Dürr's subsidiary, evon GmbH, including automatic code generation, helped minimize the amount of engineering required.

In mountainous regions, more and more roads are being routed through tunnels. In exchange for their convenience, these tunnels place heightened demands on safety and reliability. Fresh air and light need to be delivered deep into the mountain, and noxious exhaust fumes must be allowed to escape. Signaling and monitoring systems are needed to regulate the flow of traffic. In the event of an accident or other emergency, the technology must also help people exit the tunnel quickly and safely. Disasters like those in the Mont Blanc and Tauern tunnels and the Kaprun funicular serve as dramatic and painful reminders of the importance of tunnel safety. The technology installed in the tunnel must provide reliable safety over decades of operation. This, in turn, relies on durable and reliable control components equipped to handle both present and future requirements.

Highway tunnel no small undertaking

Tunnel automation systems can easily take on immense proportions, as was the case with the Pfänder Tunnel that bypasses Bregenz, capital of the Austrian state of Vorarlberg. The 6.7-kilometer, two-lane tunnel first opened to traffic over thirty years ago. In June of 2012, after nearly five years of construction, a second two-lane tunnel featuring state-of-the-art electrical and safety technology was opened adjacent to the original one, which was then upgraded to match its new neighbor by July of the following year.

The project, commissioned by the Austrian highway operator ASFINAG in April 2011, encompassed a low-voltage distribution system and emergency power supply with five UPS units, lighting provided by 2100 LED bulbs, air quality sensors, 120 variable message signs and traffic lights, 1750 curb reflectors, 300 emergency exit guide lights and 200 video cameras.

In addition, 100 emergency call stations and alarm systems were also installed. Connecting these to the 141 tunnel con

"The ability to transfer code directly to the X20 control system from B&R is a huge relief for traffic control system engineers. The advanced software technology behind evon's process control system, in combination with the powerful, open and robust B&R systems, provides the long-term reliability required for many years of operation."

Andreas Leitner, **Managing Director of evon**

Developing control technology and process control systems to provide lighting, fresh air and traffic safety in highway tunnels is no small undertaking. The Pfänder Tunnel in Bregenz, Austria boasts a dizzying 45,000 data points.

These systems are all connected to ASFINAG's master control station in Hohenems.

trollers and to the master control station required more than 60 kilometers of fiber optic cable, 140 network switches and 14 kilometers of fire alarm cable.

Like all seven tunnels on the highways and expressways of Vorarlberg, the Pfänder Tunnel is controlled and monitored from the master control station in Hohenems, Austria. There, the 45,000 data points that represent the Pfänder Tunnel are managed in 200 process diagrams.

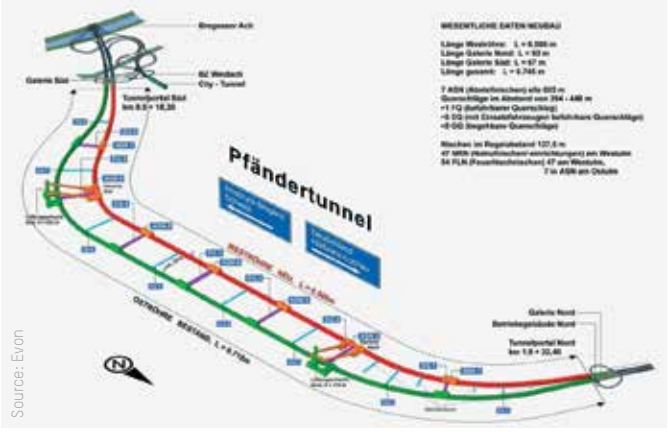
Long-term reliability in a harsh environment

As the general contractor for the approximately €25 million project, ASFINAG selected Dürr Austria GmbH. This innovative organization of 80 highly-skilled and motivated employees has an excellent reputation for developing solutions that pull together all of the necessary individual systems into a seamlessly coordinated whole. For the integration of this overall solution, Dürr called on the 23 employees of its subsidiary evon, who specialize in software development.

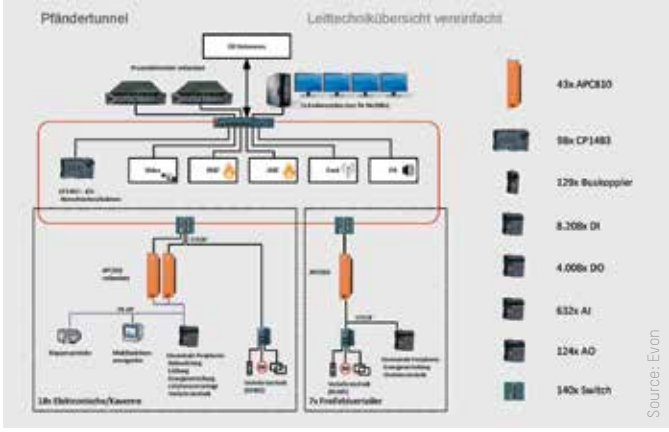
"The individual systems that comprise this project are relatively straightforward in themselves," explains Andreas Leitner, managing director of evon, "yet the extensive interconnections and long distances between them, as well as the task of making the systems failsafe and redundant at all levels, made the overall solution quite complex indeed. On top of all that, we faced the challenge of fitting all the control equipment into a very limited space and ensuring that it would operate reliably for many years in a dusty environment exposed to constant exhaust fumes."

Compact and robust

To control the individual systems throughout the tunnel, evon selected I/O systems from B&R's compact and robust X20 series.



A second tunnel was added next to the 30-year-old original, which was subsequently upgraded to equally state-of-the-art technology. The project included the installation of 300 emergency exit guide lights and 200 video cameras as well as 100 emergency call stations and alarm systems.



Control is provided by distributed X20 controllers from B&R and a redundant pair of B&R Automation PCs positioned in each section of the tunnel. With no moving parts such as fans and hard drives, they ensure maintenance-free functionality for many years of operation.

The 98 controllers distributed throughout the tunnel are networked via a redundant ring of fiber optic cable. Control of the X20 systems is provided by 43 B&R Automation PCs, positioned out in the open in redundant pairs with each assigned to a particular section of the tunnel.

These controllers send data directly from the Pfänder Tunnel to the master control station in Hohenems. Shock, vibration, heat and continuous operation in industrial environments are no problem for B&R's Industrial PCs. With no hard drives or fans, they were designed for just such inhospitable conditions. HMI devices installed include Automation Panels, Power Panels and PANELWARE tablets.

Openness in process control

The distributed B&R control system operates within, and seamlessly intertwined with, evon's XAMControl process control system. Also at home in processing and building control applications, XAMControl is built on a database platform and can be adapted simply by setting parameters rather than by tediously rewriting code. The X20 controllers in the Pfänder Tunnel are managed and programmed centrally via this process control system.

XAMControl scans and automatically detects the hardware configuration and generates C# code for specific control tasks. This code is tested on virtual PLCs and then converted by the B&R compiler directly into machine code that can be executed by the X20 systems.

This homogeneously integrated system architecture made it possible – for the first time ever in a traffic control solution – to follow a consistent top-down approach to system development, where the software is fully tested and simulated prior to being assigned to the actual hardware configuration. "The decision to work with B&R was an easy one. Not only do their products provide thorough openness and compatibility with an excellent price/performance ratio, they were accompanied by outstanding support from B&R's local technical office in Graz and direct communication between our development departments," says Leitner, citing some of the most significant advantages of the cooperation. "The ability to derive the control code from database-supported, object-oriented programming in the management system helps users avoid unnecessary redundant work and eliminate potential errors caused by interfacing issues."

45,000 data points keep traffic flowing smoothly

The successful cooperation between Dürr, evon and B&R produced an overall system whose performance goes beyond simply providing reliable, safe operation. The seamless continuity, from the master control station down to each and every data point, makes work easier and faster for maintenance technicians and supervisory bodies. This was enough to fully satisfy the operator of Austria's highways and expressways, ASFINAG, that control of the tunnel's automation is in good hands with B&R. ←

The power is in your hands

As the cost of energy continues to soar and penalties for missed Kyoto targets loom, the acute necessity of improving energy efficiency cannot be ignored. The first step toward conserving energy is knowing precisely how, when and where it is being consumed. Sophisticated measurement of energy consumption is therefore an essential feature of an efficient solution. The APROL EnMon system from B&R provides continuous energy monitoring, either as a stand-alone unit or integrated in a process control system.

Around the world, there is increasing political pressure to manufacture energy-efficient products with environmentally friendly production methods. Heightened sensitivity to this topic can be felt across all markets. Publication of the EN/ISO 50001 standard for energy management systems in June of 2011 certainly played a role in this.

One decisive factor in the overall efficiency of a machine, production line or system is the drive and control technology that runs it. B&R solutions ensure optimum dimensioning and layout of motors and drive components, and offer energy-saving features such as control cabinet cold-plate mounting, DC bus coupling and active regeneration of braking energy.

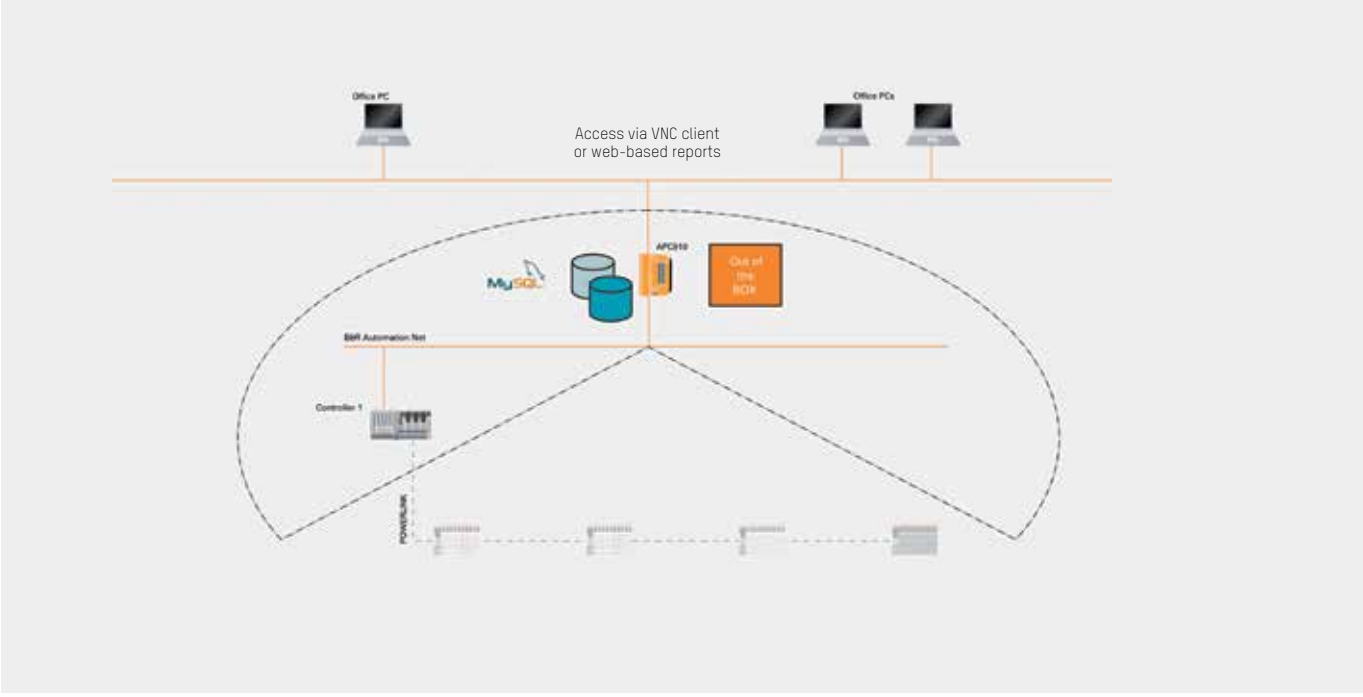
Autonomous energy monitoring

B&R's all-new energy monitoring solution is APROL EnMon. It helps users implement ISO 50001, and by improving energy efficiency it helps them lower costs and become more competitive. By identifying how energy and production costs interact, consumption can be taken into consideration for pricing and cost accounting or billed directly according to the "user pays" principle.

EnMon helps identify potential savings and provides justification for cost-cutting projects to achieve maximum cost efficiency for any type of energy. Monitoring the power supply reduces downtime and helps prevent unplanned outages. B&R's solution for energy efficiency supports a process of continuous improvement, either as a standalone unit or integrated in an existing APROL process control system. All relevant energy consumption data is measured, recorded and evaluated. Energy reports and graphs can be generated for individual machines, systems, subsystems or an entire organization. Reports can be sorted in whatever way is most convenient, according to production batch or cost unit. Based on the APROL process control system, the APROL EnMon platform provides maximum flexibility and scalability for adapting to systems with varying numbers of measurement points with minimum engineering effort.

Ready-to-use solution

APROL EnMon comes preinstalled on an Automation PC 910, B&R's industrial PC for control cabinet installation. Commission-



As a preconfigured turnkey solution, Aprol EnMon is simple to install. Browser-based modules give personnel at any desktop PC convenient access to all views and functions.

ing and parameterization are especially fast since the software and hardware configuration are already where they need to be. All that's left to do is configure the network settings and enter the sensors and their assigned software templates in a table. Then the application software is generated and loaded automatically.

In addition to EnMon's operator software and development environment, a central component is its powerful database with an SQL interface. This database runs on the extremely stable Suse Linux Enterprise Server operating system and saves a history of all required energy data.

The data can be accessed from any location using a web browser on a desktop PC, with no additional software required. The number of EnMon controllers required by a particular application depends on the number and type of measurement positions and the type of data processing performed. Each controller typically receives and processes data from several hundred measurement positions. Additional controllers can easily be added as needed. Data enters the monitoring system via common industrial interfaces such as POWERLINK, Modbus TCP, Profibus or Ethernet/IP.

Full integration of all energy sources

Monitoring with APROL EnMon is not limited to electrical energy. All types of energy are supported, and the generically designed system allows users to define and name them freely. This enables monitoring not only electrical energy, but also of oil, gas, steam or district heating, as well as media that are often overlooked when it comes to energy, such as pressurized air and water. Users of APROL EnMon can select from a range of extremely compact I/O modules in the B&R X20 series to measure and record energy consumption. X20IF interface modules provide Modbus RTU, ModbusTCP, Profibus DP, EtherNet/IP connections to read meter values from measurement points in existing networks.

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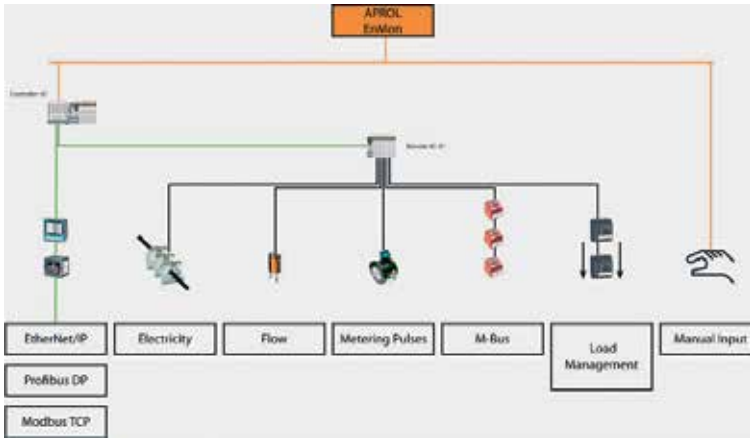
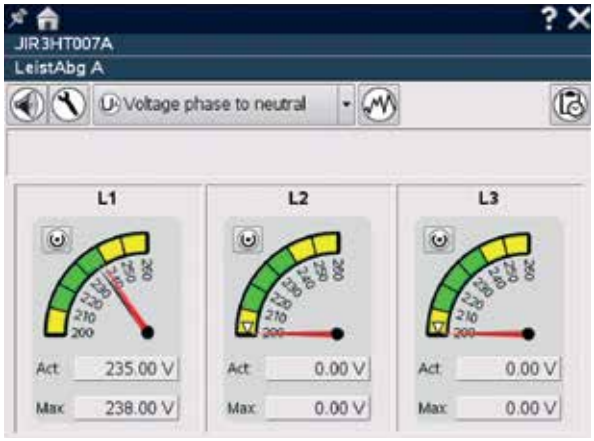


Energy consumption is recorded using extremely compact I/O modules from B&R's X20 series, which allow existing sensors to be connected via the most common industrial bus systems.



Measuring current, frequency and reactive power on all phases with the X20AP module helps boost the availability of electrical networks.

Voltage, current, frequency and reactive energy on all phases can be measured by the X20AP energy measurement module for electrical power. The X20AP measures up to the 31st harmonic, which allows it to also detect unwanted harmonics on local electrical grids. These result when inverters are used excessively in order to save energy. The X20AI module for analog signals is used to measure flow. The X20DC counter module measures digital pulse signals. The X20CS interface module with an integrated M-Bus master accommodates 250 gas, water, current, thermal or pulse counters with M-Bus connections. In principle, any module from the entire X20 I/O series can be used.

Informative reports

During commissioning, service and maintenance, the EnMon Dashboard offers energy managers and their teams both a web-based reporting environment and a powerful environment for system diagnostics and operation. APROL EnMon provides two custom interfaces tailored specifically to specific roles and tasks.

The system follows the hierarchy of main distributer / sub-distributer / consumer by allowing each measurement position to be assigned as Area, SubArea or Consumer. Countless preconfigured billing and analysis reports, as well as trend analysis features, can be viewed in various formats, including table reports, bar or pie charts or in the form of various trend graphs. For handling APROL EnMon data, the system has an SQL interface for connecting with business intelligence networks. An Iosys interface provides read/write access to process variables without expensive interfacing agreements between Enterprise Resource Planning and Energy Monitoring.

Convenient measurement and control

APROL EnMon offers numerous modules that precisely calculate energy consumption data.

- One is the FlowCalculation module for calculating flow through pipes with various shapes (gates, nozzles, etc.) at very high precision.
- Another is the PowerCalculation module for calculating the thermal power/ energy contained in water and steam.

We've already mentioned the many types of reports that APROL EnMon can generate, but the solution can do much more than that. One very effective feature is load management, which helps mitigate peak loads and prevent unplanned outages due to sudden overloads. Configurable software control modules allow you to manually connect and disconnect loads as well as assign them priorities and defined timing behavior. The loads are connected/disconnected via X20DO digital output modules or X20IF interface modules. APROL EnMon factors in daytime and seasonal rates and allows custom definition of holidays. This allows operators to shift the timing of heavy loads to take advantage of lower rates. The cost savings this brings are considerable.

Scalable and easily integrated, APROL EnMon is a powerful turnkey solution for optimizing energy consumption. In the face of rising energy prices it is still possible to reduce unit costs while conserving valuable resources. B&R's solution can be implemented just as easily and effectively on the smallest stand-alone machine or at the most expansive processing plant. Peripheral consumers such as auxiliary buildings and equipment can play a significant role in energy efficiency. APROL EnMon allows you to integrate them into a single, comprehensive energy management solution. ←

Textile industry

Dyed and wound

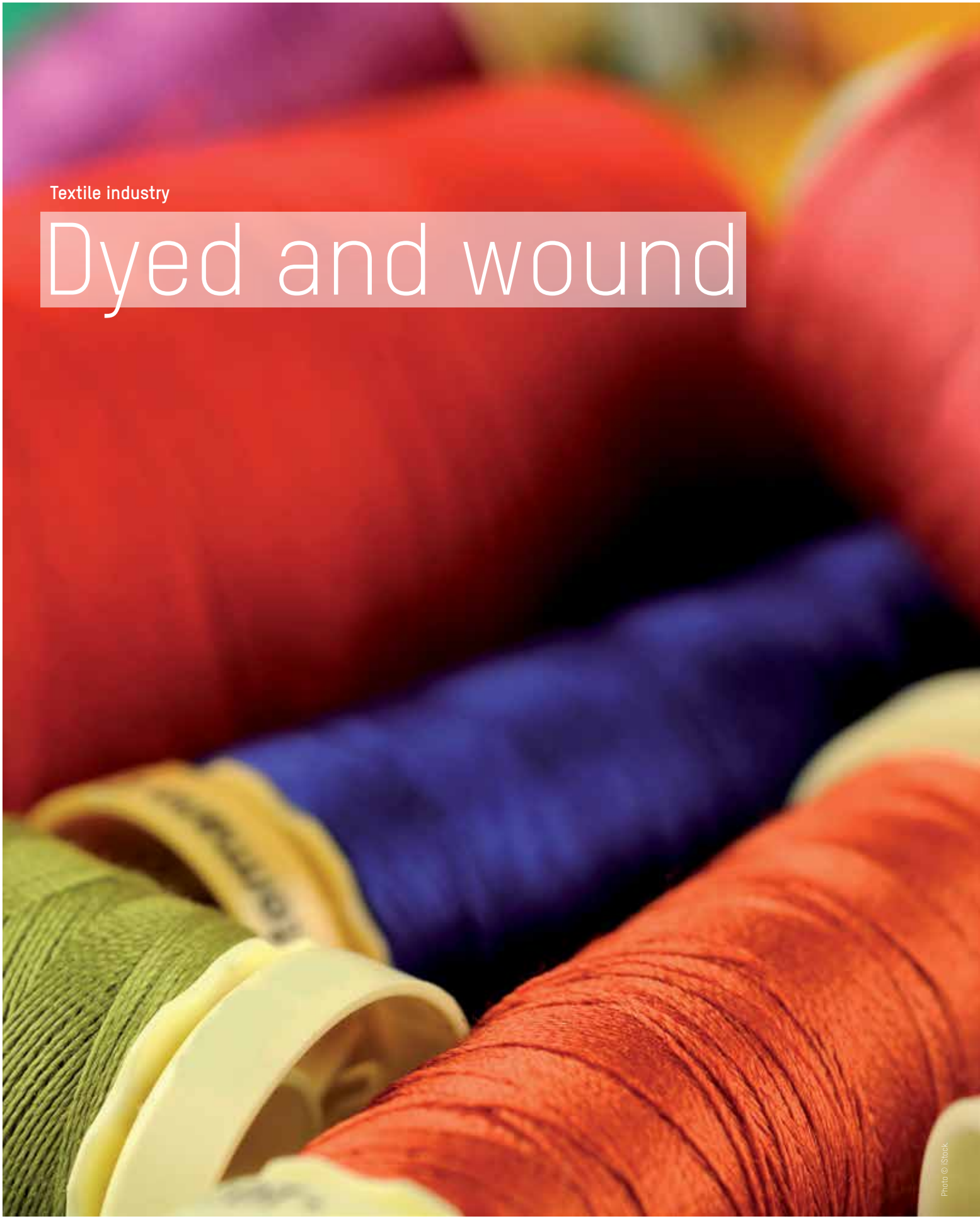


Photo © iStock

Physical well-being and safety aside, the desire to be trendy and fashionable is one of the most fundamental motivations for today's consumer. End products such as bed sheets, towels and clothing are made more attractive by adding color through the process of indigo dyeing. Jupiter Comtex is a leader in the manufacture of indigo dyeing and sizing machines. Automation expertise from B&R has played a vital role in the company's continued growth.

Jupiter Comtex manufactures world class preparatory textile machinery including warping, sizing and indigo dyeing machines. Warping machines are used to gauge yarn strength and perform length and count measurement. Sizing improves the strength and abrasion resistance of the yarn to reduce the chance of threads fraying and breaking during the weaving process. Dyeing is the process of adding colors to textile products, and the properties of the indigo dye account for a variety of color designs that are available on fabrics.

Driven by a focus on innovative technology, excellent quality and customer orientation, Jupiter Comtex found a likeminded partner in B&R, whose high-performance hardware and software has helped win big-name clients such as Jindal, Siyarams, GHCL, Century Denim, Welspun, Arvind, Bharat Vijay Mills and many more.

Sophisticated winding control

The slasher dyeing machines offered by Jupiter Comtex require highly precise control technology. Threads from multiple back beams are combined to form a warp sheet, which is then fed to the pre-wetting tank, where the grey yarn is cleaned and prepared to allow for better dye penetration. From here the warp continues to the dyeing tanks, which are interconnected and use circulation pumps to maintain a homogeneous dye solution.

The Power Panel 500 offers maximum computing power for the most complex tasks, such as sophisticated machine vision systems. Compact Power Panel devices are designed for use in the harshest industrial environments and ensure the highest level of operating comfort.

One of the most critical requirements of the machine is to maintain constant warp tension throughout the process, as this is the only way to ensure the quality of the final product. High accuracy is achieved by equipping the rollers with load cells that feed weight measurements directly back to the drives to allow for compensation. Another critical part of the machine with respect to winding control is that the diameter of the winder increases as thread is accumulated. As a result, the winding speed must be reduced proportionally to maintain constant thread tension.

Demands mastered with ease

Jupiter Comtex masters these demanding requirements using hardware and software from B&R. The powerful X20 controller serves as the heart of the control system. An operator panel from B&R's Power Panel 500 series serves as the HMI. B&R also provides a specially engineered software library to further enhance the machines and reduce the programming effort. The B&R hardware helps Jupiter Comtex achieve its desired level of product quality and makes its machines more productive while also reducing stress on the yarn. "As a testament to B&R's state-of-the-art, user-friendly hardware and software platform, even our end customers strongly recommend their products," says Gitesh Mistry, owner of Jupiter Comtex.

Key to robustness

B&R's Power Panel HMI series is advancing into domains previously only handled by industrial PCs. By combining control, motion and HMI in a single device, the Power Panel offers a complete, cost-effective solution. The series provides an optimal platform for open operating systems, giving users unlimited flexibility to create an optimal software architecture. Regardless of whether they are used to automate complete systems, as intelligent HMI terminals or together with open PC operating systems, the Power Panel series offers the right tool for any situation.

Unique and mature partnership

The partnership between Jupiter Comtex and B&R spans more than a decade. B&R components are used in every single machine the company manufactures. "Innovation is what drives the success of a business, and B&R understands that. We have been working with B&R since 2000, and I look forward to maintaining this relationship for many years to come. Jupiter Comtex is built on its vision, and B&R has helped us convert that vision into reality," says Mistry. Trust is the most important factor for a strong business relationship. Jupiter Comtex completely relies on B&R and its competitive products to provide its end customers with the most powerful and user-friendly machines possible. The innovative technology offered in Jupiter Comtex machines is the competitive advantage that sets them apart.

Innovative future lies ahead

Jupiter Comtex has a unique bond with B&R, who has displayed a complete understanding of the company's needs and requirements. Jupiter Comtex looks forward to continued support, new technologies and innovative software. One particular change is inevitable, as Jupiter Comtex understands that keeping pace with the industry requires very high speeds that can only be achieved with Ethernet technology. By implementing the real-time capabilities offered by Ethernet POWERLINK, Jupiter Comtex will surely gain an edge over its competitors. All automation components provided by B&R are equipped with this fast, reliable and robust technology. ←

Gitesh Mistry
Owner of Jupiter Comtex

JUPITER

"The combination of innovative technology and after sales service encourage us to always opt for B&R components. As technical chairman of the company, I can say that B&R has always amazed us with its new products, and the partnership has played a major role in the growth of Jupiter Comtex."

Jupiter's slasher dyeing machines run on highly precise control technology from B&R. Winding control with constant warp tension is achieved with ease.

Automotive industry

Shifting gears with perfection

The Indian automotive market is one of the largest in the world and has seen exceptional growth rates in the recent past. Given the tremendous potential for continued growth, even the well-established players are going to great lengths to maintain their positions. Reduced time to market, improved precision and enhanced product quality have become their mantra to bridge the gap between supply and demand. When it comes to delivering complete production solutions, automotive companies place their trust in SPM.

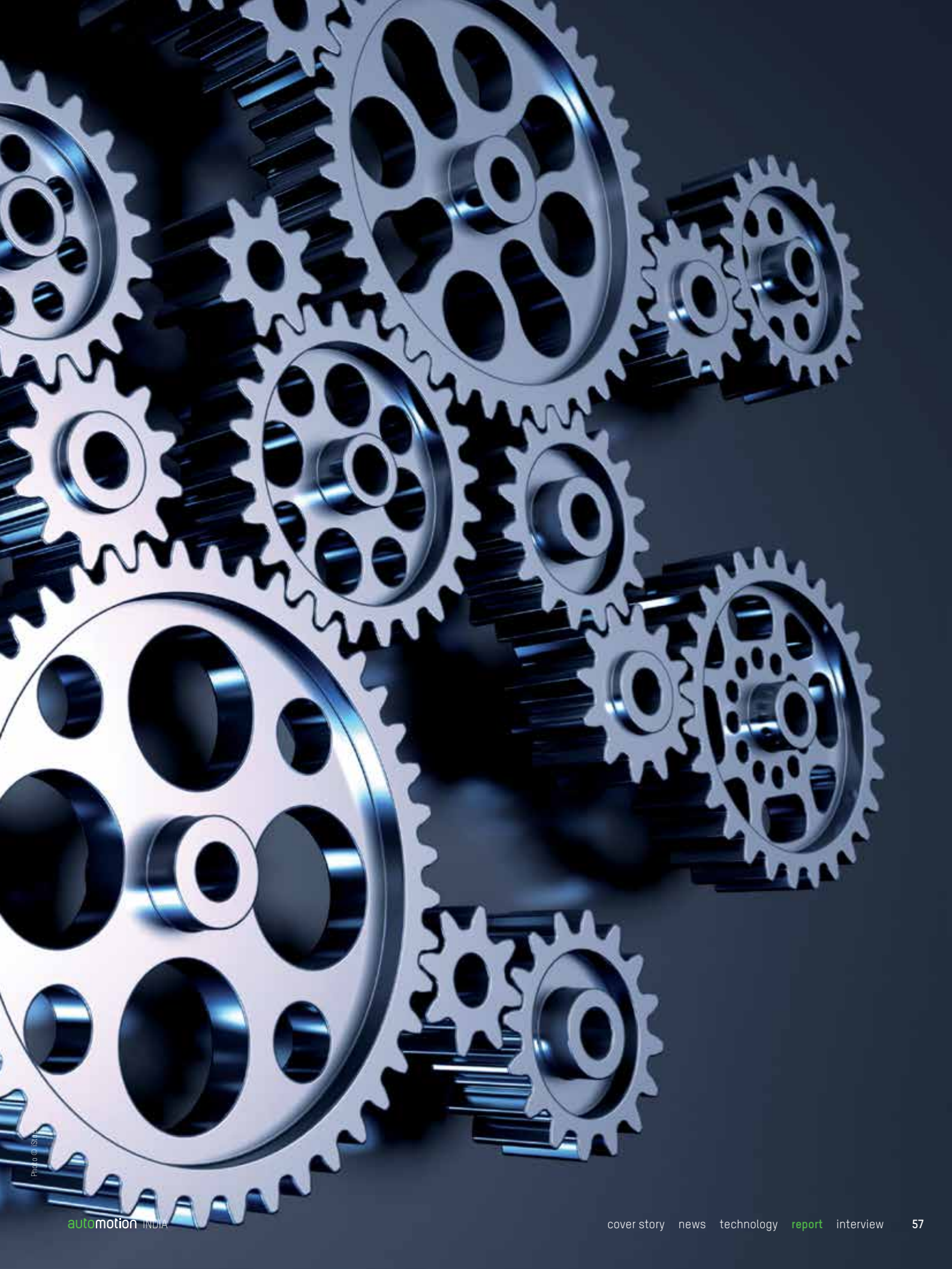


Photo © iStock

The Panel PC 900 combines a display and a PC into a single extremely compact device. They are available with a single or multi-touch screen and/or input keys in a wide variety of display sizes with a versatile selection of processors ranging from Celeron® up to the quad-core Core™ i7. Designed with IP65 protection, they are perfect for use in especially harsh environments.

SPM India Limited is a specialized manufacturer of automotive assembly lines with over two decades of proven service. SPM provides total solutions, from concept to commissioning, for assembly lines and process verification equipment. Although design plays a central role, a significant amount of responsibility is shared by the technology used to automate these lines. With the innovative and completely scalable product range from B&R, SPM is well prepared to tackle the growing competition.

Decentralized solution for transmission

The transmission system is an essential component of every automobile, transferring power from the engine to the drive axle. SPM faced the challenging task of developing an assembly line for six-speed gearboxes with a near zero defect rate. The line's three zones have a total of 54 stations, including pressing machines, three-axis robotic nut runner systems, an image processing station, leak testing machines and database management via SCADA.

One of SPM's main objectives was to establish highly reliable communication and provide distributed control between stations. In the search for a decentralized automation solution with complete flexibility, the unmatched performance of B&R's Power Panel and Automation PC made them the clear victors. B&R's fieldbus technology also proved perfectly suited to the application. Individual stations working on the generic fieldbus network share production data across the assembly line, as well as with the entire SCADA assembly database.

Quality is B&R's guarantee

As always, quality is a key factor in customer satisfaction and process profitability. The quality of gear assembly is ensured by examining the displacement of the tool with respect to the load applied. This process demanded a dedicated controller with faster sampling capability, so SPM choose a B&R Power Panel 65. The compact PLC with a powerful Geode processor, integrated HMI and flexible fieldbus options offered 400 µs sampling over X2X Link,

Mr. Manjunath Patil, Controls Manager of SPM India Limited Unit I

SPM's assembly line for six-speed gearboxes with a near zero defect rate. B&R's scalable solution has helped to choose an optimum fit from its wide range of controllers and industrial PCs.

Dr. G. D. R. Krishna
Managing Director of SPM India Limited Unit I

"We trust in B&R systems for their elevated performance, easy connectivity to peripheral devices, online data communication for 3rd party integration as well as data storage and history card generation. Our partnership has given us the confidence to look to the future with great optimism."

providing the performance required by the daunting task. The real-time graphical representation of load versus displacement allowed SPM to take its pressing machines to whole new level. The Power Panel 65 also provided seamless integration of the multiple controllers on the assembly line over the generic fieldbus network.

Best-in-class Panel PCs

The optimal flexibility and ergonomics of B&R's Panel PC 800 presented SPM a unique solution for implementing SCADA for its collective database and monitoring system. Recently SPM has upgraded to the newer Panel PC 900 series, which provides a versatile selection of processors ranging from Celeron® up to the quad-core Core™ i7. The best-in-class Automation PCs with high-performance Intel processors, modular, fanless operation and extremely robust construction are perfectly suited for automotive assembly applications. "We have chosen B&R PCs based on their unique characteristics, including robustness, ease of operation and easy controls. B&R PCs are clearly built for sturdy and reliable industrial applications," says SPM's managing director, Dr. G. D. R. Krishna.

Joint architects of innovative solutions

Joining forces with B&R, SPM once again proved its ability to create the sophisticated automation architecture required for automotive assembly lines – thanks to highly efficient Power Panels, extremely rugged X20 modules and reliable Automation PCs.

B&R's powerful engineering tool, Automation Studio, helped to considerably reduce development time. Integrated functions for concurrent development and powerful simulation tools ensured that the entire assembly line was programmed efficiently and on time. ←

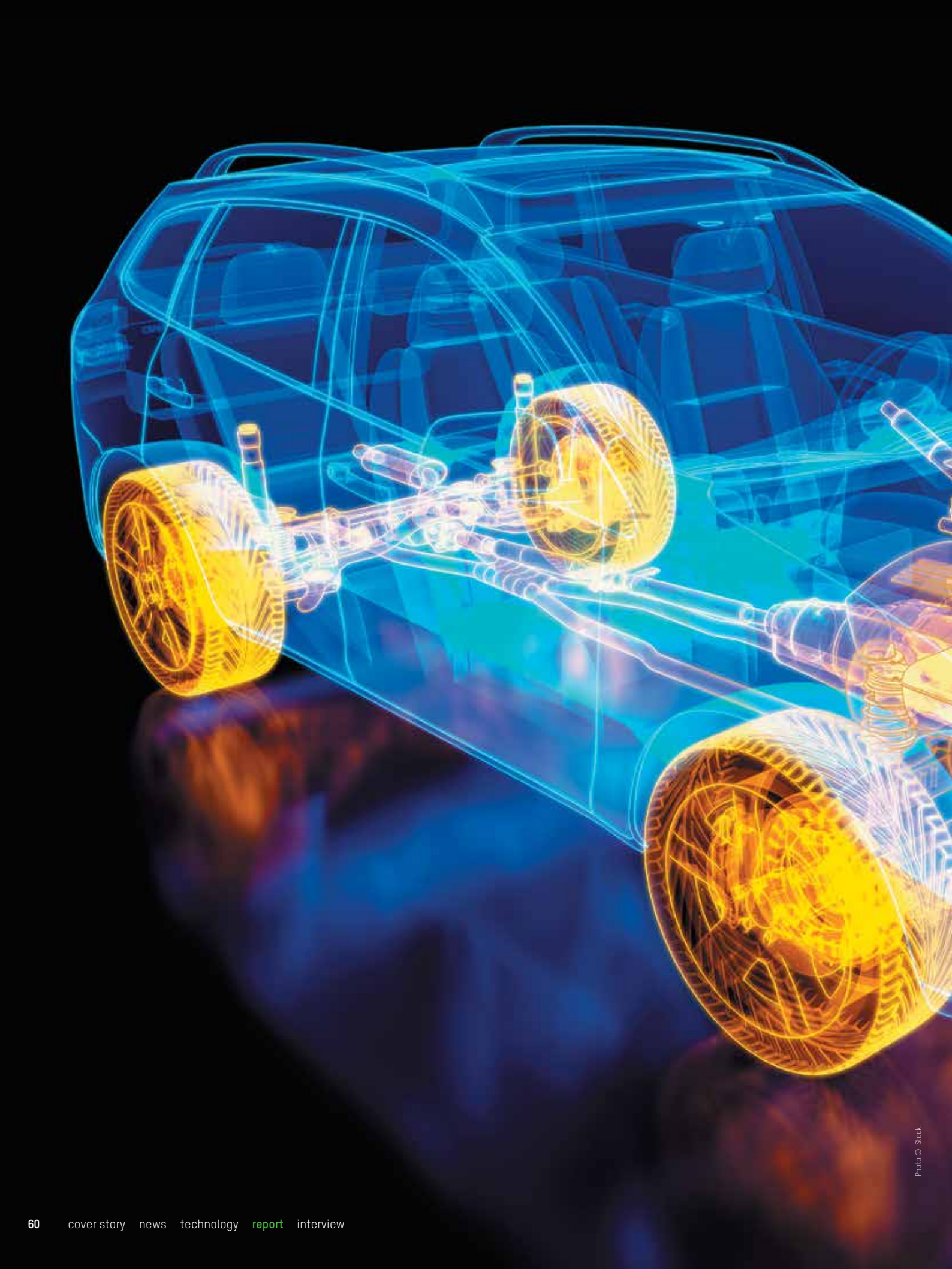
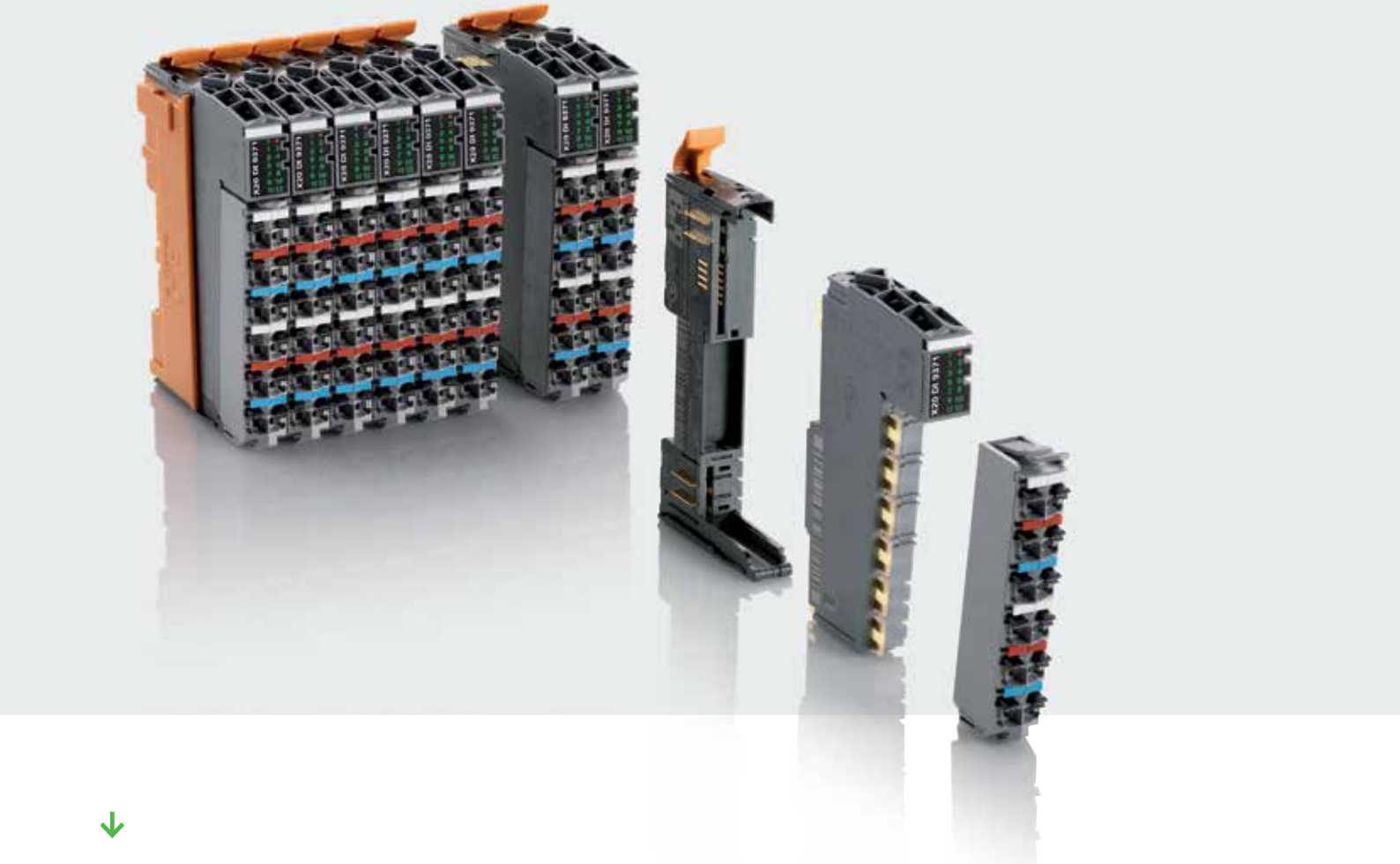


Photo © iStock.

Engine, hold your head high!

An engine takes in fuel and ignites it to produce highly expanded gas. The resulting energy is used to produce mechanical motion. This operation makes an engine a very complicated device, whose performance depends heavily upon both its design and the quality of its manufacturing. Unit II from SPM India Limited, a leading Indian supplier to global automotive OEMs and component manufacturers, wanted to build a machine to insert collets around the valve stem of the engine head. While this sounds like a simple pressing application, a closer look reveals the significant challenges overcome with innovative engineering and integrated automation from B&R.



Various measurement sensors can be integrated in the X20 PLC system with the corresponding I/O modules in order to ensure optimal handling. Intelligent modules like the X20AI2632 provide accurate measurements with integrated data acquisition, evaluation and storage.

With its roots in the manufacture of manual jigs and fixtures, SPMIL Unit II now designs, manufactures and assembles complex special-purpose equipment serving virtually every requirement on the local and global market – including assembly lines, presses, leak test machines, end-of-line testing equipment, vision systems and deburring machines.

Engine head collet insertion

The core of an engine is the cylinder in which the piston moves up and down. The cylinder head sits on top of the cylinder block, closing the cylinder to form the combustion chamber. The head is generally where the valves, spark plugs and fuel injectors are mounted.

The cylinder head also holds the valves used to open and close the engine's intake and exhaust ports. The valve is usually a flat metal disc with a long rod known as the valve stem attached to one side. The spring on the valve stem is held in place by the two halves of a collet – a sleeve with a cylindrical inner surface and a conical outer surface, which, when pressed against a matching taper, constricts the diameter of the collet and secures the spring around the valve stem.

SPM was tasked with building a machine to insert collets around the valve stems. Although this sounds like simple pressing application, the machine kinematics and in-line quality analysis presented considerable engineering challenges. Together, however, SPM and B&R proved up to the task.

V. B. Sunil,
Head - Projects

"B&R provides technically superb automation solutions that can be used on various challenging projects – helping us to include one-of-a-kind features in the fields of automation, robotics and machine building. The unparalleled Automation Studio programming platform makes managing critical applications easy, efficient and effective."

Photos © B&R

PLC, motion control and HMI – all in one device. That is what distinguishes the Power Panel product family. The performance range, which includes Intel® platforms, can cover even the most complex robotics and CNC applications. Operator panels with a wide range of display sizes, touch screens and/or keypads are available.

Automation at the heart

The key tasks performed by this machine include first driving the press head and then analyzing the correctness of collet insertion. The insertion tool, driven by a servo motor coupled with a ball screw on the Z-axis, is used to press the spring and retainer as well as to insert the collet around the valve stem. The traverse control is determined by the model of cylinder head selected. Encoder feedback allows the press head to stop at the face of the valve.

Highly precise placement of the collet over the valve stem is vital. A laser sensor is used to verify collet orientation. The highly sensitive reflective device is located at an appropriate distance from the base, while the laser device is attached to the press head and moves along with it. Sensor feedback is processed with the intelligent B&R X20AI2632 analog input module.

Intelligence in every part

Thanks to the 50µs signal sampling and 16-bit resolution provided by the X20AI2632 analog module, the signal from the laser sensor is hard to miss. This provides accurate measurements with integrated data acquisition and storage without adding to the load on the PLC.

With the intelligent module acquiring the signal very precisely, SPM needed an equally smart solution for the controller in order to process the data and take action in real-time. B&R's Power Panel 400 HMI unit with a high-performance Intel processor and built-in controller was entrusted with the quality analysis of data from the press head. Samples are processed at one millisecond to verify correct component assembly. The algorithm for identifying collet orientation was achieved through extensive trial and error. As the outer thickness of the collet measures in millimeters, it was crucial to control the traverse speed such that the collet falls in the focus of the laser. The results were displayed on the HMI as well as saved to the flash drive in .csv format. This report, which contains details on retainer flatness as well as the heights of the retainer, collet and stem, is utilized to provide quality assurance of the cylinder head assembly.

Perfect automation partner

B&R's performance on this challenging application established it as a go-to partner for various other automotive applications as well. The intelligence of the Power Panel, the impressive X20 controllers and intelligent I/O modules, and last but not the least the smart Automation Studio engineering platform provided the framework for a wide variety of successful applications. "SPM has since built many innovative machines using B&R solutions for controlling, capturing, analyzing and sharing data with third party systems. A few examples include a cam bush pressing machine, an online gauging station for shim selection with MES handshaking, fully-automatic deburring machines with brush life mapping, leak test machines with flow versus decay data capturing and analysis, a liner pressing machine with load versus distance data and liner projection check" says, G. D. Venkatesh, Director, SPM Unit II. ←

Photo © iStock.

Metal industry

Let it flow

Having pioneered abrasive waterjet technology and introduced the first ultrahigh-pressure waterjet cutting machine in the 1980s, Flow International Corporation was quick to recognize the complex nature of waterjets and the importance of delivering an innovative, high-quality machine. In 2010, Flow discovered that their controls were posing a constraint to the advancement of the company's core technology. After a thorough evaluation process of alternative solutions from a select few industry players, Flow found the performance they were looking for in the PC-based solution from B&R.

More and more manufacturers are realizing they can achieve greater efficiency and productivity by implementing ultrahigh-pressure waterjets in their operations. Waterjets can cut a vast range of materials, are generally easy to use and maintain and, unlike many other methods, do not produce excessive heat that can alter the properties of the material. Waterjet cutting is among the world's most rapidly growing machine tool applications. While the process itself is fairly straightforward, the materials, technology and design that go into a waterjet cutting machine are quite complex. Waterjet technology uses a high pressure pump to turn tap water into an ultrahigh-pressure stream, which then flows through piping to the cutting head. Abrasive waterjet tools mix an abrasive additive into the water stream before it reaches the cutting head, allowing the waterjet to cut through virtually any material on earth.

Four times faster than the speed of sound

Flow International Corporation is a waterjet technology pioneer supplying the aerospace, automotive, job and machine shop, paper, food, art and architecture, industrial cleaning, surface preparation and food processing industries with systems installed in over 60 countries. They recently partnered with B&R to develop their latest waterjet innovation, the Mach 4c waterjet system. Equipped with the most advanced components available, the Mach 4c features HyperJet® pumps, which allow the machine to maintain up to 87,000 psi of continuous operating pressure while the water travels at four times the speed of sound. The wa-

Tim Fabian, **Director of Customer Care at Flow Waterjet**

"We selected B&R as our supplier because of their products' performance, their global presence and their ability to support and service our customers with parts, service, and technical information, as well as the potential for a true partnership where we could essentially co-develop technology. We needed a company who could step up with some of its own resources, collaborate effectively with our engineering staff and really help us take this technology to the next level."

openSAFETY

The intelligent integrated safety technology, openSAFETY, provides minimal response times. Together with B&R servo drives featuring SafeMOTION, a SafeLOGIC controller and failsafe I/O modules, guaranteed safe reactions no longer require a complete shutdown.

The Mach 4c is considered the flagship waterjet product from the flagship company in the industry.

terjet also integrates Dynamic XD for bevel and 3D cutting, enabling virtually any shape to be cut more quickly and precisely. Currently, the Mach 4c is the world's most accurate and user-friendly waterjet machine.

Reusable software shifts focus to innovation

The Mach 4c runs B&R's real-time operating system, Automation Runtime, with a B&R CNC kernel. B&R's Automation Studio software development environment unifies control, HMI, motion, safety and CNC functionality all on a single platform. Flow's customers benefit from easy-to-use software that accommodates all types of material in virtually any size or shape. "When building the Mach 4c model, we took into account the needs of an operator in a high productivity shop to ensure owners a quick return on their investment," explains Flow's director of customer care, Tim Fabian. Automation Studio's many features facilitating reusable code have helped minimize Flow's soft-ware development expenses and allowed them to focus on stream modeling and other key software innovations. "B&R's modular software development tool, Automation Studio, has been instrumental to our engineering and support staff," says Fabian.

Rugged panel for customizable and intuitive control

For the Mach 4c's visualization and control, Flow opted for a customized version of B&R's Panel PC 800. With its rugged, fan-free design, they were able to achieve a high level of environmental protection in the challenging waterjet environment.

Customers experience increased performance in the Mach 4c's simple and intuitive HMI. The Mach 4c operator panel features two PCI and PCI Express slots, modular drives, additional interfaces and an integrated UPS. The panel's custom face gives the machine a strong personal identity and features custom LED push buttons and membrane keys that can be custom-programmed with multiple options to match Flow's array of machine configurations. The

ETHERNET POWERLINK

The industrial Ethernet protocol, POWERLINK, integrates the Mach 4c's PC with its servo drives and mo-tors, machine I/O, and integrated safety in real-time. Its open architecture has afforded Flow's customers more flexibility in their waterjet system selections.

Flow International's Mach 4c waterjet system uses the B&R software development tool, Automation Studio, to run the control, visualization, motion, safety and CNC functionality on a single platform. The engineering team especially benefits from the simplified software design process attributed to the modular architecture and the ability to reuse programming code in Automation Studio.

Mach 4c panels are mounted onto a roll-around cart so the user can control the machine from wherever is most convenient.

Intelligent integrated communication

A single-processor controller perfectly synchronizes CNC and PLC functionality into the Mach 4c system and allows for better integration with the motion control platform consisting of B&R ACOPOS servo drives. A failsafe controller with I/O provides safe shut-offs without requiring a complete machine shutdown or production stop. The intelligent integrated safety technology allows for quick response times. The Mach 4c communicates primarily via a POWERLINK network linking the PC with the servo drives and motors, I/O and integrated safety components. The decentralized architecture leaves very little wiring to be found on the machine. POWERLINK's flexible design enables machine operators to focus on their primary tasks rather than bothering with fieldbus technology. A transmission speed of 100 Mbit/s and a synchronization accuracy of +/- 100 ns allow even the most demanding CNC and motion control tasks to be combined on a single network. POWERLINK also provides the freedom and flexibility to use third-party devices on the same network. The open architecture has allowed the Mach 4c to adapt to customers' needs and integrate a wide variety of options.

Waterjets on the flagship

"A waterjet isn't just a waterjet," says Fabian. "And the only way to stay on the forefront of the technology is to invest significantly in the R&D effort. That's how we maintain our position as the top waterjet provider in the world." The Mach 4c is considered the flagship waterjet product from the industry's flagship company. "Our most innovative new products rely on B&R technology," says Fabian. ←

The Mach 4c waterjet integrates Dynamic XD for bevel and 3D cutting, enabling virtually any shape to be cut more quickly and precisely. B&R's real-time operating system, Automation Runtime, runs the Mach 4c and includes a B&R CNC kernel.

Photos © B&R

The pursuit of the perfect solution

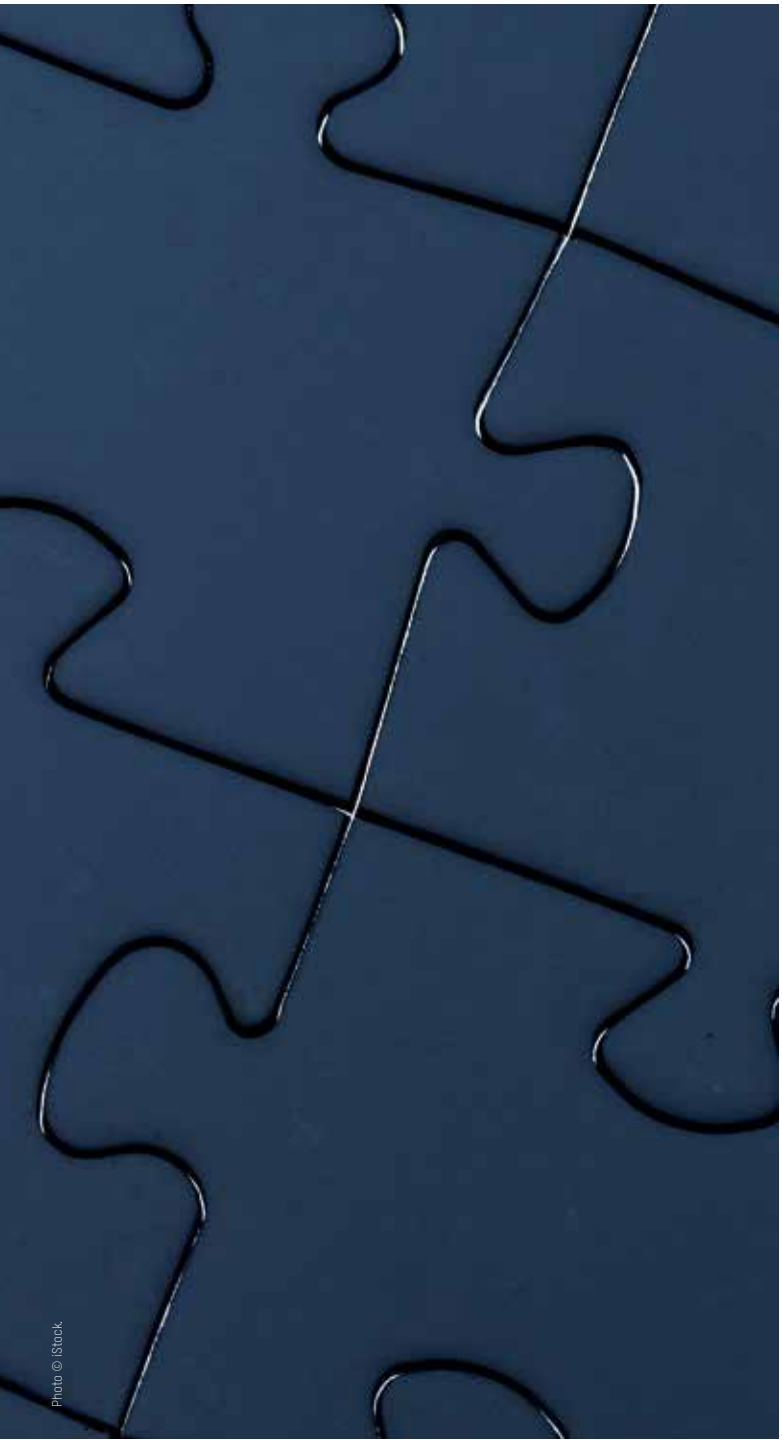


Photo © iStock

Nearly a decade ago, seeing that its current solution was not future-ready Windsor realized that, in order to achieve its vision of becoming a premium machine supplier, it would need an automation partner with world-class products. B&R quickly proved it was up to the task, with a prototype of an injection molding machine that exceeded Windsor's expectations. It became clear that the two companies share not only a focus on customer satisfaction, but also a constant aspiration for perfect solutions based on cutting-edge technology. One might say they are two companies "from the same mold".

With 530 employees and two state-of-the-art production centers in the Indian state of Gujarat, Windsor Machines Limited has grown to become the country's largest manufacturer of plastic processing machinery. The facility in Chhatral manufactures injection molding machines, whereas the facility in Vatva handles the manufacturing of pipe extrusion lines and blown film extrusion lines.

Leadership in injection molding machines

Since its founding in 1964, Windsor has worked hard to reinforce its leadership in injection molding. In 2010, Windsor obtained the technology for higher tonnage machines from Italtech, a well-known Italian injection molding machinery manufacturer.

Today, the Injection Molding division offers a complete portfolio of products ranging from 100 to 1,300 tons using hydro-mechanical and toggle clamping technology. Products using hydraulic and servo motor technology cater to a wide range of industries, including household items, furniture, packaging, automobiles, electrical/electronic components and RPVC/CPVC fittings, always with a focus on energy efficiency.

Advanced technologies for the mold quality

Windsor relies solely on B&R technology for their automation tasks. Windsor's ARMOUR, CASTLE and SPRINT injection molding machines are very successful in the market. Together with B&R, Windsor identified the key factors for the success of their proj-

With B&R's Automation Studio development environment, implementing temperature control was extraordinarily easy. The results speak for themselves: faster responses to temperature fluctuations and environmental changes, improved molding stability and reduced electrical energy needed for barrel heating.

The ARMOUR series is one of the most energy efficient machine designs, featuring an advanced toggle mechanism.

The customized Power Panel from B&R on an injection molding machine.

T. S. Rajan
COO at Windsor Machines

"Working with B&R over the past decade has been a great experience. This partnership has been a win-win situation for both parties, and our customer now has a product that combines the advantages of Windsor's experience in building injection molding and extrusion machinery with B&R's automation expertise."

ects, namely a faster controller, a modular I/O system and an HMI unit that is perfectly tuned to how the machine operates.

A high-speed, full-featured B&R controller ensures consistent high quality, which results in a stable and precise mold every time. Temperature control with auto-tuning is easily implemented using B&R's Automation Studio software development environment. This allows faster responses to temperature fluctuations and environmental changes, thus improving molding stability and reducing the amount of electrical energy needed for barrel heating. In addition, the standby temperature is now standardized in order to prevent materials from burning and to save time when restarting with a new mold.

An extremely rapid, fast-response closed loop injection process ensures superior reproducibility and consistent molded product quality. Smooth velocity for pressure changeover effectively prevents flashing while ensuring stable and repeatable molding conditions. Automatic functions are provided for mold height adjustment, lubrication, purging and barrel heating.

Efficient configuration of parameters

The ability to efficiently set parameters on the visualization device is essential to efficient machine operation and, ultimately, to satisfied users. With this in mind, developers at Windsor selected B&R's Power Panel, an HMI device with a built-in controller, which B&R customized to the exact requirements of the machine in terms of design and key layout. The Power Panel's many features include the ability to display machine cycle time details on a single screen, edit process parameters online, store mold data (recipes) in internal memory or on external USB storage devices, automatically calibrate linear transducers and protect access using a four-tiered password system.

Cutting edge diagnostic functions

B&R's web server based diagnostic tool, System Diagnostics Manager (SDM), makes maintenance much easier. SDM can be enabled with a simple mouse click in B&R's Automation Studio development environment.

Customized parameter pages accessible via the web server can also be created for remote viewing and management tasks. Operators can maintain strict control of molding requirements by monitoring machine performance based on shot weight consistency and cycle time parameters such as refill and injection time. Maintenance functions such as hardware diagnostics, a scheduler, production data, event logs, trends and statistical process control data for various critical parameters are also available.

Extrusion lines also optimized

Third-generation pipe extruders form Windsor are now providing stiff competition to international brands in terms of reliability, aesthetics, power optimization and sturdiness. The most current installations include CPVC pipe manufacturing lines for both domestic as well as international markets. Windsor's collaboration with KUHNE GmbH has also provided the company a significant technological edge in monolayer and multilayer blown film lines since 1992.

As Windsor's automation partner, B&R took on the task of automating its high speed extrusion lines for pipe and blown film. APROL – B&R's process control system – is used as a centralized operator station for the complete extrusion line. Machine functions like reversing haul-off control, fully automatic thickness measurement and control, IBC system control and gravimetric dosing control are handled by a central B&R controller.

Additional distributed intelligence is provided by two-station full surface auto-winders equipped with HMI devices for local operations. All hydraulic components, pneumatic valves and sensors are wired using the highly modular X20 and X67 I/O systems, adding both design flexibility and cost effectiveness.

In any extrusion line, PVC processing is a challenge. As a heat-sensitive material, it demands extremely precise temperature control during processing. B&R's closed loop control with auto-tuning ensures highly accurate temperature control for the extruder barrel and die heads. Melt pressure is also handled using closed loop PID control to achieve accurate pipe length cutting. ←

Plastic industry

Mind Blowing Precision

The mere mention of parison control is enough to send a shiver down the spine of many plastics industry engineers. In the field of blow molding, wall thickness is a primary quality criterion for the bottles and containers being produced. With the largest manufacturing infrastructure in India's blow molding industry, Jagmohan is renowned for manufacturing robust, reliable machines. When it comes to precision-sensitive applications like parison control, Jagmohan relies on powerful and modular B&R automation to give its machines a unique competitive edge in final product quality.

Nikunj Shah,
Owner, Jagmohan

JAGMOHAN
Innovating Reliably

"B&R hardware and software platforms give us the flexibility to handle all planned and unplanned future expansions in the machine. The integrated approach followed by B&R is very unique in the market."

Jagmohan offers one-roof solution for extrusion blow molding machines starting from 200 ml to 3000 litres capacities. JMV series machines offer multi-point parison control for precise wall thickness.

Jagmohan offers blow molding machines for producing single, double and triple layer goods ranging from small tables, chairs and toys to liquid containers, tanks and pipes. These products are used in households, automobiles and various specific industries. Jagmohan offers a wide range of extrusion blow molding machines from 200 ml to 5000 L, and relies on the expertise of B&R to equip its entire portfolio with flexible, highly precise automation.

The blow molding process itself is relatively quick and straightforward: molten plastic is expanded under high pressure to take the form of a mold. The process is easy to comprehend, but the accuracy and precision required throughout the various stages is demanding.

It starts with extrusion

The molten plastic is prepared in the extruder, with a screw arrangement that continuously churns the molten plastic in order to avoid burning, maintain its viscosity and avoid the formation of lumps as it is fed it into the head. Temperature control in this unit is provided by a PID controller implemented in the B&R PLC.

Once the tank is filled, which is measured by a linear scale, the molten plastic in-flow is cut off. The tank has a punch mounted on top which presses the molten plastic through an adjustable outlet at the bottom of the tank to dispense a continuous hollow tube. The size of the adjustable outlet is governed by the parison control mechanism implemented in the controller, which allows definition of 1000 points for very high accuracy and effective thickness control.

Precise parison control

If you look at any plastic bottle, you can see that the top and base of the bottle are much more sturdy than the middle portion. This is where parison control comes into play. The thickness of the parison is controlled by adjusting the size of the tank outlet. This high-precision control is seamlessly implemented in the B&R controllers and visualized graphically on the HMI panel.

Upon completion of this extrusion process, the mold aligns itself with the hollow tube that was just produced and closes around it. A blow pin enters the end of the hollow tube and blows in air at very high pressure. The cycle of blowing and exhaust is repeated twice to ensure uniform results.

After the blowing process, the blow pin retracts and the mold opens. The gripper unit removes the article from the mold and drops it in the deflashing area, where the excess plastic around the edges of the blown product is cut off. Simultaneous to the blowing process, new molten plastic enters the extruder and the press makes room for the new material so that a new production cycle can begin immediately.

Modularity is essential

The modular hardware from B&R enables Jagmohan to expand its machine portfolio with variety of different hardware, giving them great flexibility in their machine design. The B&R X20 I/O slices play a significant role in the entire process. Configured in the software, any hardware changes can be accommodated with minimal effort.

The 10.4" color HMI unit from B&R's Power Panel series adds a distinctive look to the process visualization. This keyed Power Panel makes it easy to set up to 1,000 parison control data points, while the recipe and the alarm management systems help the operator diagnose problems and reduce downtimes.

Apart from the single parison control block, B&R also offers a double parison control variant. The customer can have two different products with different wall thickness being manufactured from one machine. Parison settings can also be swapped between stations at the click of a button.

Integrated approach to success

Throughout their partnership, Jagmohan and B&R have worked together closely and developed a unique technological bond. B&R's integrated solution the parison control block provides a distinctive advantage to the machines Jagmohan offers, improving the quality of the final product by adding accuracy to the blowing process.

Photos © B&R

Printing industry

POWERLINK at the pulse of the print industry

Photo © iStock.

Increasing complexity, growing numbers of axes and pressure to maximize both speed and precision are the challenges facing builders of printing and binding machines. These applications demand dynamic reactions and rigidly synchronized axes. The combination of cross traffic capabilities, slave multiplexing and the freedom to put together any topology make POWERLINK an ideal communication standard for print media production.

Competition is fierce in the print industry, with individual printers vying to print ever smaller batches on office machines. There is enormous pressure to deliver impeccable quality at lower and lower costs. There is limited room in the budget for misprints and waste. This applies not only to the print process itself, but also to post press processing, cutting, folding, binding and packaging.

Equipment suppliers for the print industry have responded by developing faster and faster machines with more comprehensively automated processes all the way from printing to processing and delivery. They are also designing more versatile printing equipment that allows for the high levels of utilization necessary to make it profitable. This includes the flexibility to print substrates of varying thickness, texture and rigidity – from plastic film several micrometers thick to paper in the millimeter range. After all, printed materials include more than magazines like the one you're reading right now. There's also the ad on the bus down the street, the bag of frozen peas in your freezer and the money in your wallet.

Exploding numbers of axes

One consequence of these developments has been a rapidly increasing number of movement axes. It's not uncommon to find individual machines with fifty axes or large-scale operations in excess of two hundred. A series of up to eighteen different color stations needs to be perfectly coordinated. The slightest variation in the positioning of any one color degrades the overall image

Photo: UTECO

In Crystal, a central impression cylinder flexo printing machine, UTECO relies on POWERLINK to provide deterministic data transfer and real-time safety responses.

Photo: Müller Martini

The SigmaCollator from Müller Martini runs on a POWERLINK network. Each section of the system has an integrated B&R Power Panel for direct control.

ETHERNET POWERLINK

quality. Large deviations, as shown in the image, result in costly waste. Yet even the tiniest flaw can cause soft edges or distort color gradients.

The challenge would be considerably more easily surmountable if the properties of the substrate remained constant throughout the entire process. However, even the printing process itself changes the characteristics of the paper or film. Tension and slack due to irregularities in winding and unwinding impact the absolute position of the partially printed image. To account for this, sensors throughout the system detect the current position using registration marks and make corrections for each subsequent processing step.

These high-precision positioning functions are a vital element throughout every aspect of print media production – pre press, press and post press – and demand absolute coordination of all axes involved. This synchronization is generally derived from a single master axis, making the transfer bandwidth of the communication medium a decisive factor. Today's printers are achieving unprecedented speeds, and registration mark sensors have sample rates as low as two microseconds. At this level, when drives need to be addressed and queried sequentially, even Ethernet is too slow.

Bandwidth optimization with POWERLINK

Three qualities of the POWERLINK real-time protocol for Ethernet can help alleviate this time pressure. One of them is its cross traffic capability, which means that every drive on the network receives data from an intelligent network node simultaneously and directly, without having to pass through the master. This allows them to react with no delay.

The second accelerating mechanism within the protocol is slave node multiplexing. Since the response from the drives is not nearly as time critical as the synchronization signal, is isn't necessary for every node to respond within the same cycle. Communication cycle times can therefore be kept short, even with extremely large numbers of axes.

This makes it possible to design printing machines where complexity, speed and precision are not mutually exclusive, but instead can all be maximized at the same time.

Unrestricted topology for optimum modularity

Another characteristic of POWERLINK with particular advantages for printing technology is that it is completely independent of the network topology. This allows cable lengths and signal paths to be optimized in large machines. It is also possible to construct networks where all nodes remain accessible and operation can continue, even in the event of a broken cable. Above all, however, it is easy to design very modular automated printing solutions. Individual color stations or entire post press machines can be designed as self-contained units that can be plugged together to form flexible production lines that can easily be expanded or rearranged.

"Right now there is no other communication protocol on the industrial automation market that better meets the demands of print media production machines," says Dr. Robert Kickinger, mechatronic technologies manager at B&R. "With increasing complexity and growing numbers of axes, a trend toward higher speeds and greater precision, as well as a need for fast and safe reactions to errors, POWERLINK is the ideal standard for this industry." ←

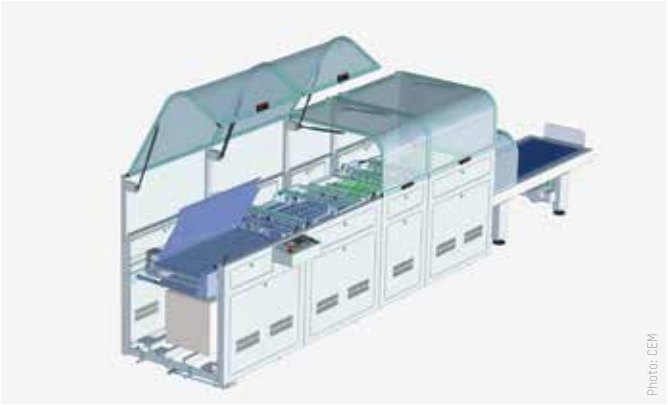


Photo: CEM

As for communication, every component in a CEM system is connected via the open, real-time capable and Ethernet-based POWERLINK fieldbus network.

Photo: Shaanxi Beiren

Impressed by its precision, Shaanxi Beiren now uses POWERLINK in all of its printing machinery.

Ultrafast automation

1 µs

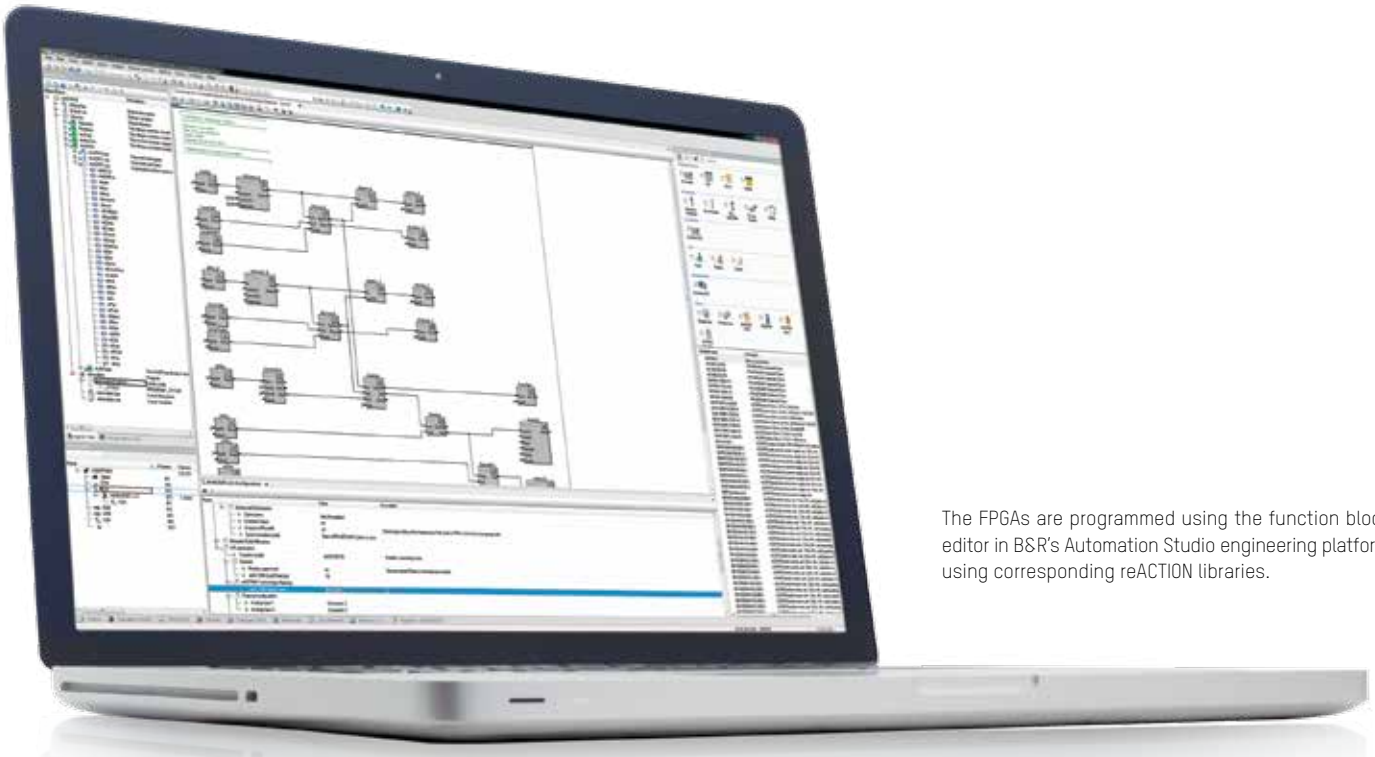
reACTION Technology reduces response times in industrial automation applications down to 1 µs. B&R has designed this new ultrafast control technology using standard hardware that can be programmed in accordance with IEC 61131 standards. The result is an immense increase in performance without the downside of additional costs.

In many applications, control speed has a direct impact on product quality. "When forming PET bottles, for example, pressure must be controlled very precisely," explains Anton Meindl, manager of B&R's Controls business unit. "The greater the control precision, the thinner you can make the wall of the bottle." Other examples include the high-precision speed and position control required in injection molding applications. The printing industry is another area where high-speed control functions are essential. "When paper is fed into a machine, the edge needs to be detected at a very fast speed," says Meindl. The list of applications that could potentially benefit from ultrafast response times is virtually endless. Conventional I/O technology operates with a minimum response time of around 1 ms. "A millisecond is no longer fast enough for some applications," notes Meindl. "In filling stations for bottled beverages, the control technology needs to process the signal from the fill level sensor faster in order to achieve optimal results." Response times in a conventional solution are influenced by a number of factors such as network performance, or the number of nodes on the network, as well as network traffic and controller performance. With conventional signal processing, the input driver in an I/O module reads the input signal and converts it into a logic signal. This signal is then sent over the network to the central PLC. The PLC processes the signal and sends it back to the module. The output driver once again converts it and sends it to

Anton Meindl
Manager of B&R's Controls business unit

"Distributed automation systems using reACTION Technology are advancing into a whole new dimension of high-speed control."

Photos © B&R



The FPGAs are programmed using the function block editor in B&R's Automation Studio engineering platform using corresponding reACTION libraries.

where it is needed. With this approach, there is no way to achieve response times much below the millisecond range.

1 µs response time

"When we developed reACTION Technology, our goal was to accelerate signal processing by integrating as much of it as possible directly into the I/O modules themselves," says Meindl. "At the same time, we wanted to do so without sacrificing the benefits of centralized software management." This new B&R solution cuts the delay between the time the input signal is received and the time the control signal is sent down to 1 µs. The technology itself is based on I/O modules with integrated FPGA chips. "We used FPGA chips because of their ability to process signals quickly in parallel," explains Meindl. With around 10 connected function blocks, the processing time in the FPGA is around 0.8 µs.

FPGAs programmed quickly and easily

One challenge B&R's developers faced was the difficulty typically associated with programming FPGAs. "We found a very good solution to this problem," says Meindl. Machine builders can now manage and program FPGAs in the familiar Automation Studio development environment. They do so by developing programs and parameters in the form of IEC 61131 function blocks; communication between I/O and CPU tasks is handled conventionally through the exchange of process variables. Logical operators like AND, OR, XOR and NOT can be used, as can arithmetic operators such as ADD, SUB, MUL and DIV as well as flip-flops, PWM, comparator functions and counters. The connections created with function blocks can be tested just like regular control code. Simulation is possible by executing the modules on the controller. If everything works as planned, the software function is then assigned to the respective hardware component in the Automation Studio hardware configuration. "Using the same easy approach to software development that B&R customers are accustomed to, reACTION Technology opens up a whole new dimension of speed," says Meindl. In the interest of making applications as universal as possible, function blocks can be loaded to the modules at any time for local execution.

The advantages

- Response time of 1 µs
- Massive reduction of PLC load
- IEC 61131 programming
- Centralized program management
- Integrated parameter management

B&R offers reACTION Technology for the I/O modules in both its X20 and X67 series (photo), as well as the compact controllers in the X20 system.

Video:
Apple under fire

Flexibly faster with reACTION Technology

reACTION Technology integrates signal processing directly in the module, taking the system bus and central controller out of the response time equation. "reACTION Technology always offers the same ultrafast performance," says Meindl. Other solutions on the market either don't offer the same speed or impose unnecessary restrictions on the machine builder with regard to flexibility and programming. With signal processing using reACTION Technology, the input driver samples the input signal with a resolution of 20 ns and converts it to a logic signal. The FPGA then processes the signal with a cycle time of up to 1 µs. The result is sent back to the I/O module's output driver. The module converts it and generates a physical signal. In other words, the FPGA assumes responsibility for certain control functions and reduces the load on the PLC.

"Since reACTION Technology takes on a significant portion of the processing load, a smaller PLC can be used," says Meindl. This means that machine builders can achieve microsecond control responses using a controller that operates in the millisecond range. "The user now decides the size of processor to be used based on the average load of the application rather than the peak speeds required by a few specific functions," adds Meindl.

Ultrafast modules, ultrafast control

reACTION Technology is available on both X20 and X67 I/O modules, as well as on the new X20 compact controllers. Three modules with different I/O configurations are available, including two X20 modules (X20RT8001 and X20RT8201) and one X67 module (X67BC81RT).

IP20-rated X20 modules each have four digital inputs with variable input filters and another four configurable digital I/O points with a physical conversion time under 2 µs. The X20RT8201 module has two additional analog inputs (+/-10 V) with 12-bit resolution and a 5 µs conversion time. The X67 module features IP67 protection and offers two 24 VDC digital inputs, three 5 VDC inputs and four configurable I/O points. In addition to the two analog inputs, an analog output (+/-10 V) with 12-bit resolution has also been integrated.
B&R offers reACTION Technology on two compact controller models, the X20CP1381-RT and X20CP1382-RT. These compact controllers are available with 200 MHz or 400 MHz processors. Depending on the variant, up to 256 MB RAM and 16 kB nonvolatile RAM is available. A built-in flash drive is available to provide up to 4 GB of application and data storage. The controllers come equipped with Ethernet, USB and RS232 interfaces. In both performance classes, integrated POWERLINK and CAN interfaces are also available. ←

POWERLINK

Open Source Solutions

The “bus” in “fieldbus” comes from the Latin "omnibus”, meaning "for all”. For all manufacturers of automation hardware who would like to make their devices and systems POWERLINK-ready, B&R makes implementing this real-time technology a cinch. Without any further obligation to B&R and, most importantly, without having to purchase any proprietary hardware whatsoever.

Ninad Deshpande,
Marketing – Open Technology, B&R India

"In less than a decade Ethernet POWERLINK has created a strong foothold in the Indian market with more than 100,000 nodes installation at various plants. These nodes encompass controllers, remote I/Os, drives, sensors and actuators. Device manufacturers in India too have realized the benefits of the technology and expressed their trust in the open source stack. Absolutely no licenses and no copyrights!"

What is "open source" in the first place? Is it something that has no owner? Or something that is unmanaged? The term is surrounded with misconceptions and interpretations. With POWERLINK, open means usage without restrictions. The source code is not only available free of cost but also for free redistribution. In the course of redistribution, it can also be modified and have derived works. The Open Source Initiative (OSI) is an organization dedicated to promoting open source software and assumes the responsibility for reviewing and approving licenses as OSD-conformant. A few famous open source technologies include Firefox, Android, Apache, Linux... and POWERLINK.

Why open source? This is the next question that needs to be answered for a more complete understanding of open technology. A few potential answers to this question include better quality, no vendor lock-in, increased security, lower costs and, last but not least, access to license-free source code. A clear example of how openness can lead to better quality is Linux, the open source operating system which has been shown by researchers to have fewer bugs compared to proprietary alternatives.

In 2009, the U.S. White House shifted from a proprietary content management system to the open source Drupal CMS, which shows the class of security that can be provided by an open source platform. Generally, a proprietary system may initially seem to be very efficient before one is confronted with the inefficiencies in interoperating with other systems. Proprietary systems also have unclear long term policies and are limited to one vendor.

Evolving automation industry

The automation industry is demanding ever higher speeds, increased accuracy and improved reliability. To achieve this, customers must choose between implementing a new system and upgrading their current one. PLC, HMI, sensors and drives are only a few of the many automation products used throughout a plant. Not wanting to be tied down by a single automation supplier, customers are increasingly defining the standards to be met rather than the suppliers to be used.

Customers are more interested in long-term availability and a stable platform. Automation suppliers are willing to work with systems that have no single owner, no patents, no royalty and no copyright. Though there may be many automation suppliers providing various products, many customers insist that the backbone of the system – communication – be open in order to avoid vendor dependency.

Trends in fieldbus

Like the automation industry, fieldbus technology is also evolving to provide users with high speeds, convenient diagnostics and easy maintenance. What began with wired serial technology eventually evolved into the faster fieldbus technology. The next evolution has been a shift towards industrial Ethernet.

Ethernet-based communication offers better diagnostics than conventional fieldbus approaches. The simple industrial CAT5 cables used for wiring allow devices to be connected without specially trained wiring technicians. Customers are becoming increasingly aware of the fact that the network will be a key differentiator going forward.

A real-time open solution for industrial Ethernet

Ethernet POWERLINK, which is a real-time open source solution, is used as a communication backbone in automation systems. POWERLINK is a global leader in real-time Ethernet solutions with an installed base of nearly 900,000 systems and 3,100 OEMs trusting in POWERLINK technology.

The POWERLINK license is recognized by the Open Source Initiative as OSD-conformant under the Open Source Definition "10 Criteria". POWERLINK also has a BSD license, which is a family of permissive free software licenses imposing minimal restrictions on redistribution of covered software – unlike copyleft licenses, which have reciprocity share-alike requirements. This BSD license states that anyone is allowed to use and modify the code and create derived works with an ability to re-publish changes under any other license.

Stefan Schönegger,
Manager of Open Automation Technologies, B&R

"The reign of proprietary systems for industrial safety electronics is over. Openness and real independence from these manufacturers makes it easy for device manufacturers to integrate POWERLINK cheaply and easily. They enjoy this freedom of implementation with the choice of hardware and software at their disposal."

Performance without limits, flexible topologies, machine modularity and advanced interaction of sensors and controls are the requirements of modern automation, and POWERLINK completely satisfies all these requirements.

Benefits
POWERLINK is the only real-time deterministic solution based on standard Ethernet and is the only open solution on the market. Here, determinism is defined as the ability of a network to send a piece of information to a specific destination and receive a response in a time frame that is predictable and repeatable.

With the rapid evolution of Ethernet from 100 Mbits/s to 1 Gbits/s and further, POWERLINK allows users to safeguard and future-proof their investments by staying on the forefront of these advancements. Any standard PC or any industrial PC with an Ethernet port can be used to run POWERLINK.

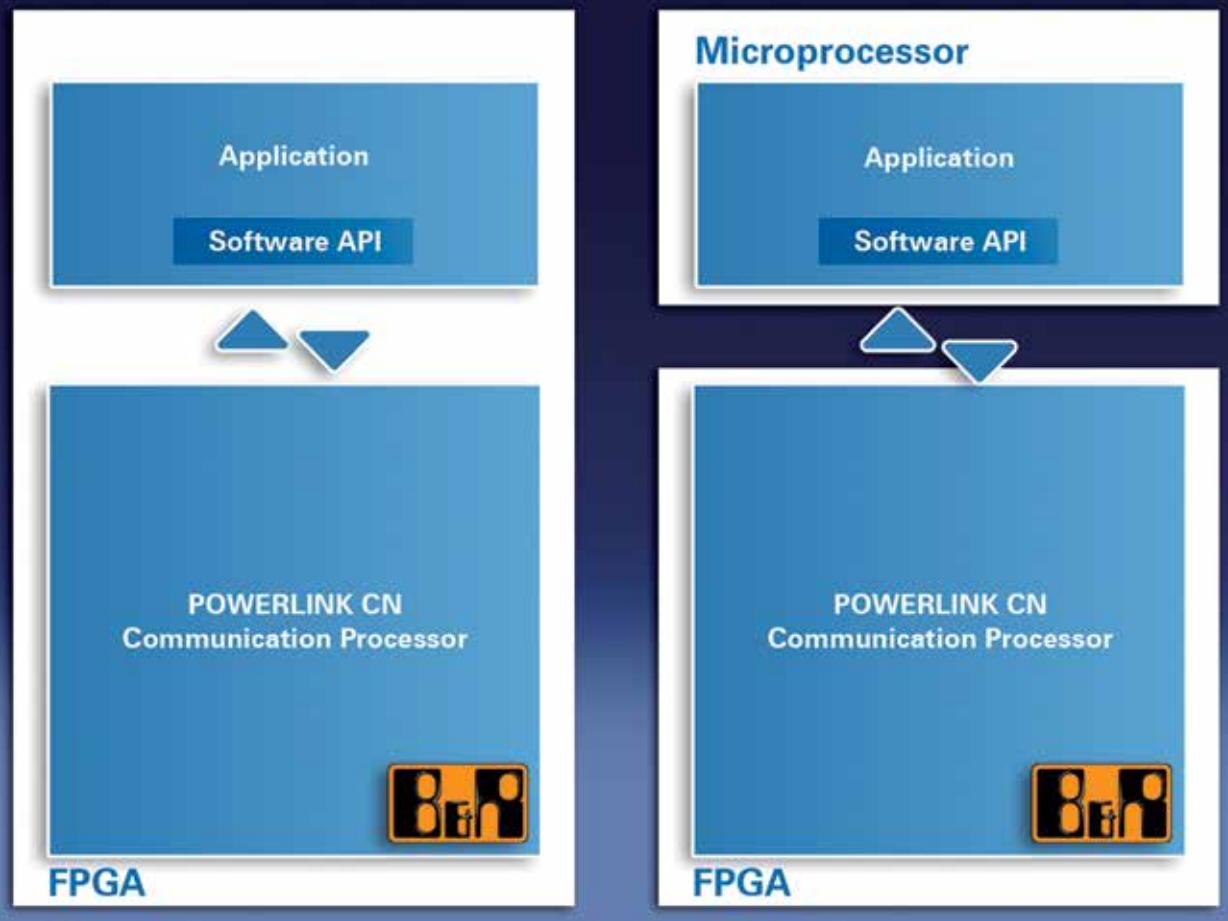
POWERLINK enables the user to work with the topology that best fits the machine and delivers maximum performance, regardless of which topology is chosen. POWERLINK also offers numerous forms of redundancy, including ring, multi-master and media redundancy. Equipped with all these features, POWERLINK is able to achieve cycle times as low as 100 µs.

Offering maximum performance along with the advantages of standard Ethernet, the freedom of absolute openness and the lowest total cost of ownership, POWERLINK satisfies all the requirements for industrial automation. All automation suppliers stand to profit from integrating the openness of the internationally renowned POWERLINK and fieldbus-independent openSAFETY standards into their products.

Cost-effective and in no way limited with regard to usability, these products broaden compatibility throughout the market and around the world. At the same time, they make it much easier for system integrators to implement complete automation solutions.

POWERLINK implementation made easy
In the past, designing a new connection for a certain Ethernet-based industrial field network system was not exactly easy to achieve. More often that not, it was associated with very high entry costs. In addition, most industrial Ethernet systems are proprietary, meaning that anyone who wanted to work with a certain fieldbus usually had to purchase the necessary hardware components directly from the original manufacturer. This is often difficult for component manufacturers to swallow since they are often competing with these same fieldbus producers.

As the only industrial Ethernet system with hard real-time capabilities, POWERLINK is a purely software-based solution that doesn't require any customer-specific semiconductor components. This



is the only way to guarantee the complete openness that allows hardware manufacturers to retain their independence from the designers of fieldbus systems.

Being open source, this software is guaranteed to work with any platform, regardless of the processor or operating system being used. Nevertheless, the open nature of the license does not require that the solutions created through its use be released into the public domain.

No hardware or software limitations

POWERLINK can be implemented on any hardware, including FPGA, ARM, Intel and AMD processors. Similarly, it can work on any software platform, including VxWorks, QNX, Windows and Linux.

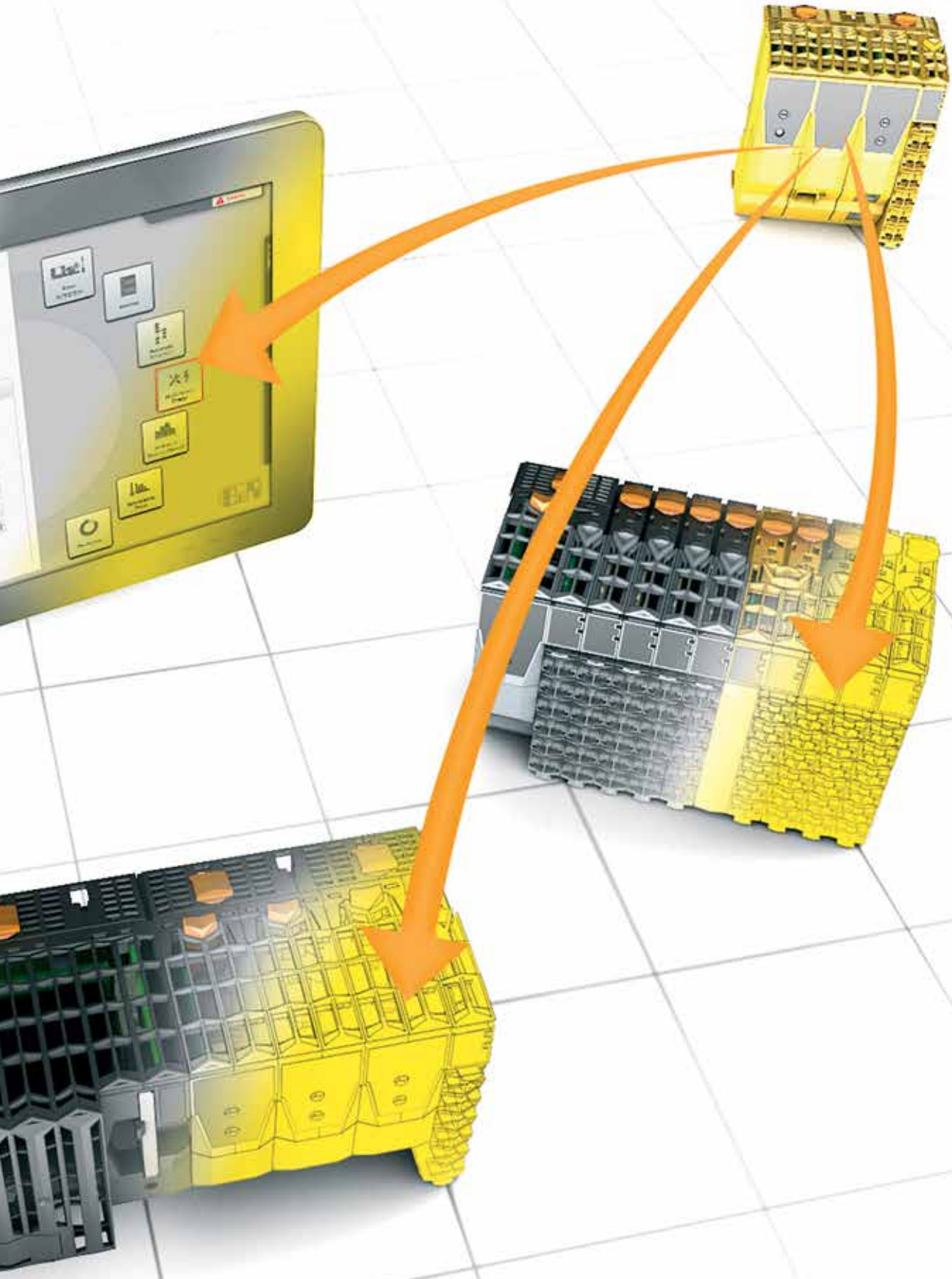
FPGAs are integrated circuits designed to be programmed in the field as opposed to when they are manufactured. The program itself is stored in the unit's non-volatile memory. Unlike the ASIC chips commonly used in other systems and manufactured specifically for a particular customer, FPGAs are completely application-neutral and available as standard components from well-known chip manufacturers and distributors.

Since they can be used for different purposes and in many different types of applications, they are also produced in very large numbers, making them attractive from a cost point of view as well. This lowers the cost of an industrial Ethernet connection to no higher than most extensively used classic fieldbuses, which makes this uniform solution especially economical for cost-sensitive products such as compact sensors with very little electronics, servo drives and I/O bus connector modules. For the first time ever, Ethernet has been made affordable for these device classes in the form of a technologically advanced system that refuses to make compromises when it comes to real-time capability.

The message that B&R is sending to the market is crystal clear: Proprietary is yesterday. The future belongs to manufacturer-independent, open solutions like POWERLINK. ←

Equal safety for all!

Traditionally, the cost of integrated safety solutions has prevented small scale applications from enjoying their advantages. Smaller applications have instead resorted to hardwired solutions and been forced to deal with the resulting lack of scalability and system discontinuity between applications of different sizes. B&R now offers an elegantly simple solution to these problems – SafeLOGIC-X.



With SafeLOGIC-X, the functions normally provided by the hardware controller are shared by the standard PLC, safe input modules and HMI units. This is accomplished without sacrificing any of the advantages of integrated safety technology.

open SAFETY

As the only open safety standard, openSAFETY offers much more than simply SIL 3-compliant communication services. The specified configuration and parameterization services ensure that parameters and configuration data are safely monitored and distributed on the network. These innovative functions are fundamental to the architecture of B&R's new safety solution, SafeLOGIC-X.

Developers of modern machinery are well aware of the benefits to be gained from integrating safety technology on the bus network. They value the time and money saved on running cables as well as the flexibility provided by virtual wiring – which also just so happens to make it much easer to design modular machines and systems. Safety solutions from B&R feature advanced safety functions for motion control and exceptionally fast response times made possible by the open Ethernet standard, POWERLINK. Safety signals are transmitted via openSAFETY, the only bus-independent safety protocol on the market. Integrated safety technology from B&R is rapidly finding more widespread use, particularly in larger and more complex machinery.

Integrated safety for applications of any size

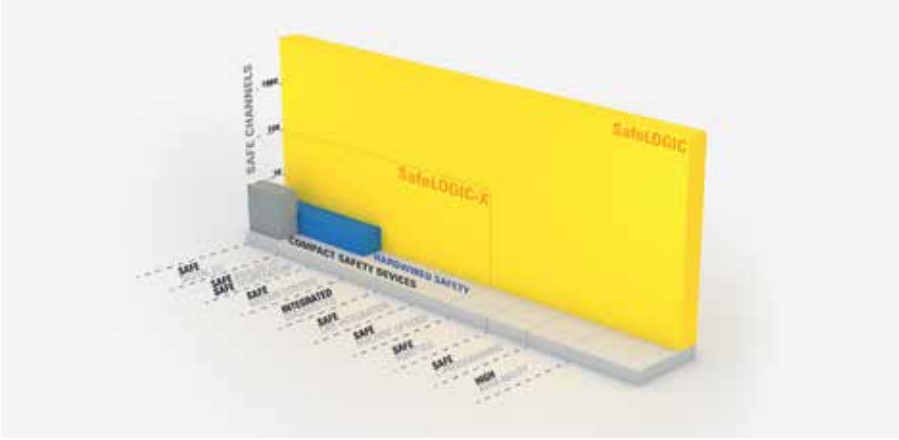
"Despite all the clear advantages of this technology," says Franz Kaufleitner, B&R's product manager for integrated safety technology, "there remains a whole range of applications where it has yet to be implemented." Kaufleitner continues, "Especially when it comes to small scale applications, where the purchase price alone is often the decisive factor, there is simply no room in the budget for a separate safety controller."

B&R's new solution, however, offers the advantages of an integrated bus-based PLC at a price that can compete with conventional solutions based on separate relay technology. The many benefits for users are clear: a consistent machine design and consistent diagnostics for increased machine availability.

Safety tasks distributed across existing hardware

"It's easy to see what people like about our solution," says Kaufleitner. "Using software alone, we've managed to eliminate the need for a dedicated safety controller." The safety functions otherwise provided by B&R's SafeLOGIC controllers are distributed throughout the network on existing hardware components. To make this possible, B&R experts split all safety-related tasks into three packages:

- Execution of the safety application: This task was outsourced to a safe input module from B&R's X20 SafeIO series. This safe hardware element features a dual processor system with ARM cores.
- Safe management of configuration parameters: In a SafeLOGIC controller these parameters are stored centrally. When the controller is exchanged, they must be transferred to the new hardware using a method that ensures



With SafeLOGIC, B&R offers the most comprehensive and highest performing safety system available on the market. Now SafeLOGIC-X brings integrated safety technology to smaller applications as well.

The safety application runs on safe input modules from B&R's X20 SafeIO series, which provide a safe hardware element with dual ARM processor cores.

"We've succeeded in creating a solution whose scalability allows it to fill a serious gap in the market. Machine and systems manufacturers can now eliminate inconsistencies between the safety solutions used in their various products and enjoy the benefits of integrated safety technology across all applications, regardless of size."

Franz Kaufleitner,
Product Manager for Integrated Safety Technology at B&R

SIL3 compliance. This task was outsourced to a group of safe tasks within the standard PLC that monitor each other.

→ Acknowledgment of safety-related actions and events: Replacing the user interface found on every SafeLOGIC controller was no problem at all. This was implemented using remote control services that run on operator panels. Safe acknowledgment is ensured using switching elements in the form of keys and display elements.

Full compatibility for small scale applications

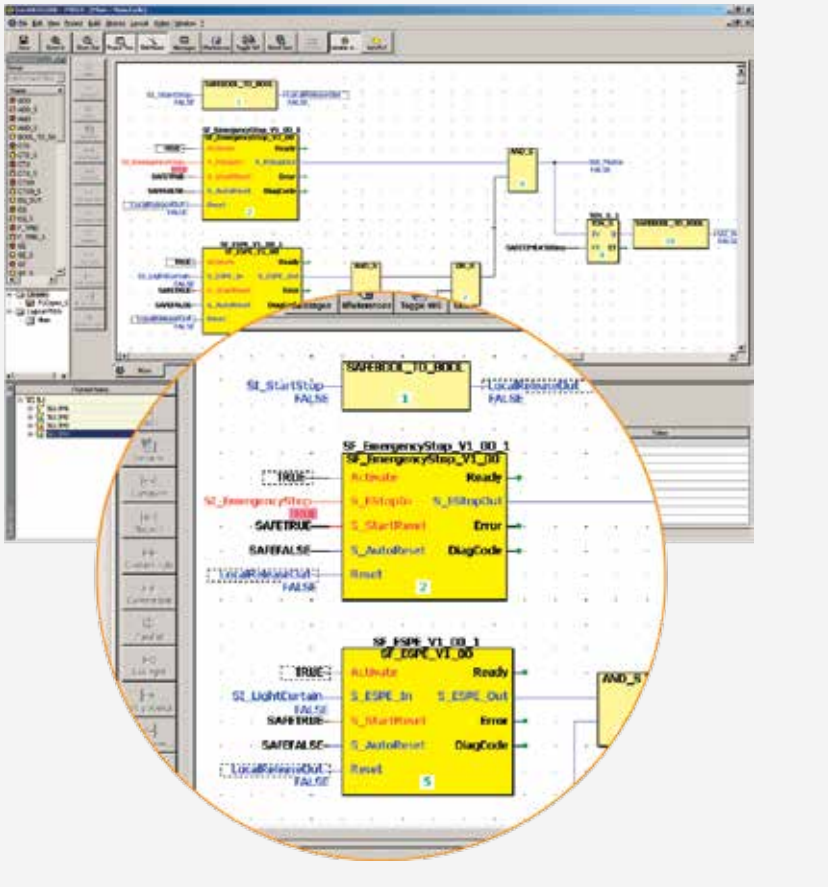
SafeLOGIC-X offers users all the advantages of an integrated safety solution with an enormous selection of state-of-the-art products: safe digital I/O modules, safe analog I/O modules, safe temperature input modules, Safe Motion Control, integrated diagnostics, safe line integration, and safe machine options.

The SafeLOGIC-X solution is programmed in Automation Studio just like the hardware-based version, using the SafeDESIGNER editor. This has a key advantage, as Kaufleitner points out: "When a system outgrows its SafeLOGIC-X solution, it's no problem to switch to a dedicated SafeLOGIC controller." The existing code can be carried over, which saves time and money.

The safety applications are scalable and can be configured to accommodate systems of any size. When safe input and output modules are added, the existing code can simply be reused as-is on a SafeLOGIC controller. SafeLOGIC-X also allows safety equipment to be configured on a visualization terminal using machine options, just like the hardware-based solution. Commissioning and service technicians can implement changes easily, without having to use any external safety-oriented programming devices.

Complete independence from the control platform

Any B&R product running B&R's real-time operating system, Automation Runtime, can execute the software-based safety solution. This includes the entire range of Automation PCs and Panel PCs, as well as Power Panels and the modular X20 series of control modules. "We've succeeded in creating a solution whose scalability allows it to fill a serious gap in the market," notes Kaufleitner. "Machine and systems manufacturers can now eliminate inconsistencies between the safety solutions used in their various products and enjoy the benefits of integrated safety technology across all applications, regardless of size." ←



The safety application is wired virtually in Automation Studio's graphical SafeDESIGNER editor. There is no need to decide right away whether the application will run on SafeLOGIC hardware or a SafeLOGIC-X solution. That's the great advantage of this solution: its absolute scalability.

Photos © B&R

Optimize your system

B&R offers an extensive range of products for delivering integrated automation solutions. For a complete overview of all B&R system components, visit www.br-automation.com

Box PCs / Panel PCs

- Automation PC 910 / Panel PC 900
- Powerful Intel Core i3/i5/i7 processors
- Fanless operation
- Windows 7, Windows 8, Windows Embedded, Linux, real-time
- Uncompromising quality for operation over many years
- Direct fieldbus connection

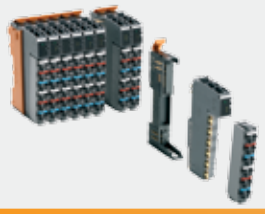
Automation Panels

- Automation Panel 900
- Widescreen from 7" to 24" Full HD
- 4:3 from 12.1" XGA to 19" SXGA
- Projected capacitive multi-touch and analog resistive single-touch
- Hygienic design (IP69K)
- Swing arm or cabinet mounting
- Remote operation up to 100 m with SDL3

reACTION TECHNOLOGY

Ultrafast automation

- reACTION TECHNOLOGY
- 1 µs response time
- Cost-effective due to standard hardware
- IEC 61131 programming
- Significant reduction of CPU load
- Digital and analog signal preprocessing
- Comprehensive diagnostics and simulation
- Extensive function library

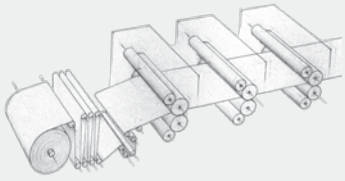


Modular I/O system

- X20 I/O
- Open for all fieldbus systems
- Removable terminal blocks
- Hot-pluggable
- Unequaled component density: 16 channels in just 12.5 mm
- No-risk hardware replacement due to centralized management of firmware/configurations

IP67 I/O system

- X67 I/O
- Open for all fieldbus systems
- Seamless integration
- Excellent EMC properties
- Diagnostics via PLC program and web interface
- Simple cabling



Technology Solutions

- Integrated closed-loop control
- Hydraulics, temperature, winders, printing
- Profile generators, controllers, system identification, autotuning
- Virtual sensors
- Simulation models
- Model Predictive Control (MPC), Advanced Process Control (APC)

IP20 motion control

- ACOPOS/ACOPOSmulti/ACOPOSmicro
- Power range from 500 W to 120 kW
- Regeneration-capable and energy-saving
- Integrated drive sizing
- Easy programming with standardized PLCopen function blocks
- Maximum dynamics and precision with a perfectly orchestrated complete system

IP65 motion control

- ACOPOSmotor/ACOPOSremote
- Seamless integration in the ACOPOSmulti drive system
- Integrated safety technology and SafeMOTION
- High continuous power up to 4 kW
- Integrated drive sizing
- Easy programming with standardized PLCopen function blocks

HMI terminals

- **Power Panel T-series**
- Portrait and landscape
- 4.3" to 10.1"
- Widescreen and 4:3
- Integrated VNC terminal and web client
- Compact, fanless and maintenance-free
- IP65 protection
- Daisy chain connections

Power Panels

- **Power Panel C-series**
- Control and HMI in a single device
- Easy programming in IEC 61131-3, CFC, ANSI C, C++, PLCopen
- 5.7" to 10.1"
- Widescreen and 4:3
- Open communication (FTP, VNC, OPC, web server, POWERLINK)

Scalable PLC platform

- **X20 controller**
- Easy programming in IEC 61131-3, CFC, ANSI C, C++, PLCopen
- Open fieldbus options (POWERLINK, CANopen, DeviceNet, PROFIBUS, PROFINET, etc.)
- Intel Atom performance
- Fanless and maintenance-free
- Integrated CNC and robotics

Safe control platform

- **SafeLOGIC**
- Safety in accordance with CAT 4 / PL e / SIL 3
- PLCopen-certified function blocks
- Virtual wiring
- Management of machine options
- Easy IEC 61131 programming
- Openness through openSAFETY
- Integrated diagnostics

Safe I/O system

- **X20 SafeIO / X67 SafeIO**
- Digital inputs/outputs
- Relay outputs
- Analog inputs
- Temperature inputs
- Use of I/O data in both standard and safe applications
- Safety in accordance with CAT 4 / PL e / SIL 3

Safe motion control

- **SafeMOTION**
- Fastest reaction times
- STO, STO1, SBC, SOS, SS1, SS2, SLS, SDI, SLI, SMS, SLP, SMP, Safe Homing, SBT, SafeROBOTICS
- Safety in accordance with CAT 4 / PL e / SIL 3
- Network-based safety technology
- Safe parameter transfer with SafeLOGIC

CNC / Robotics

- **Generic Motion Control**
- CNC functions for all technologies
- Ready-to-use robotics solutions
- Any kinematic transformations
- Motion profiles optimized for power consumption and timing
- Support for servos, steppers and hydraulics
- Interpretation of NC dialects

Motors / Gears

- Power range up to 140 kW
- Synchronous motors, stepper motors, direct drives
- Direct gearbox mounting
- Integrated diagnostics down to the motor
- Integrated sizing with speed-torque chart
- Embedded parameter chip

Mobile automation

- **MA170 system**
- Modular control and I/O system
- Extremely robust housing and hardware
- -40 to +85°C temperature range (housing surface)
- 8 to 32 VDC power supply
- Extreme shock and vibration resistance
- POWERLINK & CANopen

For every industry

Automation Studio 4 is the ultimate integrated automation software for every industry. When it comes to efficient and sustainable software engineering for machines and systems, Automation Studio offers the power and versatility to optimize every horizontal and vertical aspect of your system and the openness to secure its value long into the future.

Manufacturers face unyielding pressure to raise the level of automation in their production lines, with individual machines becoming increasingly automated as well. When it comes to integrating handling equipment, robots and the transport systems that connect them, it makes no difference whether you're running a production hall or processing plant. The logical next step is to merge individual subsystems with automated control of the entire system at a supervisory level to close any gaps between processes.

Methodological differences from industry to industry are fading. Control algorithms and production sequences have many similarities, whether processing metal or wood, whether printing on textiles, plastic or paper or converting them into packaging, or whether producing or packaging pharmaceutical, food and beverage or tobacco products. On the other hand, there are most certainly industry-specific differences, as indicated by different applicable standards.

The Automation Studio 4 development system integrates every aspect of automation, providing uniform solutions for open and closed loop control, motion control and safety technology as well as hardware and software for operating and monitoring entire systems from the highest supervisory level down to individual sensors and actuators. The features it provides and the systems it is used to create are suited for all industries, support compliance with relevant standards and are certified by the respective industrial governing bodies.

A selection of technology packages provides pre-programmed open loop, closed loop and motion control technology as well as visualization solutions for typical industry-specific system components, making it easy for software developers to create solutions optimized for particular industries.

Integrated automation software for every industry

01 Commercial vehicles **02** Infrastructure **03** Metal **04** Handling & Robotics **05** Print **06** Wind power **07** Maritime & Offshore **08** Tobacco **09** Packaging **10** Environment & Recycling **11** Chemicals & Pharmaceuticals **12** Food & Beverages **13** Semiconductors **14** Oil & Gas **15** Measurement and testing technology **16** Energy **17** Wood **18** Medical engineering **19** Plastics **20** Textiles **21** Automotive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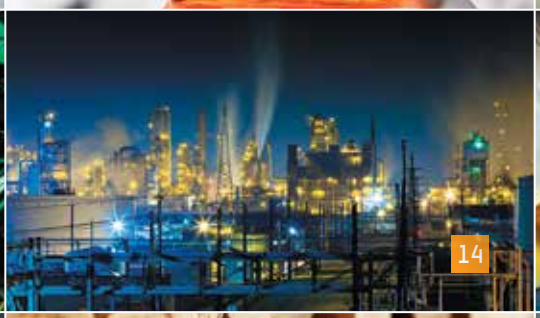
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What Indian manufacturers say about us ...

Divyakant Shrivastav,
United Breweries Limited

"We value the fantastic support provided by B&R's local technical offices. The good quality products in its portfolio withstand the harsh environmental conditions prevalent in India. We at United Breweries Limited are thankful to B&R for offering their prompt and efficient services."

Arvind Kumar Rai,
Engineer-Instrumentation,
United Breweries Limited

"The world class compact products from B&R occupy very less space in the panel. The modular I/O's can be mounted on a din rail making it easy for maintenance. The support offered by B&R is the best in class."

Sanjay Singh,
Senior Manager Production,
Dainik Bhaskar Corp Limited

"Thanks to the B&R hardware the diagnosis and maintenance is made very easy. We are also very satisfied with the support offered by B&R which guarantees a 24*7 operation."

Harish Gaonkar,
MTR Foods

"We believe in openness and B&R products adhere to this concept making it a preferred vendor for MTR foods. This helps us in improving plant design and cost efficiency."

A. V. Mandhare,
Asst. Manager–Electrical,
Garware Wall Ropes

R. S. Sanas,
Sr. Officer–Electrical,
Garware Wall Ropes

"At our Wai unit, we have successfully automated our netting machines with B&R control system. We appreciate the quality and capability of B&R products like compact HMI with built-in PLC, servo drives and motors. It has enormously helped us achieve our production goals as well as our quality targets. We are very confident to recommend B&R to our equipment suppliers. The Servo-PLC based electrical system is advantageous in numerous ways. It considerably reduces waste, setup time and down time, increases production and makes it easy for the operator to handle the machine."

Diwakar Tiwari,
Head-Processing, Arvind Limited

"We have numerous machines with B&R controls operating with complete reliability. Thanking the great support from B&R our plants are functional 24*7. This is why we place our trust in B&R."

N. P. Tripathi,
DGM – Electronics, Uflex Limited

"We appreciate the fantastic and timely support provided by B&R with a very fast response from the entire team. The working style is of international standard and the team is technically very competent. I am fully satisfied with the working and support or your team and products. Thanks to B&R our plants are able to function round the clock."

Dinesh Purandare,
Team Leader Electrical & Instrumentation Maintenance,
Hindustan Coca Cola Bottling Plant Limited

Hitendra Dhotre,
Team Leader Procurement,
Hindustan Coca Cola Bottling Plant Limited

"The modular X20 I/O's from B&R simplify the maintenance and occupy nominal space in the control cabinets. The modules can be wired without using screw drivers and the three part configuration makes replacement very simple. The accuracy and speed achieved due to the B&R servo systems is phenomenal and incomparable. Last but not the least the support during critical times is outstanding. The company has a strong international presence and the quality of its products is outstanding. Thanks to B&R our plants are free from downtimes."

Manoj A. Patil,
AGM - Maintenance,
Fleetguard Filters Private Limited

"Our cooperation with B&R has been extremely effective, and we have received top class support in tough times. The products are compact, and the software design aids the maintenance to diagnose the machine functions and take corrective actions."

S. S. Nimbal,
Senior Manager Electrical,
Exide Industries Limited

"The power panel from B&R is a unique offering with an integrated PLC and HMI in one product thus reducing the hardware and simplifying maintenance. The robustness has encouraged us to recommend our machine suppliers to provide their equipment with B&R control system."

R. M. Yadav,
Senior Manager Maintenance, Colour Roof India Limited

"B&R has a competent service force which supports us to keep our plant operational. We are pleased with the good quality products and support offered by B&R."

Bhadresh Parmar,
Claris Otsuka Ltd.

"We need our plants to operate continuously without breakdowns to achieve great production consistency and accuracy. B&R hardware and support helps us to achieve a good quality production consistently with minimum hassle."

Shivraj Choudhary,
Haldiram Snacks (P) Limited

"B&R has always been our preferred solution provider for our packaging machines contributing with their seamlessly integrated hardware and software. B&R's approach with Ethernet POWERLINK and PackML standards are influential in Haldirams success and have given a boost to the packaging machines and line integration."

Milind Kadia,
Manager - Engineering,
Intas Pharmaceuticals Limited

"Accuracy, speed and high productivity are the basic requirements Intas Pharmaceuticals demands from its equipment manufacturers. B&R hardware and support are decisive for high uptime."

Dinkar Paithankar,
Manager–Maintenance,
Lear Corporation

"Lear Corporation works hard towards reducing downtimes and having maximum efficiency on the production line. Only a quality service like the one rendered by B&R allows us to stick to our philosophy. We have complete faith in B&R."

Rajanand R.,
Sr. Manager, SAB Miller India Limited

"We value the support provided by B&R's local technical offices, the company's international presence and the outstanding service & quality of its products. We recommend our machine suppliers to provide their equipment with B&R control." ←

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