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The Bachmann Customer Magazine 09 | 2019

INTERACTION

INTERVIEW: USABILITY AT KUKA | MQTT AND / OR OPC UA?
CYBERSECURITY IN CHINA | PRODUCT AND USER NEWS

DEAR READER,

Devices have transformed not only our workplaces, but also our private lives – and not always for the better. Along with all the conveniences that have become such a part of our lives, societies are also increasingly confronted with the risks which come with digitalization and interconnectivity.

Thanks to the smartphone, time-honored business models have been transformed, often in dramatic ways. Wholly new companies and industries have arisen, while the inventions from Apple, Samsung and others have given rise to hitherto unthinkable possibilities. I don't fully subscribe to the unconditional introduction of consumer electronics into industrial settings, due to the accompanying risks. But I do trust the inherent usability and UX offered by these devices.

A lot of the things we see today in machine user interfaces came originally from the smartphone world. Machine users now expect a user experience which is just as simple and intuitive as with their own smartphone or tablet. That's a challenge for UX designers and at the same time ensures a high degree of motivation and process safety in their work.

As an industry supplier, have we missed the boat in this reconfiguration of user interfaces? Critics may see it that way but, in defense of my colleagues, the usability and UX revolution is not based on fantastic ideas and technological advances alone. For the creation of world standards, economies of scale are also decisive.

And this is where we come full circle, as we are also ensuring that the sophisticated usability in consumer electronics is repurposed for industry. Our systems are open, are based on the latest web technologies, and meet the very highest security requirements. Moreover, they are long-lasting and made especially with harsh working climates in mind. That's what sets us apart.

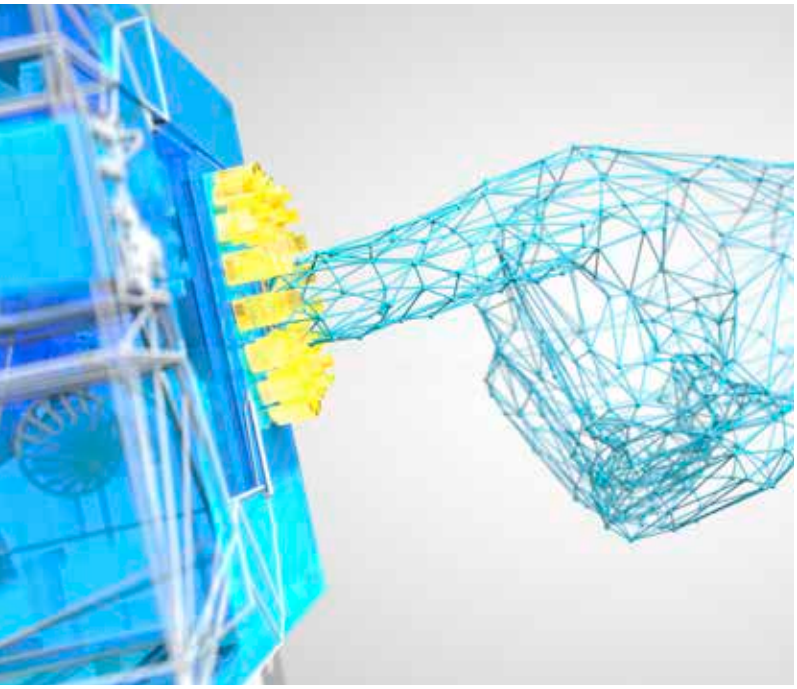
This issue centers firmly on operability and interaction with machines. Usability and UX are now essential features for error prevention and boosting productivity. They are increasingly decisive competitive factors in mechanical engineering. This is absolutely clear from the various examples contained in this issue.

Enjoy your read.

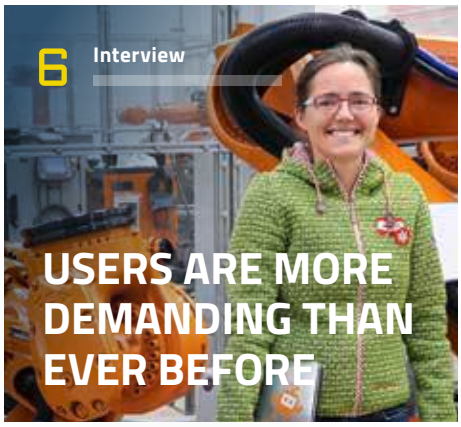
Bernhard Zangerl
CEO Bachmann electronic


»We ensure that the sophisticated usability in consumer electronics is repurposed for industry.«
Bernhard Zangerl
CEO Bachmann electronic

SERVE AND OBSERVE



Touch, Augmented Reality, voice control, machine learning and all kinds of buttons: Human Machine Interfaces (HMI) are gaining traction and for many are also useful ways of sorting through data in a production facility. But in spite of all the new technology, the task remains essentially the same: providing the right information, at the right time, for the right people. In this issue we give you an overview of interface solutions, and hopefully in the process, deliver the right information to the right person. The time and place are up to you.



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Jessica Rademacher is Head of User Experience and Usability at Kuka.

She studied Electrical Engineering in Augsburg and graduated as a qualified engineer, before becoming part of Kuka College. There, she trains users in the programming of robots, among other fascinating things.

At the same time, she studied Lifelong Learning at Kaiserslautern University, coming out with a Master of Arts.

In her free time, she's part of Neuberg Music Club and loves to ride her Vespa around the place.

Interview

USERS ARE MORE DEMANDING THAN EVER BEFORE

Jessica Rademacher is Head of User Experience and Usability at Kuka's R&D Center. In this interview she reveals how customer demands have changed and why a user interface is now a decisive competitive factor.

Can you sell usability and user experience (UX) to us? Will it become a competitive factor in robotics?

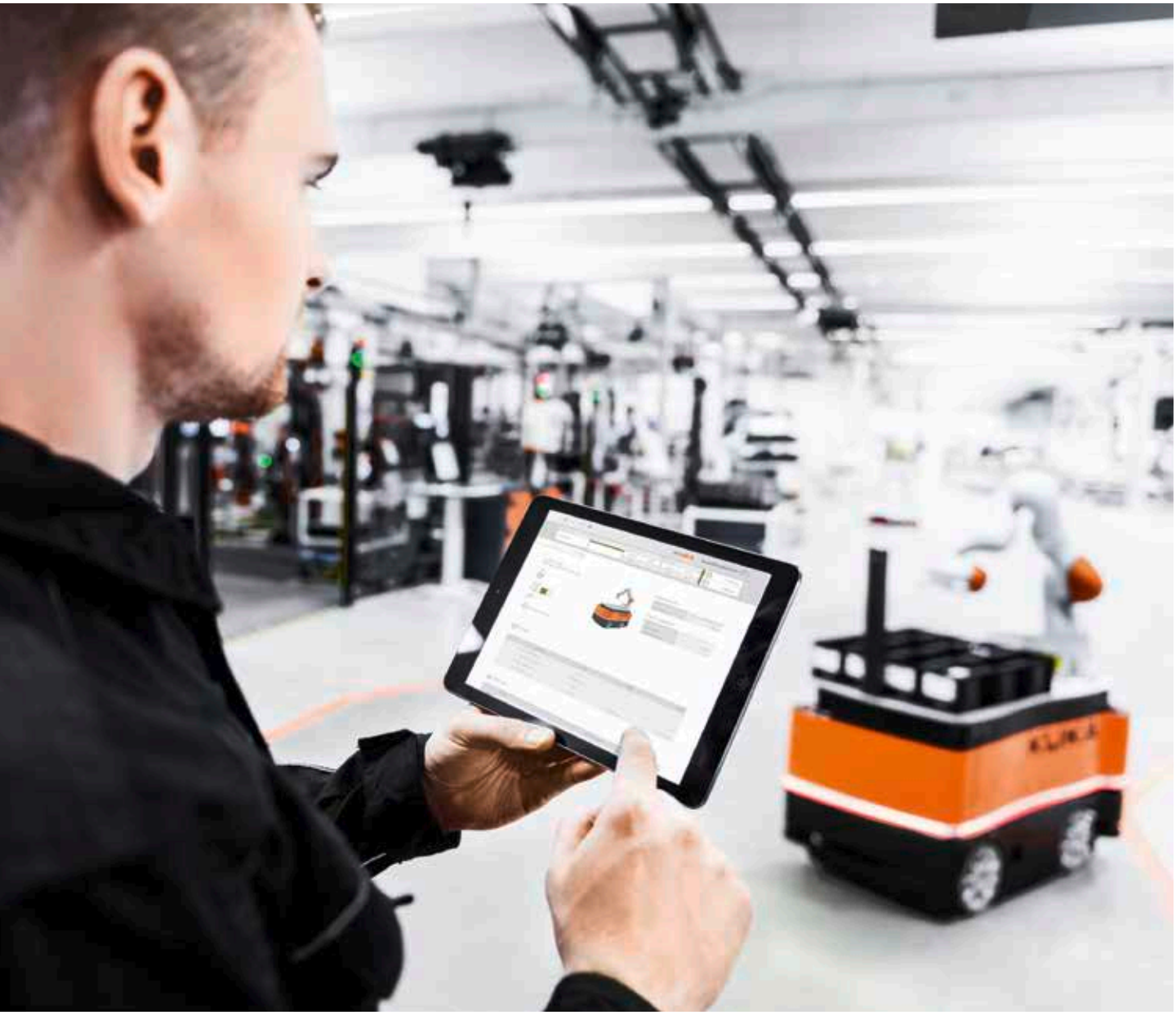
Yes. When a task can be more concisely and efficiently completed, thanks to usability and UX, it becomes an economic factor and as such a competitive factor. For this reason, in my opinion it's invaluable to better address the customer and the varying user groups.

What role does visualization play in IIoT applications, connectivity or data business models?

It's a great medium for bringing to life something which can otherwise be very abstract. Visualization can help make complex topics around IIoT or Smart Data more comprehensible, and in this way, bring them closer to the user. As well as representing critical machine conditions, maintenance intervals or company-specific classification numbers, visualizations can also help you establish whether or not a system is online. For new business models, such as pay-per-use, visualization is the prime source of information regarding how much is being produced. So in this way, visualization is just as important in IIoT.

How have usability and UX changed in recent years?

Due to a more diverse range of tasks, the operation of mechatronic systems has become ever more complex. In this way, user interfaces – as the point where man meets machine – have become increasingly important. A further challenge at the current time is the huge diversity of users. It used to be pretty homogeneous, involving mainly experts with a high degree of technical knowledge. But as the number of systems has increased and we've entered a diverse range of markets, we must now take into account and support a whole range of different user groups – deep technical knowledge is no longer taken for granted.



With humans and robots working together, good usability and UX are important requirements.

Where do you stand regarding standards for user interfaces?

We use standards in the form of guidelines and style guides. It's a requirement of ours that there are similar workflows regardless which software product it is, so that the user feels a certain familiarity when using the software, and they feel instantly at home. Generally speaking, certain control elements and related functionalities have become established in graphical user interfaces. A classic example of this is radio buttons, which help select one option from many, as opposed to check boxes which allow multiple elements to be selected. The user has already learned which functionalities are on offer and brings this understanding into their operations. Such standards have been established and we have to accept this. That, too, is user experience.

How have the demands of customers changed?

Demands are more diverse today, as more people are now working with robots and there are many different user roles, each with their own specific tasks. This encompasses everything

from commissioning engineers to operators to maintenance staff. Of course, they all require their own optimal solutions for their own specific work tasks. Here for us it's all about finding the right middle ground, so an intensive exchange with the users is essential in order to find out exactly what they need.

What influence have smart devices had, or continue to have, on industrial user interfaces?

User expectations regarding industrial operating devices are definitely higher than ever before. What's different now is that most employees use the latest tablets or smartphones at home, and expect the same level of tech with the devices they use at work. Users also have higher demands in terms of graphic design, something which may be influenced by the app world. Good graphic design helps fulfil aesthetic expectations and helps make interfaces and workflows more comprehensible.

What role does good usability play, and what's important to you?

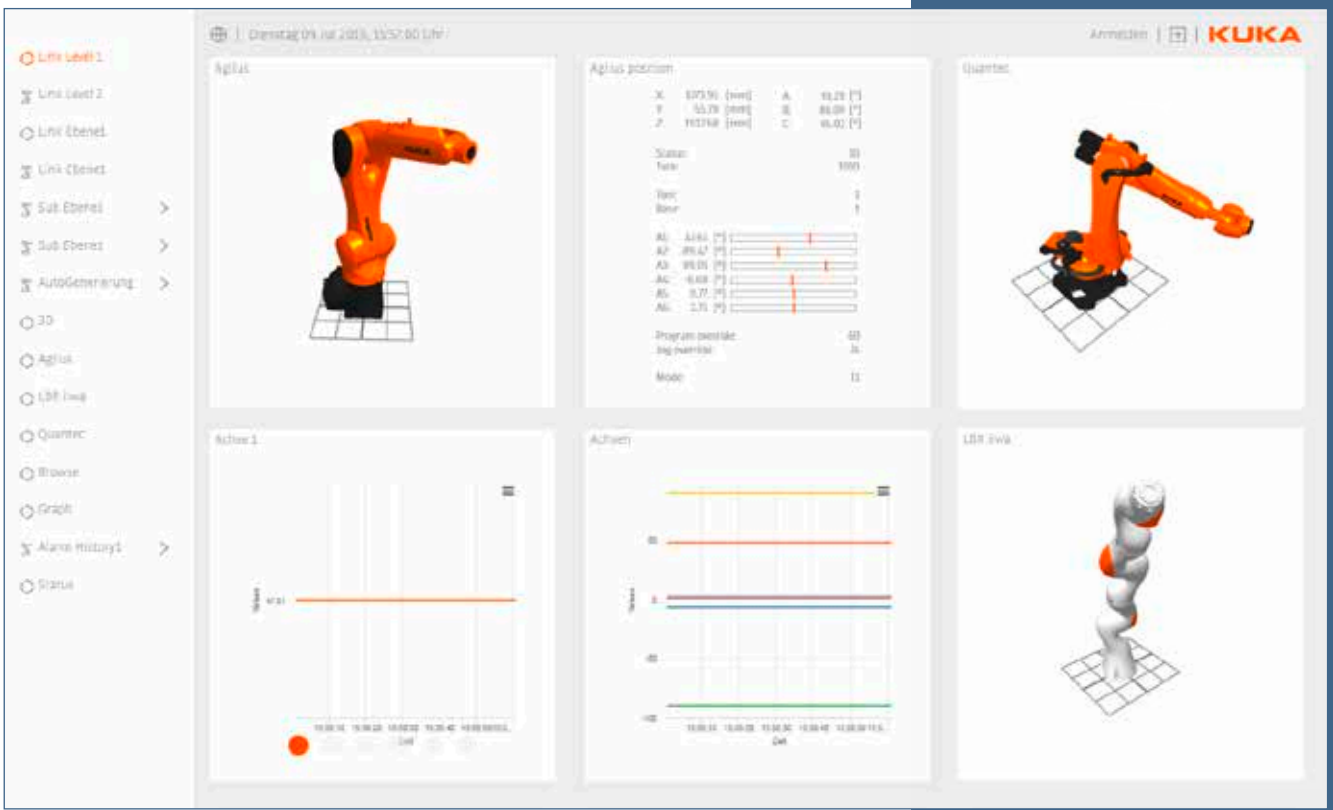
To put it simply, for us it's all about putting the human front and center. Our products should offer precisely the functionalities they need in order to carry out their tasks in an efficient, effective and satisfactory way.

How do you react to these changes, and how have you changed your own usability / UX?

These days it's no longer possible to just sell mechatronic systems and assume the customer's going to be happy with it. Customers now expect a full package that enables them to shape their processes to successfully turn their visions into reality. In order to rise to this demand, we've implemented user-centered thinking and methodologies in Research & Development processes and integrated the end user into this process – with interviews and user tests, for example.

BENEFITS OF atvise® scada INTEGRATION FOR KUKA

- Manufacturer-independent visualization for flexible use in a wide range of different projects
- Display in pure web technology, use of a wide range of different display devices
- Implementation of modern operating concepts incl. responsive design
- Standard data connection thanks to OPC UA Companion Specifications
- Open, flexible, adaptable system for seamless integration in existing solutions
- Easy to operate modular system for individual adaptions by service technicians
- Integration of 3D animations



Web visualization implemented at Kuka with atvise® scada.

Report

VISUALIZATION FOR MANUFACTURING CELLS

At Fakuma 2018, Arburg first unveiled their turnkey SCADA solution for monitoring and coordinating processes in complex injection molding manufacturing cells. The project was carried out with the support of Bachmann electronic.

Visitors to Arburg's stand at Fakuma in Friedrichshafen had the privilege of seeing first-hand the design and functions of the individually-configured turnkey solution. It was illustrated in the production of ready-to-use spirit levels. In the center of the system is an electric 470A injection-mold machine with 1,000 kN clamping force and a "1+1 cavity" mold. Within the space of 50 seconds, this ultra-modern machine produced two spirit level casing components. The Multilift V linear robotic system took out the molded parts, which were individually inscribed by laser, then moved onto an assembly station to be put together into ready-to-use spirit levels. Finally, each part underwent multiple automatized tests.

During injection molding each individual part gets its own ID. This ID is linked with test results along with part-specific process parameters such as time-stamp, series and injection time, melt cushion, and injection pressure switching. The collected data are stored in a relational database and transferred onto a higher-level system for further processing. At the fair in Friedrichshafen, by means of a printed QR code, visitors were able to call up information about their own spirit level on their smartphone.

New solutions for new requirements

In the automotive and medical technology industries and more, where security is of utmost importance, injection molding requirements are constantly on the rise. It follows that manufacturing cells must become ever smarter. In order to guarantee 100% traceability, relevant manufacturing data must be seamlessly gathered and analyzed. Moreover, increasingly complex production processes require optimally intuitive visualizations. A particular challenge here is the aggregation of statuses, errors and alarms across all subsections of a facility, and to present them clearly and allow appropriate user inputs. Arburg rose to these challenges and sought out suitable SCADA and HMI solutions. "We opted for Bachmann's web-based atvise® scada HMI software, as the product was an early trendsetter in web technologies and OPC UA. The broadest possible implementation of these two technologies was a crucial factor in our decision," explains Axel Kinting, control technology team leader at Arburg.

The Arburg Turnkey Control Module (ATCM) arose out of a joint development effort. It visualizes important system functions throughout the entire process, amalgamates part-specific data from the manufacturing process and quality testing, and forwards data sets onto an evaluating system. This enables 100% traceability for each individual part or mounted modules.

Arburg designs each turnkey system precisely according to a customer's individual requirements. This goes for the ATCM too, which offers an overview and coordination of processes in manufacturing cells. This means that visualizations can also be used for non-cyclical production processes.

Arburg designs each turnkey system precisely according to a customer's individual requirements.

A system equipped with atvise® scada visualizations in action.

For instance, the user interface can control the channeling of parts to quality control.

Customer-specific system development

"In what is a very productive workshop, the fundamentals of our Arburg-specific requirements were laid out at the project kick-off. Then during the development stage, a rapidly-responsive and competent support team was on hand. The provision of an easily adaptable object library enabled the project to be implemented very efficiently," reports Martin Huber, control technology developer at Arburg.

Along with Bachmann's web-based atvise® scada HMI software, which is based on the arm architecture and supports the panel PC, Arburg also opted for visualization HW from Bachmann electronic. This means that a complete visualizations package was put together. The schedule was tight but was thoroughly kept to thanks to a wide range of standard objects, an easy-to-learn engineering tool, and the fact that multiple developers can work simultaneously on a project, in line with the multi-user principle.

Typical SCADA functionalities – such as alarming, historisations, trending and multi-language support – make for fast realization of commands, and can be fully adapted to requirements according to use. The required data points are imported and visualized via the Allrounder Injection Molding Machine's integrated OPC UA interface.

The support arm 21.5-inch multi-touch panel PC, from the OT1300 product line, works simultaneously as atvise® scada server and, via the integrated web browser, as visualizations client. The hardware, aligned with atvise® scada, provides all the on-board means required for web visualizations, with simple configuration and seamless operation. Meanwhile, a good viewing angle and bright colors ensure maximal readability of current operating status, even when away from the actual control station. "We managed to get the whole visualizations package, consisting of the control unit and the SCADA solution, from a single source," says Axel Kinting, control technology team leader at Arburg.

atvise® scada is exclusively built on standard web technologies, meaning that external clients such as laptops, tablets, or smartphones can all access the visualizations through their own browser.

With integrated user admin and encrypted connections, the system is fully secured against unauthorized access. The panel PC comes pre-installed with the Windows 10 IoT Enterprise LTSB 2016 edition as operating system.

The latest Intel Core i7 CPU, coupled with the installed server service, ensures outstanding performance with smooth display and operation. All this makes the product bundle the most ideal solution for the on-site operation of complex machines.

Understand the
USER, their tasks
and their context

Always stay on the
right track through
project **ITERATIONS**

Infographic

6 STEPS TO A SUCCESSFUL UX PROJECT

Usability und User Experience are becoming competitive factors in the industry. Here, Bachmann electronic lists the fundamental factors for ensuring a successful project flow.

Find understandable
METAPHORS
for ease of use

Create
PROTOTYPES
as early
as possible

Involve
STAKEHOLDERS in
feedback sessions

Carry out
USABILITY TESTS
with target groups

Guest contribution

IT'S NOT ABOUT MAKING THE USER INTO A DESIGNER

User Experience (UX) involves more than just user-friendliness. It's also about usability and ease of use when working with machines. A sophisticated UX plays a key role in the acceptance of an industrial system. It also leads to higher user satisfaction, along with more efficiency and safety in its use. These days, consistent screen design and an intuitive navigation specifically adapted to user demands are key factors in the success of a machine.

Machine builders now need to internalize the four principles of UX management:

First-hand experience of the working environment helps in the creation of a good UX.

Involve the user as early as possible

What do we mean by "involve" here? Well, we go into the actual application context, in the situation where the product will ultimately be used. We want first and foremost to get a grip on the physical and social setting – who works where, with whom, and what are the conditions of the particular surroundings. But it's also especially important to understand how the users are trained, what their goals are, what hinders their productivity and is there anything they're missing? Often users adapt to highly impractical operating steps over time. They don't even realize anymore that this slows them down. To this end, not only do we carry out interviews, we also observe working processes.

Customer wishes are not necessarily demands

What we don't do is turn the users themselves into designers. We don't ask "How should the new interface look?", because it's our job to make it. When, for example, a user says to us they'd love to see a setting for screen brightness, we don't immediately try integrating that into the operational concept. Instead, we ask ourselves: "Where does this desire come from?" Does it involve, for instance, a tablet which is used in both indoor and outdoor contexts and therefore might need to automatically adjust to different light conditions? Properly configured work process-

Touchscreen would be a no-go here.

es are what engender creativity, not colorful screen design.

The right interface for the right environment

In recent years we've noticed a big upsurge in touchscreens as interfaces. This trend is gradually slowing back down. For many tasks, industry users wear gloves and at the same time a lot of their operations are of fairly low complexity. This means that quite often hardware buttons will definitely suffice. This is where we see the intersection of UX design, ergonomics and industrial design. Good products are only possible when a designer takes all three of these perspectives into account at the same time.

Everything. Now. Right?

No. UX design is good when it involves the user in the development process from the very beginning. An interface prototype such as clickable wireframes is fast and cost-effective to produce. It also helps validate some fundamental workflow design decisions earlier on in the development process. Such prototypes depict very few functions but can lead to some quite crucial decisions being made. A test with three to five users which ends with an adjustment of workflow processes is no failure – it's a quality feature of the design process.

We believe that in the future every machine manufacturer with around 100 employees will have at least one in-house UX expert in their team. Such UX experts typically collect the series of requirements arising from observation of use. UX design is becoming more complex and comes mostly from specialist partners. This is because an increasingly smaller number of GUIs (graphical user interfaces) are offering increasingly more information according to the appropriate operating situation.

Alexander Steffen
UX Strategy at Schindler Creations

»A test which ends with an adjustment of workflow processes is not a failure – it's a quality feature of the design process.«

Report

ANDROID OR ROBOTICS?

Safety is a core requirement; whereas programming and operator interface are optional. Usability and UX are becoming ever more important in the world of robotics. New firms are sprouting up and want to be part of the Cobot hype, positioning themselves between Cobot builders and workers. The inventors of Collaborative Robotics have long recognized this trend.

Eye-to-eye: The father of Cobots, Esben H. Østergaard from Denmark, Founder and CTO of Universal Robots.

Programming robots has to be made simpler.

Hardly any stand at an industry fair these days is complete without one: Collaborative Robots (Cobots) are a guaranteed crowd-puller, whether they're filling beer glasses, dancing, or smiling pleasantly at visitors. For some months already, there's been talk among industry observers of market hype, and some small players have already had to throw in the towel. Staff at these firms were thankfully taken on by competitors. Many young enterprises are pioneers of a new generation of robots with new operating and programming interfaces, which are oriented more towards the Apple world than industry norms. "Many innovations that are also adopted today in industry robotics have their origins in smaller providers, spin-off companies, or start-ups, who are looking for a niche for their applications. The biggest providers are active for the time being in classic markets, adapting new technologies like HMI under which they hide their complexity," explains Prof. Dr. Martin Ruskowski from DFKI in an interview with the trade publication, Factory.

Currently over 40 manufacturers, including some non-industry, are using Cobots to compete for customers in everything from industry to craftwork. "Our experts foresee growth of up to 60% and we are counting on growth of 2 billion euros in Europe over the coming years," says Esben H. Østergaard, the Danish founder and CTO of Universal Robots, regarded by most as the father of Cobots. He took over after the collapse of Rethink Robotics, famous for keen-eyed Cobots as "engineering coworkers".

Process safety and money

"For sure, all Cobots must fulfill safety requirements if they want to stand any chance of market success. But it's in terms of programming and flexibility where the differences soon begin to appear. The user has to be able to change the programming in order to use the Cobot in a meaningful way," explains Østergaard. "We're continually reducing the complexity so that even small companies are able to quickly deploy Cobots," adds Jürgen von Hollen, President of Universal Robots, at the Hannover Messe Preview a few weeks ago. Usability and UX paired with simple

programming is becoming a competitive advantage in the robotics world.

Will user interfaces become a selling point? "For sure, and in some industries that's already the case. If workers work even more closely with robots in the future, then robot makers will have an advantage if they offer a user interface that every user – with or without training – can quickly get to grips with. Usability and user experience are becoming even more important. It's about process safety, and saving both time and money," states Ruskowski.

This was definitely something the founders of Drag & Bot recognized. Currently firms often look to expensive external services for the programming of industrial robots, says its founder, from the Fraunhofer Research Institute. This is why up to now industrial robots have mostly only been cost-effectively deployed for monotonous tasks with very high batch sizes – such as in the automobile industry, for example. Small- and medium-sized enterprises have to be able to deploy industrial robots more flexibly to make their acquisition worthwhile. With Drag & Bot's simple robot programming, automated solutions can be adapted to the producing company's individual needs without specialist knowledge and in a markedly shorter time, states the developer. In this way it will be possible, for example, for robots units to accomplish two quite different tasks within the same working day, the researchers say.

ROS as middleware

The idea: for industry robots to be instructed with the software even without IT know-how. At present, functional processes are added to the cloud solution by drag and drop. Parameterization of individual function blocks is supported by various so-called "wizards" which help with operation and input. For example, when operating a robot arm, the user guides it into the desired position by hand, Teach Pendant or via the system navigation. The movement pattern is identified and then the wizard automatically takes over.

One of the biggest advantages for those responsible is that customers and partners alike can dynamically enhance the software, adapting it to their own requirements. The programmed functional processes can be shared at will with other colleagues or production sites via the cloud. The software works independent of respective robot hardware and currently supports ABB, Kuka, Fanuc, Denso and Universal Robots, among others. Further compatibilities are currently being worked on.

Equally important for the success of Drag & Bot has been the usability and user experience of the software. "We're the Android of robotics," joked Witalij Siebert at the Maschinenbau-Gipfel Summit in Berlin. He and his colleagues aim to position themselves between worker and robot builder, as a platform with function blocks for Cobots, grippers, and programming with Phyton and Robot Operating System (ROS) as middleware.

The founders of Drag & Bot, from left:
Pablo Quilez, Martin Naumann, Daniel Seebauer and Witalij Siebert.

According to Prof. Dr. Martin Ruskowski from DFKI,
good usability is a competitive advantage.

Interview

STRIVING FOR BETTER PROCESS SAFETY

Tom Cadera is an industrial designer and, alongside eye-catching machine panels, he's specialized in developing operator interfaces for industry with his team of designers, usability experts and programmers. His Human Machine Interfaces are used by car manufacturers, packaging specialists or pharmaceutical firms. In this interview he spells out the difference between design and usability, and explains why good operator interfaces also assure better process safety.

What are the differences between design, usability and UX?

Design is characterized by visual and aesthetic aspects, whereas usability is more about how something is used in practice. In differentiating the two it can be helpful to state that good usability can be achieved with or without good design. But of course the User Experience would suffer, where the emotional involvement with a product or software is key. Design, on the contrary, is a very wide-ranging term that also describes the process of product development. So the two concepts are closely related and in good products they are mutually dependent. To summarize, we could say that good visual design and good usability make a good UX possible.

The iPhone significantly changed operations – how has the industry reacted to this?

Since 2007, the spread of smartphones and tablets has had a strong influence on the requirements of users. The interactive principles and good design of most apps have brought about the expectation that all products are just as easy to use or can be operated on the same principles as everyday mobile devices. This is something which is now definitely affecting industry too. Here as elsewhere there's been an increase in the number of digital natives who are now operating industrial machinery.

The industry is really trying to provide adequate solutions. However, this is technically and commercially more difficult than in the telecommunications industry, for example. This is because in industry we have both much lower quantities and higher technical requirements.

At the same time, machines are expected to run for a very long time. As a consequence, the technology to be used in industrial contexts is often much more expensive than that deployed for the high quantities of mass market smartphones. In industry we are very reliant on industrial-standard electronic components. This always lags somewhat behind current technical standards in the consumer sector, generally being larger and slower.

However, right now there's a big opportunity opening up for industry:

In demand: Operator interfacesby Cadera Design are often singled out by specialist jurys.

web technology makes it possible to profit relatively quickly from achievements in the consumer sector. The HTML5-based modern principles being worked on there enable responsive and high-performing user interfaces in industry too.

How do web technologies like HTML5 work in industry?

Recently this has come up a lot in the frontend sector. Modern development frameworks already count on a clear separation between content and functions (such as controlling) on the one hand and form on the other (such as user interfaces). And one of the most modern approaches is the deployment of HTML5-based user interfaces (in combination with CSS, Javascript and SVG). Here an integrated web server is obviously included, and the interaction with the interface must ultimately be securely and quickly passed on to the controller (SPS). Through ever increasing web-based applications in other business sectors, exciting synergies are arising – as well as greater chances of consistency. In this respect there are some very interesting solutions around right now.

atvise® from Bachmann, for example...

Yes for sure, this tool is right at the forefront.

Why do industrial companies need usability experts?

We've seen more and more that products which are hard to operate are simply not accepted anymore. And rightly so. As designers and usability experts, having been intricately involved with this for over 25 years, we are naturally delighted that usability is now seen as a natural part of a product's quality pro file. In the operation of machines, a further aspect comes into play: machine safety. Operating errors can prove very harmful to a user's health – or even their life. And for the machine owners it's also about profitability, of course.

Every machine is an investment which should hopefully pay off in the fastest-possible time. For this, machine availability, fast startup times, and continuous error-free production are crucial. All this can be increased with good usability.

Which industries are ahead of the game and why?

We're working a lot, for instance, with pharmaceutical companies. In this industry, as there's a high potential for adversely affecting human health and lives, the very highest quality standards apply. This then quite often plays a role in usability specifications. We also frequently work with producers of packaging machines. Here too we've observed an ever-stronger orientation towards quality, something that works very well for us.

You often speak of process safety through usability – what do you mean by that?

When an operator feels safe and secure, they make less mistakes. Failure rates naturally have an influence on production results. Here it becomes clear just how far emotional aspects affect operating safety and therefore commercial factors as well. Ideally, a high-quality, cost-efficient, and reproducible control system overseeing all production stages should be within reach of all operators at all times. Only when production processes are clearly defined can a manufacturing company be sure they can consistently deliver to customers on time, with optimal material use, and with the standards they require. High-performance HMIs must therefore ensure that these processes are defined, saved, and promptly made available to every user in as simple and intuitive a way as possible. The circumstances may be complex, but the operation must be clear and straightforward. Otherwise they won't take root. And here usability plays a decisive role.

Why don't industry players employ their own usability experts instead of outsourcing, if it's as important as you say it is?

Well, large machine manufacturers do exactly that. At small- and medium-sized companies there are not necessarily always enough things to do to keep usability experts busy. For them it mostly makes most sense to cover these needs with external specialists. Moreover, these firms obviously benefit from the experience that external specialists like us have brought to a diverse range of projects.

What usability and UX trends do you foresee over the coming years?

We're excited to see what influence Artificial Intelligence will have on machine sites. We see very big potential in the modulization of HMIs. AR and VR are definitely buzzwords right now but we're still waiting to see a truly successful breakthrough. I think this also has to do with the implementation of the related hardware, something which obviously interests me hugely as an industrial designer. For example, people don't generally like wearing heavy and unwieldy glasses. And merely putting good user interfaces on touchscreens definitely falls short. People want to physically interact more with their products, want to feel the controls and get clear haptic feedback. I think people just feel a need to literally grasp and capture more things.

I think in the long-term interaction will become three-dimensional again. Confirmation gestures, at least, seem too unreliable to us, too much about grabbing something "out of the air". They just don't work well and anyhow have not been receiving much acceptance. Seen this way, we humans need something to grab hold of; we just feel better that way. And that is the best basis for a good user experience.

»People want to physically interact more with their products.«

Tom Cadera
Industrial Designer, CaderaDesign GmbH

wind.automation

EARNING YOUR TRUST IS OUR GOAL

For years, we have focused on the future needs of our customers. This is because Bachmann electronic understands that true partnership shares a common purpose: to help each other achieve their goals.

The power of your trust drives us forward to continuously create and develop innovative and reliable automation solutions – specifically for your business.

THANKS TO YOU, WE HAVE:

- automated over 100,000 wind turbines worldwide
- acquired over 50 years automation experience
- earned 250 trusting partners

...and are the number one industry leader in wind automation solutions.

Report

SOVEREIGNTY OVER CYBERSPACE

The new Chinese Cybersecurity Law has caused no small amount of commotion in European industry. With China an important market for Bachmann electronic, here the lawyers Dr. Florian Kessler and Jost Blöchl summarize here the most important challenges for firms.

China's Cybersecurity Law (CCL) has been in force as of June 1, 2017. It affects various regulations around data protection, IT security and online behavior. Europe's General Data Protection Regulation (GDPR) is comparable, as it covers aspects of IT security laws, freedom of expression, and the Network Enforcement Act. However, the Chinese version is different in a number of important ways, and fundamentally different in its scope. While European law-makers argue their case based on the personal rights of citizens, in China it's all about preserving "Sovereignty over Cyberspace" and national security.

The CCL is just one part of the larger strategy of building a digital China. Various authorities and institutions are involved in this roll-out, some of which are equipped with legislative powers. These are laws, decrees or national standards which serve to substantiate the obligations broadly outlined in the CCL. The titles of around 300 national standards involving IT security and data protection are a clear indication of the direction China wants to head in: Cloud Computing, Big Data, Internet of Things, Industrial Control Systems, or Smart Cities are just some examples of the extensive regulation of the digital realm which is foreseen. Many of the provisions are as yet still in drafting stage.

Upholding socialist values

The CCL covers both natural and legal persons who collect, process or disseminate information within Chinese territories. All foreign companies with Chinese branches are affected, but also foreign firms who wish to target Chinese customers via their websites. Infringements can result in the threat of company sites being blocked in China.

There are no thresholds (e.g. number of employees, or amount of data processing) for the applicability of these laws. But the obligations themselves vary depending on the legal classification of the person affected by the CCL and on the extent of data processing involved.

The first use cases affected by the new laws involve the control of firm behavior and citizen behavior on the internet. As such, they reflect the primacy of China's will to uphold cyberspace sovereignty. Authorities checked websites and social media channels for the safeguarding of "socialist values" and requested the deletion of content deemed as scandal-related gossip or anything judged to be politically sensitive.

The case of a hotel chain recently gained international attention when their website was locked down for a week. The reason? On their drop-down menu, they had Tibet and Taiwan listed as independent categories.

Further measures were taken in the name of data protection, such as the suppression of illegal data trading. As of November 1, 2018, the police authorities have been the leading supervisory body overseeing the implementation of the CCL in data protection matters. This is due to the legislative focus of the CCL on the preservation of national security, and the close link between data protection and criminal law. Cases of identity theft and online fraud are growing problems in China, something the authorities want to get a handle on. In 2019 an extensive control of data protection measures concerning app providers was announced.

In terms of data protection, there are both parallels and distinctions compared with the GDPR. The CCL gathers personal data which, similar to the GDPR, are determined according to the identifiability of a natural person. In addition – ostensibly in the name of national security, public interest, and the economic development of China – the CCL also sanctions the gathering of "important" data. Exactly what kinds of data this refers to is not yet clear. The latest draft defines a total of 27 kinds of data as "important".

The obligations around dealing with personal and important data are currently to a large extent homogeneous, with a few additional obligations pertaining to the processing of personal data. For this, European firms can in many cases take the GDPR as a point of reference, adapting only minimally to the Chinese particularities. The parallel features found in both the GDPR and the Chinese version includes obligations such as logging of data processing procedures, risk estimation, a basic consent requirement, protection of disclosure rights, amendment and deletion requirements, or the provision of a data protection policy.

A big concern for foreign firms is the local storage requirement in China. This obligation – which according to the CCL applies only to operators of critical infrastructure – has in one draft of the regulation been extended to all network operators. If this remains the case, all foreign firms will have to significantly adjust their IT infrastructures – including, for example, their choice of cloud servers or centrally overseas-operated ERP systems or SAP applications. Before data transfers to third countries, the draft regulation states that firms will be expected to carry out internal security reviews. For large amounts of data, an authorization will have to be sought in advance.

Loss of contracts

Contraventions of the CCL can result in anything from financial penalties to withdrawal of business licenses. The law's implementation shows that dealing with the CCL is proving difficult for foreign firms. Reasons for this include the flood of new regulations, lack of knowledgeable personnel, or deviations between written law and its practical application. In practice, Chinese internet companies like Alibaba and Jingdong have been sidestepping around the strict requirements, in ways such as ensuring far-reaching consent when registering on their platforms. This practice – seemingly tolerated up until now – is now under new scrutiny, with tighter new regulations announced.

For tech firms, the CCL may lead to significant limitations for market entry. Particularly affected are providers of apps for Industry 4.0. The implementation of the regulations clearly states that network products, for example, also count as sensor systems or industrial control systems with which data is gathered and processed. Meanwhile, the concept of "important" data may cover a lot of the information from the field of industrial manufacturing.

The potential obstacles to market entry are mostly to do with the idiosyncratic national standards. Compliance with standards is normally something which is recommended, not necessarily mandatory. The CCL, however, requires compliance with all "compulsory requirements of relevant national standards". Often, recommended standards are de facto mandatory, as compliance with regulatory authorities, inspection bodies, or contractual partners is required. Operators of crucial infrastructure are obliged by the CCL to purchase only network products and services which are verified as complying with relevant security checks.

If security checks are not carried out or are delayed – due to the lack of an implementation strategy, for example – this may be met with threats of future contract loss. In 2018, a think tank from the US warned that China was using the strict new cybersecurity regulations as another chess piece in the ongoing trade war, and that this may consequently lead to market foreclosure.

The fulfillment of all legally required minimum standards regarding data protection and IT security will become regular hoops for all firms in China to jump through. But with the exception of the possible obligation for data storage in China, due to the parallels with the legal conditions in Europe, the requirements will be relatively manageable for most firms.

For technology-based firms, the long-term outlook looks more challenging. These firms should keep a close eye on the further development of the standards. Where at all possible, they should also become involved in their formulation, such as through cooperation with international working groups or commentary on legislative drafting in China. Points of contact for this could be, for example, the GIZ or the European Chamber of Commerce in China. It is also recommended – particularly for providers of vital infrastructure – to maintain frequent communication with authorities, inspection bodies and customers, regarding the extent to which the recommended regulations are mandatory. For German firms, gathering expertise and successful strategies for dealing with the implementation of the CCL will be crucial in maintaining and building a competitive advantage in the Chinese market.

Note: This article first appeared in the March 2018 issue of the DIVSI magazine, published by the German Institute for Trust and Security on the Internet, and has been adapted for publishing here.

Dr. Florian Kessler
Lawyer, Kanzlei WZR

Jost Blöchl
Lawyer, Kanzlei WZR

Dr. Florian Kessler and Jost Blöchl are lawyers based out of Kanzlei WZR's Beijing office. For the very latest info about cybersecurity laws, as well as the most important action points for foreign firms, and further questions about investing in China, check out www.wzr-china.com

Outlook

SAFE SPEED MEASUREMENT FOR THE SUBCONTINENT

AMSC Windtec Solutions has been integrating the SCT202 safety module in controllers since 2016. These are used in the wind turbines of their customers. Due to a large number of installations on the Indian subcontinent, the engineers appreciate the remote diagnostic features of the modules in addition to the flexibility of their technical functions.

Next to North America and China, India is one of the most rapidly growing markets for wind power in the world. After the political confusion regarding wind power, particularly with regard to the market model, many energy companies are now reinvesting in the country.

Inox Wind is one of the most important builders of wind power plants and energy suppliers in the region. In Gujarat, Himachal Pradesh and Madhya Pradesh, technicians are building 2 MW DFIG (double-fed induction generator) wind turbine plants under license for the local market. According to Inox Wind, the plant in Madhya Pradesh is one of the largest production sites for wind turbines in Asia, and enables Inox Wind to produce plants with a total annual output of up to 1,600 MW. AMSC Austria from Klagenfurt is the licenser for the 2 MW plants. The electrical monitoring and control systems are provided by Bachmann electronic.

The plant controls manufactured by AMSC are equipped with the Bachmann M1 automation system as the main controller and safety controller.

"We have been integrating the SCT202 safety module in our systems since the middle of 2016. We don't need any external solutions for safety-related speed and position monitoring since the module for safety speed measurement is integrated directly in the controller," explains Gottfried Slanitsch, head of control technology and automation at MSC Austria. According to users, the shared use of the recorded measured values for safety-related and non-safety-related automation tasks reduces the system costs. Added to this is the fact that the solution even runs fault-free in subtropical conditions according to the Austrian engineers. "Extreme climatic conditions do not present any problems for our systems," Christoph Scherrer from Bachmann electronic emphasizes.

The automation module also features two inputs for incremental encoders, together with an encoder supply for both speed sensors, two counter inputs, as well as two safety I/Os and DOs. The provision of measured values for non-safety-related applications is not bound to the safety cycle. Instead, the concept allows the integrated use of the module in the operational control of a wind turbine. The safety-related digital outputs provided in the module enable a safety-related response in less than 1 ms. "Added to this is the fact that we can carry out the full diagnostics of the modules remotely. This enables us to reduce the downtimes of the plants," adds Michael Messner, CEO of AMSC Austria. This is particularly appreciated by the service technicians at AMSC Austria, who can access the plant from their headquarters in Klagenfurt.

SCT202 SAFETY MODULE

The SCT202 is a safety module for measuring safetyrelated rotations. For this it provides inputs and outputs which enable the implementation of safety applications up to SIL2 and PL d.

THE MODULE OFFERS THE FOLLOWING INPUTS/OUTPUTS:

— Two safety input blocks that can be used as an incremental interface (each connectable with symmetrical A/B/N tracks). The measuring result is available to the user both as a frequency as well as in the form of a counter status

— Two safety input blocks that can either be used as a counter input (connection of initiators) or latch or reference inputs

— Two safety digital inputs that can also be used as latch or reference inputs

— Two safety digital outputs as safety high-speed shutdown contacts that can be used for overspeed states (reaction time: ≤1ms) as well as in their function as safety-related digital outputs

OTHER SPECIAL FEATURES:

— Frequency measurement directly in the module

— All signals can be accessed instantly by the nonsafety-related part of the controller and enable the implementation of highly dynamic control systems without the need for an additional counter module

— Integrated referencing functions (initiator, zero pulse and combination, as well as via software)

— Standstill monitoring

— Available as ColdClimate module

Interview

APPLES AND PEARS

How does data reach the cloud? This is the question raised by many industrial users. While the trade media is full of comparisons between OPC UA and MQTT, all comparisons are misleading. Helmut Ritter from Bachmann electronic explains why.

What is MQTT?

MQTT stands for Message Queuing Telemetry Transport and was developed for small sensors with a low CPU performance. All network stations are connected to a central server which receives all the incoming data telegrams from the sensors. The telegrams are identified by "topics", for which readable names are normally used. Consumers of the information log into the central broker and can subscribe to part of the information by stating the particular topic. If the broker receives a new data telegram from a source, it sends this automatically to all consumers that have logged in.

What is the benefit of MQTT?

MQTT is considerably easier to use: Any information block with data from the controller software (message) is sent with a readable identification (topic) to the broker. From here the data processing units can receive these information blocks by subscription and process them further. With MQTT it is also possible to encrypt the message. So there's no security deficit compared to OPC UA? No. But OPC UA was declared the general communication standard in 2014 in an evaluation of the US oil and gas industry. The main reason for this decision was OPC UA's fully developed security concept, which most of the other standard fieldbuses and communication processes did not have or was specified later as an add-on.

Why do so many suppliers swear by OPC UA?

Industrial automation requires captured or calculated process data to be transferred to an external cloud memory at impromptu times (such as when a workpiece leaves the machine). The additional possibilities of OPC UA, such as browsing, the reading out of meta information or the flexible organization of variables in monitoring lists are simply not needed here, and in fact increase the complexity in the application.

And doesn't machine learning require the structured data of OPC UA?

Naturally the meaning of the data must always be known in order to be able to evaluate it. If the data model can remain unchanged, from the machine to the intermediate storage in the cloud, right through to machine evaluation, it can be recognized at any point. This is clearly an advantage.

Helmut Ritter
Product manager, Bachmann electronic

But isn't there a lot of hype about OPC UA?

The trade press has even predicted that miniature devices such as sensors would be provided with an OPC UA interface in future. In reality, it has been shown that sensors continue to supply a clearly manageable data area and only require the transfer of a small amount of data, which must be carried out in real time. For this reason there are no sensors to date in the actual market that feature OPC UA. Comparing OPC UA and MQTT is not useful since they perform different tasks. It's like comparing apples with pears. The particular application is what matters. We can offer both.

How do your customers respond to this?

We offer both an OPC UA server and client, as well as solutions for MQTT. Both technologies are used by customers. The OPC UA server is used as expected when the controller is required to store as much data as possible, and a freely designable machine visualization is required to monitor a subset of this data. MQTT, on the other hand, shows its strengths if it is possible to define on the controller in advance which data is to be collected, aggregated and archived.

Are combinations possible?

A combination is not an absolute necessity and only makes sense in special cases. Most HMI and SCADA applications are based on a direct OPC UA client server relationship. The TCP/ IP network protocol already allows here access beyond network boundaries, the additional use of MQTT has no benefits. The recently released Publish/ Subscribe extension in OPC UA Part 14 describes a 1-to-n process. The publisher sends UDP multicast packets, which can be received by several stations in the network. Only a standard Ethernet switch is required as the necessary technical infrastructure for the transfer in order to pass on the multicasts.

If the data of the manufacturing cell reaches a volume in which an "each station informs each station" process is no longer practical, it is also possible to use an MQTT broker. Unlike the normal switch, this provides the additional possibility to control the distribution of the data via the topic filter and thus reduces the amount of unnecessary data transfer for the network and subscribers.

Report

LONG LIVE HIGH SPEED PLCS

The requirements placed on PLCs are increasing. Multicore models are the answer of the automation experts. However, only focusing on hardware performance is not enough. The system software also has to support multicore technology under real-time conditions. Something that not everyone can do.

The requirements placed on processor systems in automation technology are constantly growing. Although open and closed-loop control functions are growing moderately at only a single digit annual percentage rate, new tasks are the source of a dramatic hunger for more power. Automatic diagnostic functions, the seamless logging of process values and user interventions, as well as new algorithms make up the obvious share. The integration in IIoT, the hardened security required for this, edge functionality upstream of the cloud and all kinds of communication requirements are needed in addition to the new overall architectures. This article explains why the PLC is nevertheless the best target system for all the tasks, and how the new Bachmann CPUs are equipped for this.

Up to 8 times faster

The new flagship MH230 processor module has been available since January. Thanks to the hyper threading technology this industrial low-power processor can process 4 tasks in parallel at a processing speed of 2300 MHz. A high-speed DDR4 working memory in the 2 GB range is provided for the applications. Depending on the application, this increases the basic processing capacity in single-core operation by 80 to 150% compared to its MH212 predecessor. Depending on the constellation, application programs that can fully exploit the parallel processing benefit on average by a 3 to 4 fold increase in CPU processing performance. Improvements of up to a factor of 8 are even possible in special applications.

The NVRAM retain data memory, which has been doubled in size to 1 MB, enables write operations with each cycle and still retains its most recent values even after a power fail. Besides system critical parameters that can be changed online, this particularly benefits the modern process diagnostics in the way it is used for predictive maintenance and longterm optimization. The considerably enlarged mass memory on the MH230 module is a new feature, which also offers 2 GB of file memory in ad-

dition to the CFast removable memory medium. The power supply from the internal power supply unit for the I/O modules was also increased by 20%.

The MC processor family offers the three new MC220, MC212 and MC206 models right at the start. Thanks to the state-of-the-art multicore technology, it was also possible to achieve a significant performance increase here. Besides the 2 GB DDR4 memory, four physical processor cores in the MC220 each operate at a processing speed of 1600 MHz. The two cores on the MC212 also have speeds of no less than 1300 MHz and on the MC206 600 MHz. Depending on the task, the single-core speeds are on par with their MC205 and MC210 predecessors or outperform them by up to 50%. Application programs which benefit well from the possibility of parallel processing can expect on the multicore models between 2 to 6 times the processing speed depending on the task and the model.

The MC220, with its outstanding performance and functionality, even comes with three independent gigabit Ethernet interfaces and – as with the MH230 flagship model – a 1 MB NRVRAM. Besides the CFast removable medium, 4 GB mass memories are provided here directly onboard. Whether this is used as the sole program and data memory in particularly cost-sensitive applications, as an addition to the standard memory or as a redundant storage for particularly critical files depends on the application. MC206 and MC212 offer 2x Ethernet interfaces, a 512 kB NVRAM memory and a 2 GB onboard mass memory.

All four new CPUs can also withstand operating temperatures from -30 to +60 °C without any ventilation and are also available as a condensation-proof ColdClimate variant. A trusted platform module chip (TPM 2.0) already provides the basis for cryptographic security directly in the hardware.

Does the software use all cores?

To really exploit the benefits of the multicore technology in controller systems the system software must fully support them – also under real-time conditions. In the past, systems were often offered on the market which featured multicore technology hardware, but which however contained system software that either only used one core or only really achieved real-time operation on one core. The remaining cores were thus useless or only suitable for applications that did not require cycle accuracy.

The Bachmann M1 system software with the new CPU series supports genuine real-time symmetrical multiprocessing. This means firstly that all cores can be used for real-time tasks, and secondly that the particular distribution of processes to the cores is performed automatically by the system. The benefit for the user is that this eliminates the need for laborious analysis and real-time configuration as well as providing in practice a much greater utilization of the available hardware resources. For extreme requirements it is also possible to remove individual cores from the SMP and to selectively link applications to processors.

The development and monitoring of multiprocessing applications are supported by the new Bachmann SolutionCenter from version 2.30. It is particularly easy to use since applications that have not yet been prepared for it can run in a compatibility mode on Core0. It is also possible to also run multicore CPUs in single-core mode for diagnostic tasks or for repair replacements.

This boost in performance that has now been launched is in fact two steps forward. Coupled with the new and generous features that include TMP and onboard mass memory, the central processing units of the M1 are already prepared for the full spectrum of future tasks: Whether in the autonomous energy systems, virtual power stations, high end production machines or as the head of an IIoT-CPS. Electrical interfaces, fieldbuses, safety and real time are covered in the same tried and tested and versatile way as edge functions for the cloud. Thanks to the processing power provided, additionally installed "data collectors" or edge PCs become unnecessary.

»The processing power means that additionally installed edge PCs become unnecessary.«

Matthias Schagginger
Head of product management, Bachmann electronic

Report

SWITCHING TO THE PLC DEVELOPER

With ever shorter development cycles and increasing requirements placed on quality and complexity, the working methods used in machine and plant building need to change. Greater efficiency and collaboration are an absolute necessity. It is for this reason that Senvion has been using PLC Developer since 2017. Alexander Broocks, development engineering at Senvion, explains how this changeover was successfully completed.

PLC applications (tasks) were previously implemented using M-PLC. M-PLC is a development environment provided by Bachmann electronic. Version management was carried out via VSS (Visual Source Safe) from Microsoft using the CoDeSys ENI server as the client interface. "This firstly had the disadvantage that the licensing restricted the maximum possible number of users, and secondly, that a modification to the source code was only possible if there was a connection to the server," explains Alexander Broocks. Due to the lock-modify-write concept, the users also reported that a "genuine" multi-user capability was not really provided. Another problem was the fact that the calling of the source code objects was slow and prone to errors. "Due to the fact that VSS is not atomic, any check-in and call performed simultaneously leads to incomplete calling," adds Broocks.

Shared objects

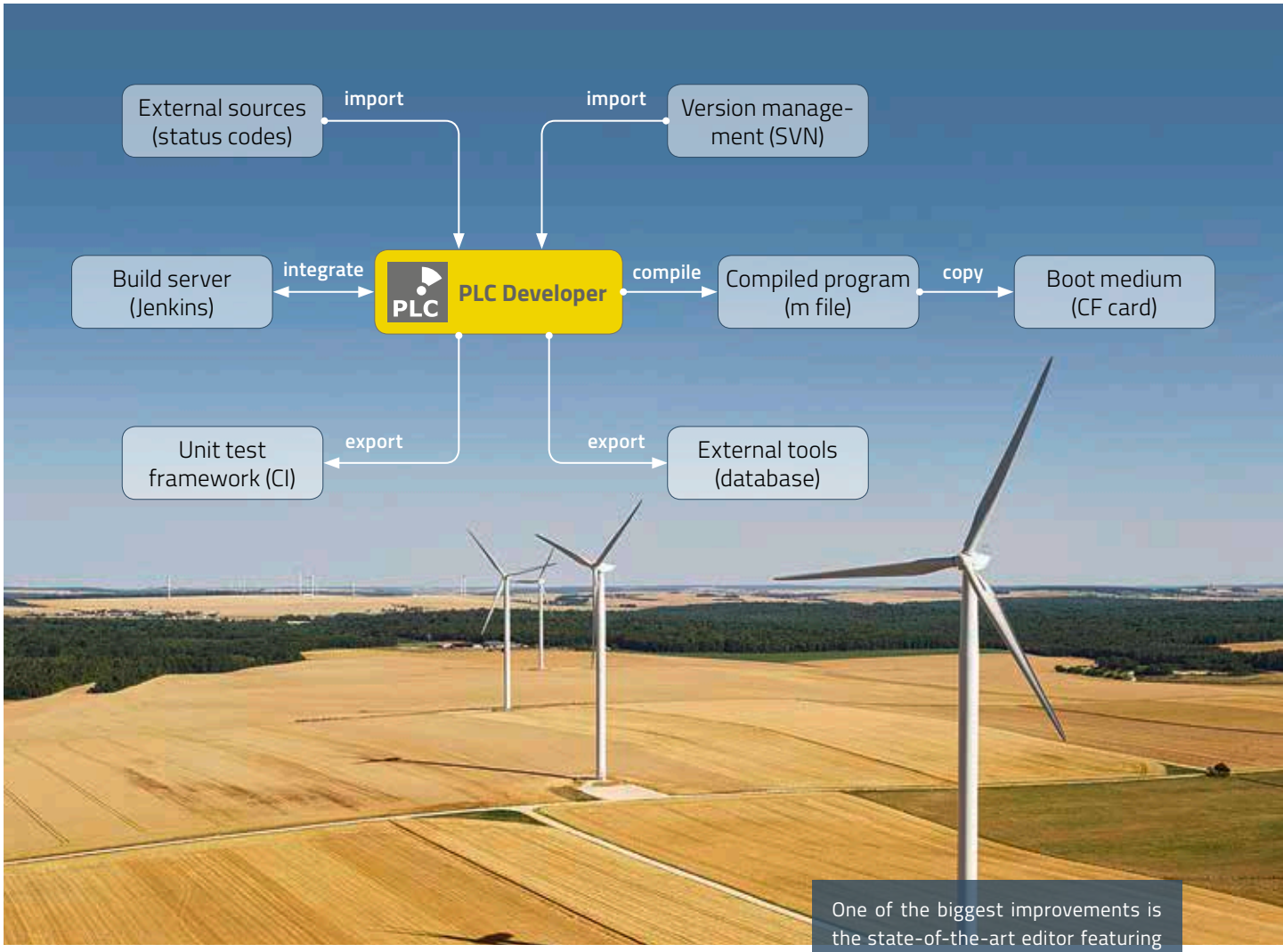
Functions that are used in several applications are implemented in the PLC applications in the form of so-called "Shared Objects" (SOs) to forward expandability and maintainability. Each application consisted of a specific project section and of shared objects. This functionality was provided by the ENI server. "The greatest challenge involved in the changeover to PLC Developer involved retaining the concept of the SOs and implementing it optimally with SVN," Broocks reports. The ability to implement identical sections only once as before had to be retained. SVN offers a solution for this with externals. However, externals are not ideal for up to 900 individual objects, since each object is individually checked and called. According to Senvion, the consequence would be extremely slow checkout and update operations.

Using symbolic links

Instead of using SVN externals, we therefore decided to use symbolic links. Symbolic links make it possible to link resources from a different project or any memory location on the file system to a project. By managing all shared objects in a project, the required sources can then be incorporated in the individual applications. "However, symbolic links have the disadvantages that Commits always have to be executed for two projects and the comparison of two versions with symbolic links is simply not possible," Broocks explains.

Due to the large number of SOs and applications and also in order to avoid and minimize errors, the creation of the relevant links had to be automatic. This initially required the use of all existing SOs to be examined in their relevant applications. This process is fully automated. A spinoff of automatic analysis provided an overview of SOs in the individual projects. This therefore created a very good basis for optimizing the assignment according to whether a function belongs to the SOs or a specific application.

After this, all applications were imported in the PLC Developer. This required all applications without SOs to be exported from the old system and imported directly in PLC Developer. The SOs were likewise exported and imported as a separate project. Using the automatically created table of the SOs, the appropriate links were finally created in the project properties file and the applications then included in the SVN.



Schematic illustration of the workflow and the interfaces all around the PLC Developer.

One of the biggest improvements is the state-of-the-art editor featuring a countless number of shortcuts and the clear highlighting of code, in conjunction with a modular, configurable user interface. Its seamless integration enables a task to be deployed on a controller as well as its debugging online without having to change the program. It is also possible to work with the PLC Developer simultaneously on several projects.

Gerold Kerbleder
Product manager, Bachmann electronic

However, the need for SVN externals is not completely eliminated. Externals are used to integrate the libraries in the applications. The use of a library by a particular application is assigned in a mapping file. Relevant externals are then generated for the projects automatically and timed on the basis of this mapping file.

Improvement in quality

EASE (Eclipse Advanced Scripting Environment) also has an important role in daily routine work. At Senvion its uses include the dynamic generation of standard source code sections, the automatic import of source code from other sources, exporting to Senvion's own unit test framework, the automatic creation of change logs and for other applications.

The PLC Developer also plays an important role in the continuous integration implemented at Senvion. The software module thus provides functions that make it possible with the Eclipse headless functionality to continuously ensure, by means of externally initiated and automatically controlled compiler operations, that an application and consequently, the entire system can be compiled.

"In addition to the benefits provided by the PLC Developer, the Solution-Center and lastly Eclipse, the availability of source code fragments in plain text format on the file system and no longer as cryptic data in a binary project file is also a tremendous benefit. This is the fundamental requirement for the ability to process with scripts. The connection to SVN makes it possible to link to a code review system, which ultimately leads to an improvement in quality," Broocks sums up.

News

USERS

CONDITION MONITORING FOR REINTJES MARINE GEARBOXES

Together with Bachmann Monitoring, Reintjes now keeps a close eye on its marine gearboxes and measures defined vibrations in order to identify any possible component damage early on and reduce any associated risk of failure.

Thanks to the Remote Monitoring service and the high sampling rate provided, Reintjes is able to interpret vibration events and initiate any necessary service operations without delay. At the same time, this enables spare parts to be supplied more quickly by initiating production starts in good time. All data collected and analyzed offshore is monitored 100% at Bachmann using trend monitoring. If one of the defined limit values is exceeded, Bachmann and Reintjes initiate the appropriate measures together. Regular status reports are also sent to the owner.

In the future Reintjes envisages the system-wide integration of CMS in higher-level ship and engine systems as an important customer benefit and is planning an appropriate extension of the condition monitoring system.

NEW BUSINESS MODELS

The water and air-cooled compressors manufactured by MacGregor are used on board seagoing ships for starting the heavy ship propulsion systems.

Besides minimum maintenance effort, prime importance is placed on the reliable availability of the compressed air supply for starting the ship diesel engines. A protection and diagnostics system tuned to the particular characteristics of the compressors already detects future maintenance requirements on the compressor system as soon as they start to develop. Based on the data analysis of extensive measurements, maintenance work is planned in advance and the required deliveries of spare parts are coordinated to suit the times when the ship is laid up. The extensive condition management prevents unnecessary service operations, and ship managers can access the status of the plant and situation-related action recommendations from anywhere at any time.

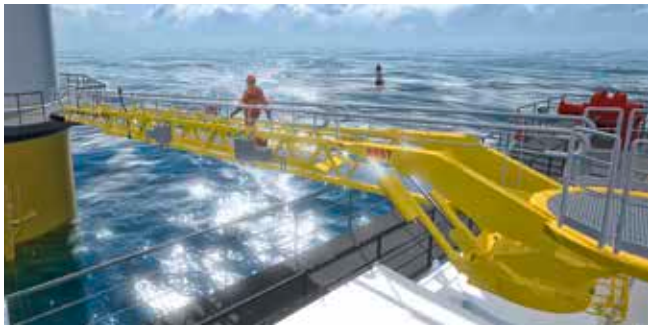
The innovative and modular condition management system was developed through intensive collaboration with the expert teams of Bachmann electronic. It enables MacGregor to offer new business and operator models for its compressor systems.

DIGITAL TWIN OF CRANE OPERATION

Bachmann electronic has been working closely with the specialists for Controllab closed-loop control technology for eight years.

The 20 Sim software works together with Bachmann electronic PLC controllers in order to create so-called digital twins from the customer's system. This is based on the 20 Sim software from Controllab. The benefits of the digital twin already become apparent in the preliminary design phase of a system. Creating the digital model of a system enables a customer to carry out development and testing in this simulated environment long before construction starts.

The crane operation or the offshore access to the platforms are an example of this work. The 20 Sim software from Controllab is supplemented by the VR and AR products with which the digitally created environment can be depicted. “Our customers are usually system integrators who work with complex control systems. Our collaboration with Bachmann electronic is particularly important for them because they get so much more than from a normal hardware supplier. Bachmann uses an open platform for its PLC systems. While many other companies have closed systems with restricted possibilities, Bachmann's open system enables customers to choose the software they wish to use,” explains CTO Paul Weustink.



IDENTIFYING SPORADIC FAULTS

Dorst looked for a graphical tool for the verification of timed program sequences to set controllers as well as for machine diagnostics. For this the engineers place their trust in Scope 3.

The controller software for machinery must have a deterministic behavior, the program sequence as well as the processing of signals always takes place in the same way. The program sequences can be visualized and optimized in all cases using different tools. However, if faults occur sporadically, developers need the possibility to draw on database supported long-term recordings. This is where Scope 3 comes into play. The following practical benefits can be expected: Scope 3 is used to analyze the communication between plant controller and robot. This examines and rectifies any sporadically occurring faults in long-term test operation and thus later further increases the availability of the plants at the customer.

All the M1 CPUs used by Dorst are equipped with a Scope 3 with a data archive.

News

PRODUCTS

CONNECTION RULES

Development of a new controller

The new VDE-AR-N-4110 connection rules for medium voltage energy producers with outputs ≥ 135 kWh has been in force since April 2019. Bachmann electronic has already obtained the component certificate for the GSP274 module.

Bachmann electronic has developed a controller tailored to these increased requirements at the point of common coupling. This controller monitors here the difference between set and actual values of different controlled variables (such as reactive power). From this the required changes to the relevant manipulated variable for sending to the generator units is determined.

ATVISE 3.3

Implementation of the OPC UA Alarms & Conditions and Historical Access standards

The networking of automation solutions is constantly increasing. Industry 4.0 and IoT require access to data and status information across all levels and at any time. This is especially difficult when handling historical data and alarms. atvise® 3.3 offers here a solution for this task, with full implementation of the OPC UA Alarms & Conditions and Historical Access standards. Alarms can be incorporated seamlessly and managed by OPC UA servers, thus making the redundant configuration of alarms a thing of the past.

For instance, a controller can be used as the only location of the alarm definition and any change in the alarm is communicated entirely automatically to all systems in which the alarm is incorporated. It is also possible to integrate the process environment into the alarm processing during the runtime. In order to give users a more in-depth view of the actual process conditions, this functionality can be used as an elegant way of providing alarms with additional information such as sensor values.

Historical untreated value and aggregates from external OPC UA servers can be looped through or synchronized. The loop through function enables users to query historical data without having to keep this on the SCADA level. Combined with programmable controllers, this function can be used to enable data histories to be utilized on the SCADA level directly from the PLC with a resolution in the millisecond range.

Another innovation is the support of the Debian Linux distribution on the ARM platform, by which atvise® scada can be run on IoT devices. This makes it possible to create entirely new architecture concepts within the atvise® product line. For example, atvise® scada could be used on distributed Raspberry Pie devices, which communicate process data with OPC UA methods to the atvise® portal as a cloud service.

SAFETY SOLUTION

The SAI205 is the all-rounder for analog value acquisition

Bachmann has expanded the modular PLC-integrated M1 safety solution for its M1 automation system. The SAI205 safety analog input module now provides a complete portfolio of analog interfaces for the acquisition of safety-related analog measured values.

The SAI205 provides inputs for capturing 4 to 20 mA signals, for temperature measurement, as well as for the acquisition of strain gauge (DMS) signals. If the inputs are connected redundantly in pairs, safety applications up to SIL2/PLd can be implemented. This large number of channels enables the space saving implementation of a broad range of safety functions in only one single module.

Another benefit of the new input modules: No external and extremely expensive safety systems are required, thus directly reducing costs. The integration of the modules in the controller system also enables better diagnostics and transparency in the controller application.

OT1300 PRODUCT UPDATE

10 display variants, flexibly configurable for your application

The Panel PCs of the OT1300 product series have been completely updated. All requirements are covered with five new CPUs, from the inexpensive Intel Atom to the Intel Celeron all-rounder, right through to the Intel Core i7 for performance hungry applications.

The 10.1", 12.1" and 18.5" widescreen diagonals with PCAP multi-touch capability were added to the usual brilliant displays and now cover the entire range from 10" to 21" with 10 display variants. USB-C and USB 3.0 interfaces, as well as the easy expandability for many other interfaces right through to 3G/4G/LTE and WiFi modules, cater for the requirements of further developments of peripheral devices.

The panel PCs are freely configurable with different mass memory and working memory sizes, and are available with Windows Embedded Standard 7 or Windows 10 IoT Enterprise as well as bundled with the atvise® web visualization. The new OT1300 models are compatible for installation with their predecessors and can be adapted specifically according to customer requirements.

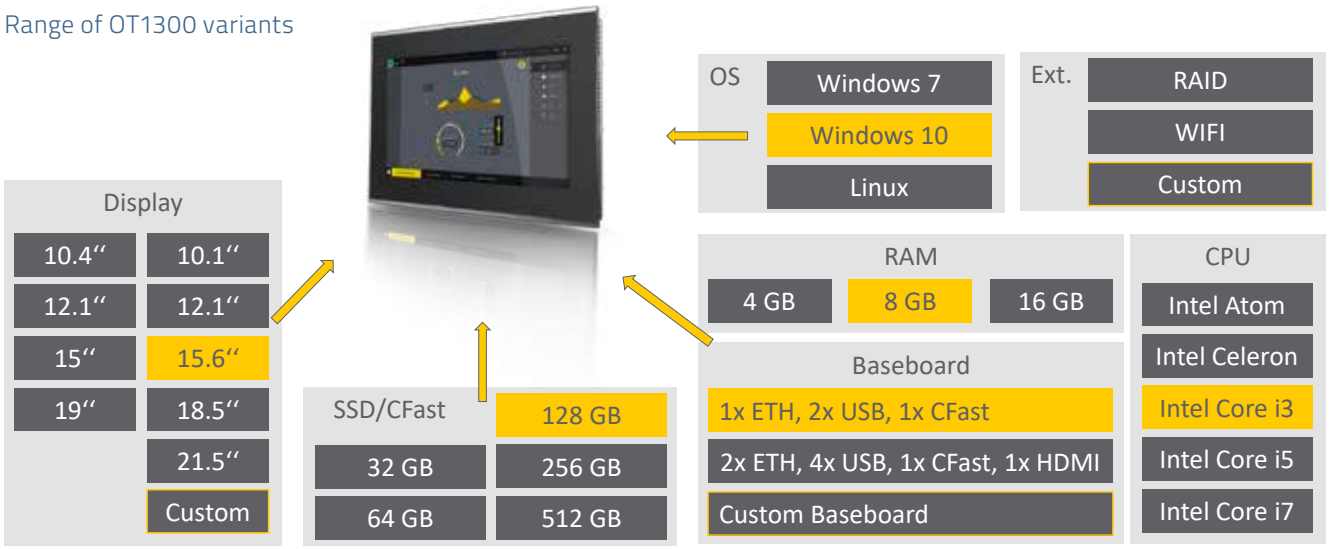
Upgrade of panel PCs – Focus on longterm availability

The long-term availability of the operator terminals must also be ensured for machines with a long lifespan. The upgrade of the OT1300 product series once more brings hardware and software to a lasting, future-proof level and at the same time ensures compatibility with the existing models.

With sixth generation Intel processors and the Windows 10 IoT Enterprise and Windows Embedded Standard 7 operating systems, the panel PCs offer the necessary level of investment security. As standard with Bachmann electronic, the software for OT1300 is integrated in the hardware and is tested for continuous 24/7 operation – this also includes web visualization via OPC UA.

When carried out in conjunction with the atvise® software, commissioning the OT1300 becomes a straightforward plug and play operation, even from the remote monitoring center. The mechanically robust construction for ambient temperatures of up to 60 degrees Celsius, the preinstalled browser with an onscreen keyboard and the state-of-the-art design round off the upgrade of the panel PCs. Together they offer a very powerful web-capable complete solution in which longterm availability takes center stage.

Range of OT1300 variants



VISUALIZATION

Performance upgrade for OT1200

The web panels of the OT1200 product series are in great demand for web-based visualizations in the 7-15" range. The new OT1200 PLUS variants offer an additional performance boost in order to support more complex visualizations on the panels. Another widescreen diagonal with PCAP multi-touch capability has been added to the brilliant 12.1" displays.

The system was likewise further improved with Linux version 1.50. Besides the upgrade of the industrial browser with a large number of optimizations, the atvise® web visualization is now likewise available in a complete package with OT1200. The atvise® configuration can be carried out very easily using the already known web configuration user interface.

MACHINE MONITORING

The AIC214 module enables the operator to monitor even more functions

Bachmann's new AIC214 condition monitoring module offers a comprehensive vibration monitoring solution that can be fully integrated in the M1 automation system. With up to 12 channels, the system measures standard high resolution vibration signals (24-bit) simultaneously. Up to 3 channels can also be used as ±10V inputs. Two counter channels are provided for independent speed measurement or as differential encoders and supply speed, position, rotation direction and phase signals.

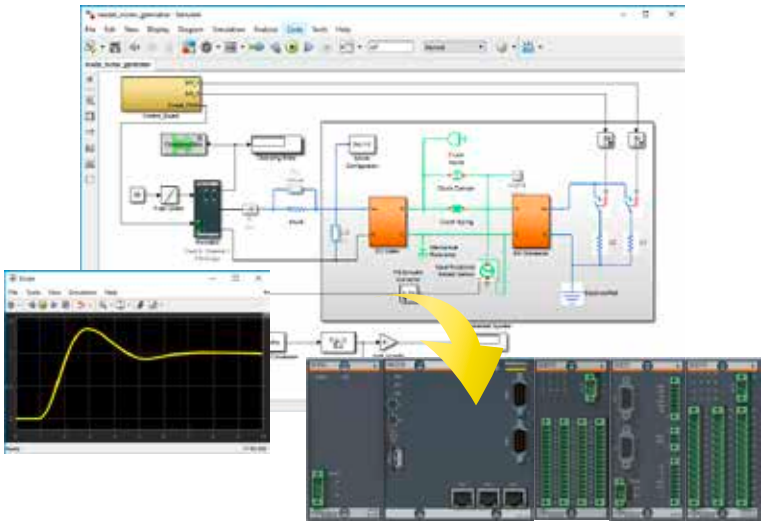
Other functions include the calculation of effective values (RMS) in specific frequency ranges in compliance with different ISO and IEC standards. These are continuously supplied so that vibration monitoring can also be used for machine protection. This therefore makes it possible to implement end-to-end monitoring and event driven recording. Sampling rates between 100Hz and 51.2kHz can be selected for each channel so that the frequency range can be optimally adapted to the task at hand.

Bachmann also offers the AIC206 module variant, which offers with 4 vibration and 2 counter channels a cost-optimized solution for smaller applications with only a few measuring points.

M-TARGET FOR SIMULINK® V2.30

Product increment opens new possibilities

HIL tests are an essential verification and safeguarding step in model-based development. An individual M1 controller can execute here both the generated open-loop and closed-loop control code as well as the code of the plant model at the same time.

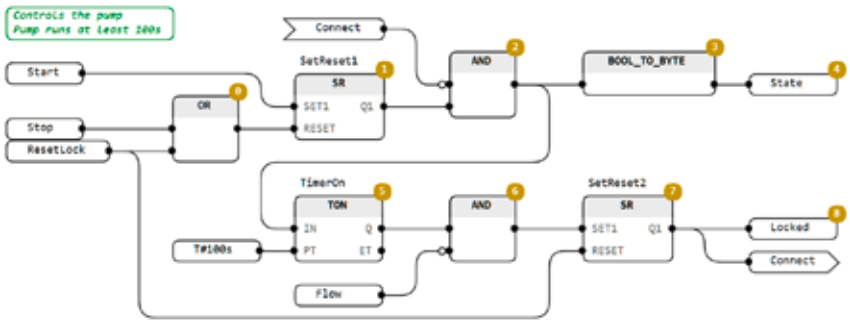


M-Target version 2.30 makes it possible to tie the appropriate M1 software modules to a dedicated core of the new multicore CPUs. This ensures an even distribution of the load and thus the optimum utilization of the available CPU capacity.

A safety module is now included in the M-Target for Simulink® libraries for the first time. This makes analog measured values captured by the SIA module also available for non-safe control system development in Simulink® parallel to the safety application. Two additional hardware modules for condition monitoring have also been added to the M-Target library. High-frequency data recorded with the AIC206 and the AIC214 can thus be read out directly in a Simulink® software module and further processed. With M-Target for Simulink® version 2.30 supporting the latest MATLAB® / Simulink® versions, you are also optimally equipped for model-based development projects in the future.

PROGRAMMING WITH FUNCTION BLOCKS

CFC editor for PLC Developer



Many IEC 61131 programmers are already working on the modern PLC Developer or are just changing over to it. The implementation of the new CFC editor in the PLC Developer enabled another significant step towards more efficient and fully integrated PLC programming.

For a good two years, it has already been possible to implement the multi-layered task definitions of programming in the PLC Developer by using the IEC 61131-3 Structured Text (ST) programming language. The CFC/FBD (Continuous Function Charts/Function Block Diagram) graphical programming languages have now also been integrated. Compared to the textual programming languages, CFC has some additional benefits: It is very intuitive, easy to program and understand; code can be reused effectively; complex application logic can be easily encapsulated and the data flow analysis often provides some important information for debugging.

The new editor can not only be operated easily via the mouse – a standard feature of graphical programming languages – but also via the keyboard. The PLC Developer is also provided with clearly designed tooltips, i.e. context-sensitive information such as data type, initialization value, function block interface or the code documentation. It also features a smart, context-sensitive autocomplete function for easy function call entry, including predefined code blocks.

The seamless code navigation allows extensive applications to be handled easily. This also includes a clearly designed debugging function: The actual values are shown directly in the diagram; Boolean values are highlighted according to their value with a user-defined coloring. It also features a breakpoints management function for repeatable debug sessions and a debug framework for processing program sections in stages.

The ability to generate a webMI visualization based on the program logic, including the display of online values directly from the programmed diagram, is a useful feature. This enables rapid diagnostics to be carried out in the field with the appropriate project version without any additional engineering tool – a tremendous assistance to service technicians. The PLC Developer is a central element of the SolutionCenter – the optimum tool for solving automation tasks with Bachmann technology.

Gerold Kerbleder
Product manager, Bachmann electronic

3 QUESTIONS TO GEROLD KERBLEDER

What is CFC?

CFC stands for Continuous Function Chart and is a type of graphical programming. This interconnects function blocks with a defined interface in the form of input and output pins. The sequence program is formed from the explicit processing order and conditional jumps to jump labels.

Why are graphical programming languages stillimportant?

Compared to textual languages, programming is very easy and manageable. This even enables users without an extensive knowledge of programming to implement or evaluate applications. Complex algorithms can be encapsulated in a function block and called.

Are users restricted to one programming language?

No, users can combine languages as required. Besides IEC 61131-3, it is also possible to incorporate C/C++ or Simulink® functions in a PLC application.

Report

PASSENGERS AND CABLE-CARS FIRMLY IN VIEW

Doppelmayr®

The cable-car manufacturer Doppelmayr and Bachmann electronic are united not only by having their roots in Vorarlberg: both firms also work together on advanced usability and UX for their customers. This partnership is now truly bearing fruit with the Doppelmayr Connect cable-car control system.

For many skiers, the cable-car between Zürs and Stuben is an everyday sight during the winter. But the lift system not only connects two villages, it also makes the Arlberg even more attractive for tourists. It's an important bit of infrastructure, and that was worth celebrating – with marching bands, dignitaries, and innumerable skiers. The so-called "Flexenbahn" was a multi-million euro investment in the future of the ski area, and is not only built for fun – it's an important part of Vorarlberg's tourism economy. If the cable-car flows smoothly, so does the money into the local economy.

Modern cable-cars transport up to 5,000 people per hour, and no ski region can afford breakdowns. This means that safety and process stability are absolutely key for the success of both cable-car operators and mechanical engineers alike. Vorarlberg's Doppelmayr are very aware of this and have revolutionized their cable-car control systems, including operational elements at cable-car stations, presenting them to the public in May 2017.

Higher employee expectations

So what are the hallmarks of modern operation? Experts know very well: it's more than just good usability alone. But the right mix of user experience (UX) and technology makes for a stable process. A team of usability experts observed cable-car employees during their workday. This included analyzing their processes and communication, and conducting a number of interviews, with the goal of better understanding their work and finding out what they expected from their operations.

It appears the employees who operate the cable-car controls and oversee the cable-car stations have become more demanding. "They want attractive hardware design, high-quality and well-made materials, and intuitive visualizations which enable a self-explanatory user experience – basically everything they're used to from the consumer industry," explains Stefan Gisinger from Doppelmayr. "The goal of a good operator interface is to efficiently organize operations and avoid mistakes." For Doppelmayr, a further aspect in the redevelopment of cable-car controls was an upgrade of the work stations of their cable-car attendants. "The goal with the redevelopment of the control systems was to bring the operator's terminal away from the control cabinet, and to position it further forward in the command room," says Gisinger.

This research resulted in Doppelmayr Connect, a cable-car control system equipped with terminals from Bachmann electronic and developed with atvise® visualization software. It came on the market two years ago. Doppelmayr and Bachmann electronic may be geographically and culturally similar, but in the end "objectively measurable facts were the deciding factor in this partnership," emphasizes Stefan Gisigner, who as electrical engineering project leader at Doppelmayr was jointly responsible for evaluating the hardware and software providers for the visualizations on the new cable-car control systems.

Minimal coder efforts

Doppelmayr decided on the atvise® scada HMI product as it demonstrated the highest product maturity in this area of innovative technology. Now a significant portion of the system operation – as well as the visualization and monitoring of individual functions – takes place using atvise® scada. Its open communication via OPC UA means it's possible to communicate with various data sources. This SCADA system runs on a customer-specific terminal based on the OT1300 series, a 21.5" TFT with full HD resolution and capacitive touchscreen.

Special features of its design include customer-specific branding, individual stand assembly, and innovative packaging designed especially for the demanding operating conditions of its setup process.

This way, the operator has an overview of both the cable-car status and the passengers at the same time.

»For us, transparency is crucial for any truly successful partnership.«

Stefan Gisinger
Project Leader, electrical engineering

For Doppelmayr, an important fact to bear in mind is that no two cable-cars are alike. This means that for the visualizations, it was important to recognize that Doppelmayr technicians have to individually configure up to 50 cable-cars a year. This meant the coding efforts for each cable-car system should be kept as efficient as possible.

The Project Team: Janine Küng, Stefan Gisinger and Wolfgang Söllner welcomed open communication between all parties.

Finding new solutions

"For us, transparency is crucial for any truly successful partnership. This means honest communication. We have to say when there are time constraints, and not just demand to speed things up without good reason", says Gisinger. For knowledge transfer purposes, an applications engineer from Bachmann electronic worked at least one or two days in-house with the Doppelmayr development team. This ensured that communication between the two firms was optimal throughout the entire process, and also allowed troubleshooting to be as efficient and smooth as possible.

Not only transparency is important for a partnership. Both parties must also be fully committed to the project. This commitment is shown in many ways. Bachmann electronic not only made test devices available for a long period of time, but as new requirements arose or were refined, a solution was worked on together, instead of sticking stubbornly to the original plan. Pivotal to this were specially-formulated commitments in terms of staff structure. Wolfgang Söllner, Bachmann's Key Account Manager in charge of the Doppelmayr project, emphasized: "The availability of the managers at Doppelmayr was extraordinary. I've had other experiences where employees at companies were constantly disturbed by service tasks or on-call requests. That makes it hard work." This was certainly not the case with Doppelmayr.

Touchscreens, and much more

Despite consumer trends, physical buttons still have their place, as there are circumstances where operators aren't necessarily able to swipe or use displays. Industrial designers these days combine modern software interfaces with hardware elements. Likewise, Doppelmayr uses both touchscreen and haptic operating elements. The industry's fan community is certainly excited. The video of the new control and operating logic has garnered thousands of hits and comments on YouTube – it's not only the operation which has changed.

In Demand

WIDESCREEN CATCHING ON

Comparison of Bachmann operator terminals: OT1321 (16:9 format) and OT1319 (5:4 format).

16:9 or 4:3 – what's all the fuss about?

Heinz Roth, product manager at Bachmann electronic: According to the statistics of W3C, the most common display aspect ratio in the consumer sector ten years ago was the 4:3 or 5:4 format. In 2018, 80% of all recorded terminal devices were already fitted with a widescreen display. The wider displays are more compatible with the human visual field and thus offer a more useful visualization area. Their widespread use in the consumer sector has meant that availability and price have also developed in favor of the widescreen formats.

What is the situation in the industrial sector?

Roth: In recent years, widescreen formats have also become increasingly popular in the industrial sector. This change has not only been driven by the improved ergonomic features.

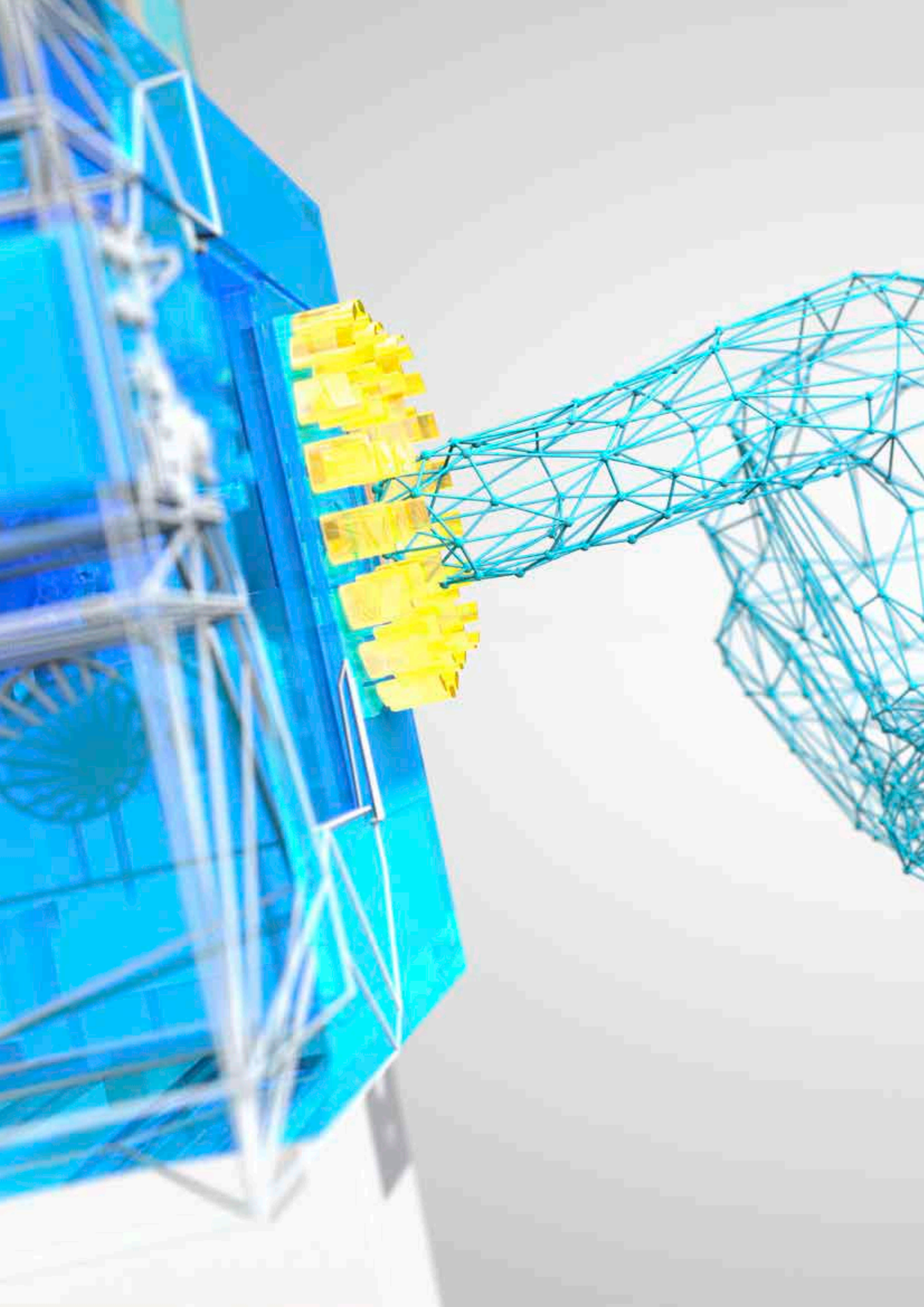
Besides the price argument, the lasting and widespread availability is an important factor in the ability to cover supply over the entire lifespan of machinery and plants. The 4:3 and 5:4 formats continue to play a role and will not disappear overnight. However, their availability and costs will gradually become a disadvantage.

How can companies switch over quickly?

Roth: Depending on the diagonal required, different aspect ratios are specified by display manufacturers when changing from 4:3 or 5:4 to a widescreen diagonal. The aspect ratios range from 15:9 (up to approx. 10"), 16:10 (10-15") to 16:9 (from 15" full HD). The visualization application itself, which can ideally make optimum use of the additional space, is definitely what is mostly affected by the change.

Positioning the navigation functions at the side is often a simple and quick solution. A change of aspect ratio also however offers the opportunity to fully rethink outdated visualizations and provide them with a solid basis for the future.

For this Bachmann offers a complete portfolio of operator terminals and the atvise® web visualization for an integrated complete system. It also offers professional support for the implementation.



»Usability and UX are not design gimmicks. They are competitive factors in mechanical engineering.«

Bernhard Zangerl
CEO Bachmann electronic

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1970 – 2020

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