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MORE INNOVATIVE SPIRIT, MORE AVAILABILITY

W2E Wind to Energy develops complete wind turbines in the multi-megawatt class and relies here on the system solutions of Bachmann electronic. The systems stand out on account of their long service life, high technical availability and maximum yields.

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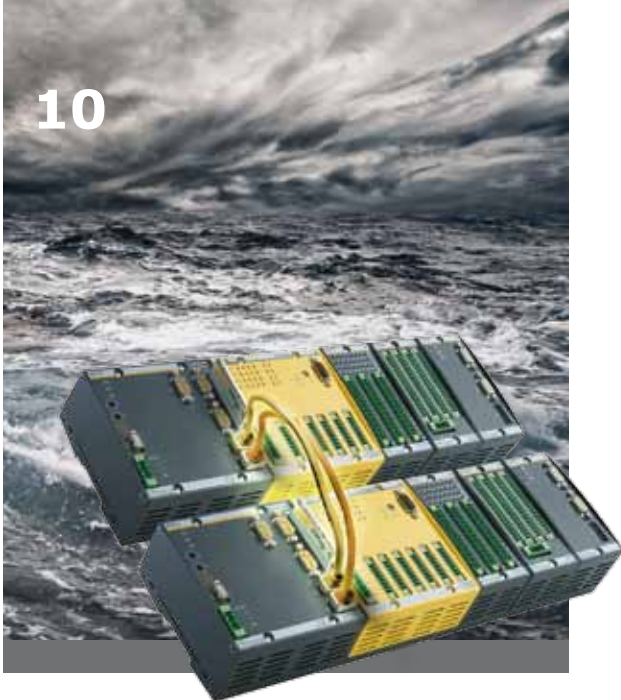
M1 automation system controls the world's most unique stencil and screen printer with integrated 100% post print inspection. Manufacturers Erska are convinced of the solution.

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The redundant design of automation systems enables the risk of unplanned machine and plant downtimes to be considerably reduced. The hot standby redundancy from Bachmann electronic guarantees maximum failsafe performance.

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Dear Readers

With our system solutions we are supplying you with the basis for your future developments. Solutions that can make you even more successful and which keep the total cost of ownership of your installation as low as possible. Discover our innovative spirit and our high level of partner-based collaboration for yourself. This edition of realtimes presents some examples of what we mean. Also in the future, our aim remains the same: Giving you the competitive edge by expanding our technologies, expertise and business fields.

Wishing you interesting reading

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**»» Bachmann system solutions
provide the basis
for future developments
in wind turbines. ««**

Dipl.-Ing. Thomas Schuckart
Process Engineer at W2E

MORE INNOVATIVE SPIRIT, MORE AVAILABILITY

Development partnership on an equal footing with W2E

W2E Wind to Energy develops complete multi-megawatt wind energy turbines for the onshore sector. The technology installed makes these systems stand out on account of their long service life, high technical availability and maximum yields. The control system is a key part of the turbine. W2E relies here on the system solutions of Bachmann electronic, enabling them to meet all the requirements set by the grid codes.



Founded by a team of seven in 2003, W2E Wind to Energy GmbH is a company that develops wind turbines in the multi-megawatt class. This also includes the certification and the operation of prototypes. W2E now has around 30 employees at its site in Rostock, North Germany. The company serves customers both in Asia and in Europe: These include companies such as Fuhrlander, AVIC Huide Wind power Engineering, EVIAG, A-Power, NuPower.

From concept development to the design of the machine elements, dynamic simulations and analyses, load calculations, FEM calculations, grid behavior analyses, operational management and closed-loop control, right through to the layout and specification of electrical and safety-related systems, all these are part W2E's range of services. New developments are always carried out in collaboration with a partner.

The development results are sold in the form of licenses as documentation. This documentation also enables licensees outside of the sector that do not have their own development department to produce, erect, commission and maintain a wind turbine. "We sell a kind of modular system," Thomas Schuckart describes the business model. He is one of the founders of the company and is responsible for the process engineering at W2E.

AN IMPRESSIVE CONCEPT


W2E supports the licensee with the market launch, quality assurance, the service concept, measuring, tests during the beta series as well as with series launch. "As all components and their manufacturers are listed in the documentation, supplier relationships are virtually provided at the same time," Anke

Hinske, information manager at W2E, explains. The Rostock company is thus offering an effective concept for launching new wind technologies on the market.

After the development of the 1.3 MW and the 2.5 MW turbines, which are suitable for series production, the Rostock team started on the development of a 2.0 MW turbine in 2008. The wind turbine manufacturer Fuhrlander joined them as partners. The new project also required the integration of a new controller. The engineers tested several manufacturers, including Bachmann electronic. These were required to provide a test program with several functions. "The devil is often in the detail, and this is where several manufacturers failed," Schuckart recalls. "We wanted to see their level of openness." Unlike other manufacturers, Bachmann developed the solution in collaboration with W2E and therefore passed the test with flying colors. "We were greatly impressed by both the openness of the Bachmann employees and that of their systems," Hinske added.

OPPORTUNITY FOR FURTHER DEVELOPMENT

"We decided to choose our new controller supplier because they enabled us to increase the



► With a tower height of 160 meters and a rotor diameter of 120 meters, the highest wind turbine in the world was the first in-house development from W2E. Like all other turbines, it was also a license project that in this case arose in collaboration with the manufacturer Fuhrländer. It was erected in Laasow, around 100 kilometers south east of Berlin in 2006.

level of automation, not only because of the technology provided, but also because of the speed and special way in which our customer requirements were addressed," Schuckart explained their choice of Bachmann after the test. We saw here a chance for both parties to pursue further development and to push forward new innovations. "We enjoy a very high level of collaboration that is based on an equal footing and is more of a partnership," the developer confirms.

"With the system solutions such as the controller, GMP, Safety, CMS etc. Bachmann is providing the basis for our future developments in wind turbines. We add to this our know-how and are supported in the process by Bachmann," the engineer describes the basic ideas behind the collaboration. "The solutions fit our ideas and we value the innovative spirit." Whatever W2E needs, we develop jointly with Bachmann. The 2.0 MW turbine with a new yaw and control system is thus based on the Bachmann M1 controller.

IN-HOUSE TECHNOLOGIES

W2E systems have a patented drive train concept that shapes design and integration – the so-called Larus Compact®. "The forces of the rotor are directed into the tower structure before being transferred to the drive train," Hinske explains the principle. "This considerably reduces costs for maintenance and repair. The high availability and long service life of the components are ensured."

The plug & play concept as a central development criterion also leads to a reduced wiring requirement. This results in the use of pluggable electrical terminals in the entire installation. Personnel have access to all subsystems of the drive train structure so that only the relevant parts have to be moved for maintenance or replacement. The slip ring is also pluggable and the filters can likewise be accessed and exchanged simply.

The pitch system of a wind turbine is of central importance. It determines the loads on the entire installation and the safety in the event of overspeed. For this W2E developed the Larus Smart® that enables operating loads to be reduced by 20 to 25 percent and thus also the effect of extreme loads. This also functions according to the modular system, since it offers the three-fold independence of the individual pitch axes. "As good as redundancy and more than only one brake," Hinske adds. This enables the smooth movement of the pitches.

SAFETY IN A NEW FORM

The experts from Rostock are also implementing in the wind sector the safety technology that has already been tried and tested in industry. With their Larus Safe® safety system, based on the Bachmann safety solution, a matrix system is used instead of a safety chain. Larus Safe® responds selectively to triggering devices and signals such as emergency stop, vibration switches, limit value relays or similar components. By means of an event-oriented, differentiated release of the actuators, forces and torques

**>> We were greatly impressed
by both the openness of the
Bachmann employees and that of
their systems. <<**

Anke Hinske
Information Manager at W2E



are reduced as extreme loads. This therefore results in considerably less wear, for example on brakes or in the gearbox. Components are therefore ensured a longer life expectancy.

CERTIFIED AND A MATCH FOR ALL REQUIREMENTS

Bachmann's programmable safety technology enables all the regulations and prescribed functions, such as the Machinery Directive 2006/42/EC or the GL Guideline, to be implemented without any additional effort, thus simplifying series production. The safety modules, together with the necessary programming tools and function blocks, have all been certified by the TÜV Süd certification body in accordance with the relevant standards including ISO 13849 and EN 954. The UL508 safety approval also enables the system to be used in North America.

The actual development of the 2.0 MW wind turbine is complete, and it is now in the prototype and beta series phase. Two systems have already been erected and started in China and Germany. There are specific plans for at least 50 systems in China, India, USA and Brazil this year. The 2.0 MW turbine is designed for wind classes IEC 2a and 3a, has all the necessary and currently applicable certification, and meets the requirements set by the grid codes.

The GMP232 grid measurement and protection module from Bachmann has been instrumental in the meeting of grid code requirements. It links the value measuring with the grid monitoring and the grid management tasks. "The GMP helps to make the response of the turbine more transparent," Hinske says. With

the integrated Scope function, important grid variables can be displayed in high resolution. As a fully integrated module in the system, together with other plant parameters, the GMP provides differentiated decision criteria in order to also manage the increased requirements placed on the individual plant during a grid fault. In this way, the stable operation of the distribution grid is guaranteed. By using the GMP, W2E also meets the requirements for receiving the SDL bonus in accordance with the SDLWind Ordinance.

SHORTER DEVELOPMENT THANKS TO THE WIND TOOL BOX

W2E also uses the Wind Tool Box from Bachmann – the so-called Wind Turbine Essentials (WTE). This is a software package tailored to the needs of wind turbine manufacturers. It helps to considerably reduce the time required for developing and commissioning the controller software and the visualization. The WTE package covers many standard tasks required for the automation of wind turbines. This means that recurring functions no longer have to be implemented in the operational management program, but can be prepared in a configuration tool in the SolutionCenter, executed on the controller CPU and monitored and operated in a visualization.

FASTER OPTIMIZATION

This type of 2.0 MW turbine has been in place in Tarnow, around 50 kilometers south of Rostock, since November 2011. It was erected by Fuhrlander and is operated by W2E themselves. This enables the design engineers to see things from the point of view of the plant operator. "This is where we test and optimize our own development," Schuckart explains the activities of the company, "With Rostock close by we are able to carry out additional measurements in real time." The optimization of the automation is carried out on site together with Bachmann. "If outside faults occur, we have to respond quickly. This is only possible with the kind of point-to-point connection that exists between our technicians and those at Bachmann," the process engineer says.

With a nominal output of 3MW, a very large 120m rotor and a hybrid tower 140m in height, W2E is currently developing another turbine technology. The developers have been working on this project since the middle of last year, and the erection of the prototype is already in the approval phase. A special feature of the 3MW

turbine is the extension of the compact drive train with a new gear generator concept, the compact hybrid drive produced by Winergy. The area of condition monitoring is given greater importance in this turbine. The control system for this project is once again from Bachmann. "The support routes are short and direct so that Bachmann can keep an eye on the entire automation process," Schuckart explains the further collaboration. ■



2.0 MW turbine

Nominal power	2.0 MW
Rotor diameter	93 or 100 m
Wind class	IEC 2a or 3a
Cut-in wind speed	3 m/s
Nominal wind speed	12 m/s
Cut-out wind speed	25 m/s
Full load hours	3,701 h, 42% and 3,975 h, 45%
Hub height (tube tower)	85 and 100 m

Wind turbine The 2.0 MW wind turbine in Tarnow, Germany, 50 kilometers south of Rostock, was not only developed by W2E, but is also operated by the company itself. It was manufactured by Fuhrlander.

Drive train The patented Larus Compact® drive train concept directs forces from the rotor into the tower structure before being transferred to the drive train. This reduces the stress on components.

Pitch system The W2E pitch system, the Larus Smart®, reduces the operating loads of a wind turbine by 20 to 25 percent.

Safety modules The in-house safety system from W2E – Larus Safe® – is based on the Bachmann Safety solution.

People on the wind turbine Dipl.-Ing. Thomas Schuckart, Process Engineer at W2E, and Anke Hinske, Information Manager, on the nacelle of the W2E's own wind turbine in Tarnow.



www.wind-to-energy.de

AVAILABILITY WITHOUT COMPROMISE

Hot standby redundancy from Bachmann

Bachmann automation solutions stand out on account of their highly robust design and maximum availability. Hot standby redundancy systems are used in situations where even momentary failures cannot be tolerated. Through the implementation of redundant design on all system levels, maximum failsafe performance and convenience is guaranteed.

redundancy control

OPTIMUM AVAILABILITY TO VIRTUALLY COMPLETE FREEDOM FROM FAILURE

Hot standby operation combines and extends the benefits of network and warm standby redundancy. In this operating mode, both master CPUs are linked in real-time: In the event of faults, the secondary system is activated immediately and without any losses. The automatic synchronization of the master CPUs is the outstanding technical benefit of hot standby redundancy and at the same time the main difference to warm standby redundancy. Whilst with warm standby redundancy the exchange of redundant values on the application level has to be programmed individually, with hot standby redundancy this is already completed with monitored and automatically ongoing system processes. In this way redundancy projects can be implemented quickly and safely.

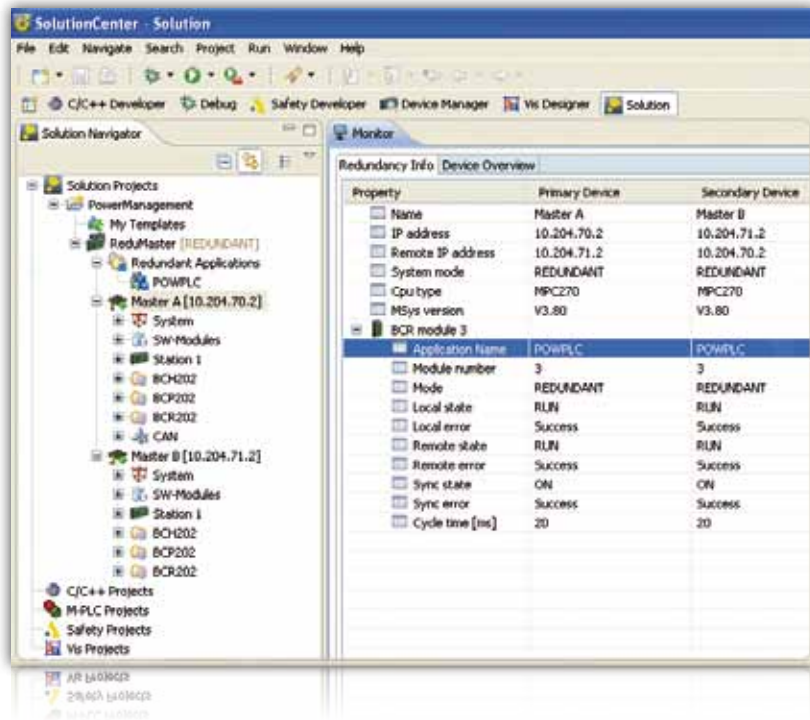
SOFTWARE-BASED SOLUTION

The entire configuration and monitoring of the system is carried out in the SolutionCenter. This also provides the user with specific support for creating and monitoring redundant applications in the IEC61131-3 conform programming



environment: The configuration environment is where the PLC project is marked as a redundancy application and all variables are then monitored cyclically. If there are any differences, the affected variables are then automatically updated. This ensures that the internal status of the redundant applications is identical and that the switching between the two master CPUs has no externally visible effect. A so-called "bumpless switchover" is implemented so that switching between the master CPUs is possible without any sudden changes in signals, even with sensitive closed-loop control systems or other calculated functions.

Thanks to the full integration of network redundancy, the hot standby implementation benefits from an unrivaled switching speed and the integrated voting mechanism. All stations are also run synchronously. This enables fault events in every substation to be logged on the basis of a central clock, which considerably simplifies the tracing of faults across the entire system.



SEAMLESS ENGINEERING

The Bachmann SolutionCenter covers all phases of the engineering process – from planning and configuration, to system creation and programming, mounting and commissioning, right through to normal operation and service. The redundancy solutions are fully embedded in this environment. Additional tools for monitoring, diagnostics and programming, supplemented with free function libraries, simplify commissioning and troubleshooting, thus helping to save time and costs.

During ongoing operation, detailed fault messages and diagnostic tools enable faults to be examined and repair measures to be implemented as required. This information is used for the preventative and ongoing adaption of maintenance schedules, and thus to further reduce the probability of malfunctions.

ROBUST, EFFICIENT – AND EASY TO RETROFIT

The M1 automation system from Bachmann electronic stands out on account of its highly rugged design and maximum availability. Nevertheless, no single system can guarantee complete freedom from failure on its own. The redundancy product line now provides three individually configurable solutions for achieving virtually "100% availability".

The Bachmann redundancy systems offer full real-time capability, are easy to program and are fully integrated into the engineering environment. The expansion of an existing automation solution into a redundant system can be implemented without replacing the controller hardware and without any reprogramming of the existing application – even for a later retrofit. ■

SolutionCenter

The user configures and programs the redundancy system in the SolutionCenter.

Master status information

- ▶ Details of master CPUs
- ▶ Redundancy status of the entire system
- ▶ System information

Application information

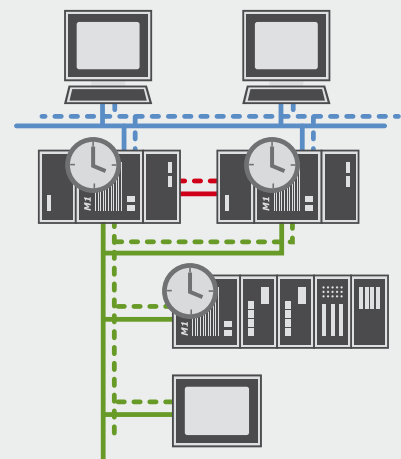
- ▶ Redundancy status
- ▶ Execution information
- ▶ Fault status
- ▶ Synchronization status
- ▶ Cycle time

Virtual redundancy devices

- ▶ Creation and manipulation of virtual redundancy configuration and applications
- ▶ Display of a virtual redundancy device with the possibility to create and manipulate redundancy configurations and applications.

▼ **Hot standby redundancy:** The two master CPUs are linked in real-time. In the event of faults, the secondary system is activated immediately, thus guaranteeing maximum fail safety for the entire system.

Hot standby redundancy



- ▶ Two master CPUs
- ▶ Automatic synchronization of master CPUs
- ▶ Bumpless switchover
- ▶ Time synchronization of all stations
- ▶ Configuration and monitoring in the SolutionCenter
- ▶ Enhanced diagnostic and programming interfaces for monitoring and evaluating the redundancy status
- ▶ Freely configurable switchover time (0, 1, 2... 10 PLC cycles)

COMBINED EXPERTISE

Software modules for the engineering of control systems for wind turbines

Depending on the manufacturer and performance class, the features of modern wind turbines vary greatly. There are nevertheless many fundamental concepts and tasks that are frequently involved. Bachmann has bundled its ten years of experience as a leading manufacturer of control systems into a package: The Wind Turbine Essentials (WTE) software package from Bachmann supports manufacturers of wind turbines with tested, reusable and configurable components.

WTE covers all the working steps involved – from the planning of the wind energy plant in the SolutionCenter to the creation of a visualization that can be given to turbine operators as an independent tool. Fully compiled software components, enabling functions such as the scanning of values and their mathematical and statistical evaluation, are provided for the control system. The range of functions is varied: Monitoring and parameter values can be grouped by system section and displayed according to user, or graphical display elements for output curves, wind roses or oscillograms created with just a few clicks of the mouse.

EVENT SYSTEM AS CORE OF THE APPLICATION

The core of most applications in wind turbines is an event status model: Events are generated from the actual values of the sensors and from commands issued from the control center. The appropriate response of the operational management software is then determined from

the collection of all active events. The listing of all events and the associated response is thus largely a complete description of the turbine application.

WTE provides the user here with a high level of freedom: Whether the effect of events is delayed, can be deactivated, or whether their frequency is to be monitored, are all features that can be defined as required. The same also goes for the type and number of responses that are associated with the events. The execution of brake programs, the response of the azimuth control or any alarm triggers are normally linked with events. However, Wind Turbine Essentials enables any number of other responses to be defined.

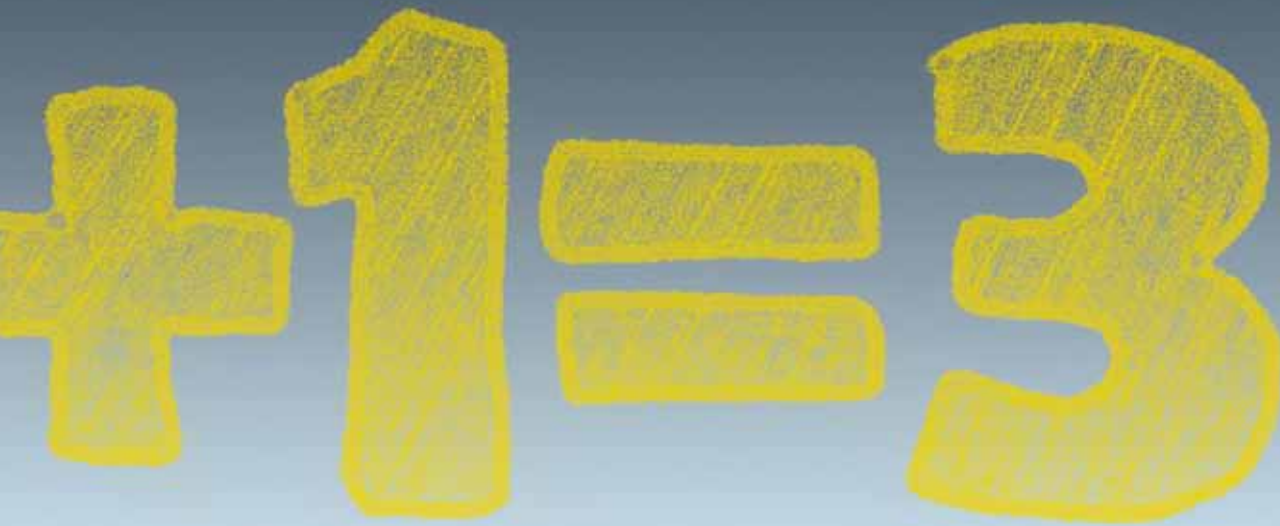
PRACTICE-BASED ENGINEERING

The WTE engineering tool comes with an integrated version management function. Whilst the configuration is created with graphical table tools, readable files are created that thus enable any differences between versions to be identified simply. This is a clear benefit – particularly when several people are working on the development of a turbine application at the same time: The work of different team members can be combined automatically or manually.

MULTI-LINGUAL VISUALIZATION

WTE already provides the user with a preconfigured visualization system. This simplifies commissioning and online monitoring from which both manufacturer and wind farm operator can benefit. The visualization is provided as a Windows application that can be adapted to the WTE project running on the





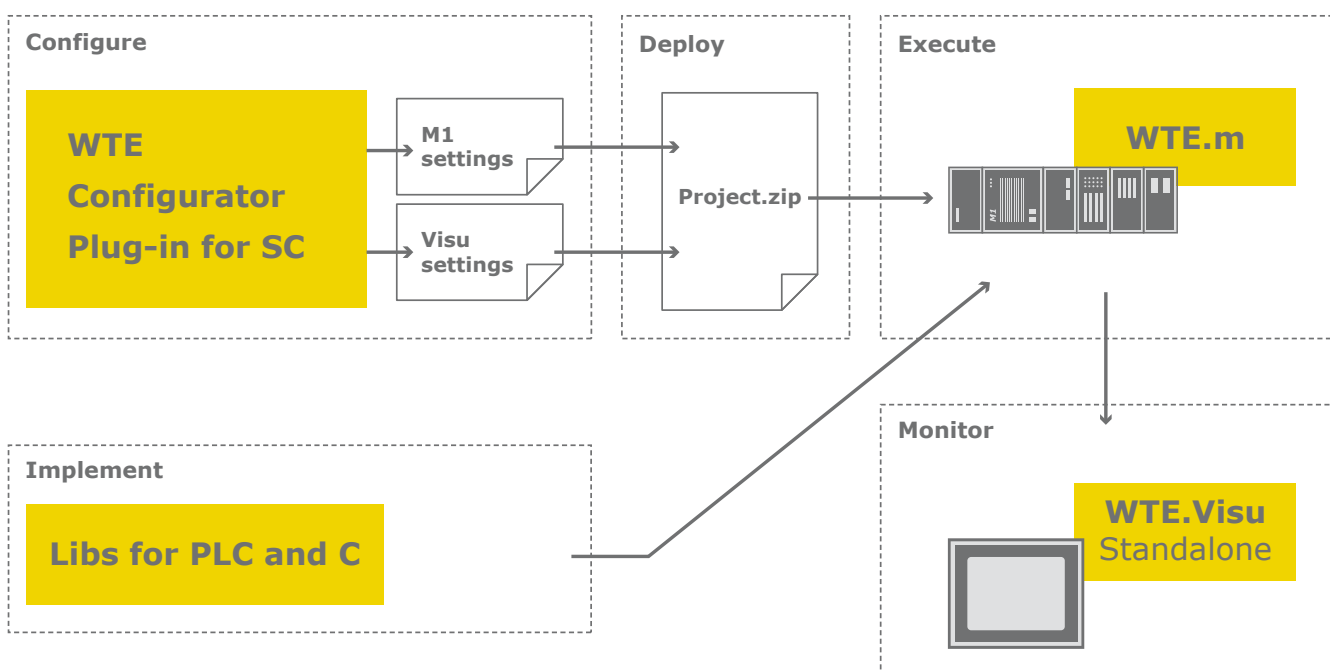
controller and can allow only read or also write access to values, depending on the logged in user. Texts for designations and descriptions can be stored in the configuration in all languages and fonts, and can be selected as required in the visualization.

MULTIPLE HELP FUNCTIONS

In a wind application, hundreds of values have to be monitored, counted, averaged or otherwise statistically processed. With WTE the user benefits from a well thought out and systematically tested solution. WTE offers a configurable solution for automatic data acquisition, and library function blocks can also be used alternatively. Several user-friendly

function blocks that reduce the formatting and management required are provided for creating log files from the user software. Files can be automatically assigned a description text. The file content can be stored in a readable CSV file or in binary format. If required, a file can be automatically closed when it reaches a defined size, compressed, and then a new file created.

With WTE, Bachmann is underlining its position as a market leader for control systems in the wind sector, and making its many years of experience available to its customers – combined in a single software package. ■



▲ Overview of the **Wind Turbine Essentials (WTE)** software package

MISSION: ENVIRONMENTAL PROTECTION

Ballast water cleaning with a state-of-the-art control solution

The use of automation systems offering the ultimate in performance and safety is indispensable in ship applications. These systems are required to cover a wide range of tasks. In this respect, the handling of ballast water is one of the major challenges. After all, this has to be treated in order to protect the environment: This process is fully automated and includes monitoring and logging. Bachmann's M1 automation system is ideal for these kinds of ship applications: All the necessary certifications for the marine sector are available.



S seawater is taken onboard ships as ballast to stabilize them mainly during empty sailings. This is stored in water tanks or in the cavity between the double sides of the ship's hull. As a result, organisms such as small fish, plankton and pathogens are regularly taken onboard as well. When the ballast water is no longer needed, it is simply released. This means that with the increasing volume of shipping, living organisms are being introduced into alien ecological systems, thus causing in part considerable damage.

CONVENTION ON THE USE OF BALLAST WATER

In order to deal with this issue, a diplomatic conference of the International Maritime Organization (IMO) passed a Ballast Water Management Treaty in February 2004.

The Convention requires all ships built from 2009 onwards to have a ballast water management system installed, which should largely eliminate the usual uncontrolled exchange of water during the taking on and releasing of ballast water that has existed to date. By 2016 all ships built before 2009, i.e. around 68,000, and all harbor installations must be fitted with this type of system. The marine control

▲ A cargo vessel
discharging ballast
water

solution from Bachmann makes it possible to effectively prevent the transfer of organisms. When the Convention was passed, there were no suitable technologies for treating ballast water comprehensively. There are now, however, several IMO-approved processes.

COMPREHENSIVE BALLAST WATER MANAGEMENT

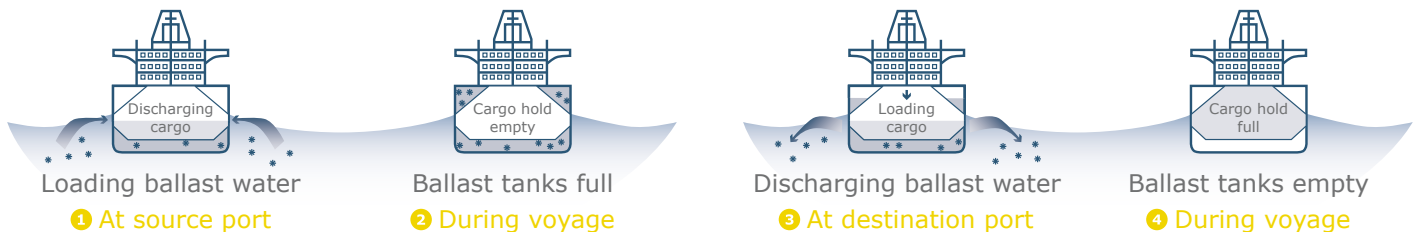
The requirements of the Convention include the full documentation of processes related to the ballast water: The owner of the ship must keep a record book as well as a ballast water and sediments management plan. The relevant

systems on special ships. These require above all a high level of availability from the controller, such as through the use of a redundant network connection and/or a dual CPU.

BACHMANN – A COMPETENT PARTNER FOR MARINE APPLICATIONS

The M1 automation system ideally meets the requirements stipulated by the Ballast Water Convention. The open hardware and software architecture makes it possible to integrate the system in already existing installations. Redundant systems can also be implemented without any problem. A software-based solution enables network, warm or hot standby redundancy to be implemented without any major investment required, and without

▼ Problem ballast water loading and discharge

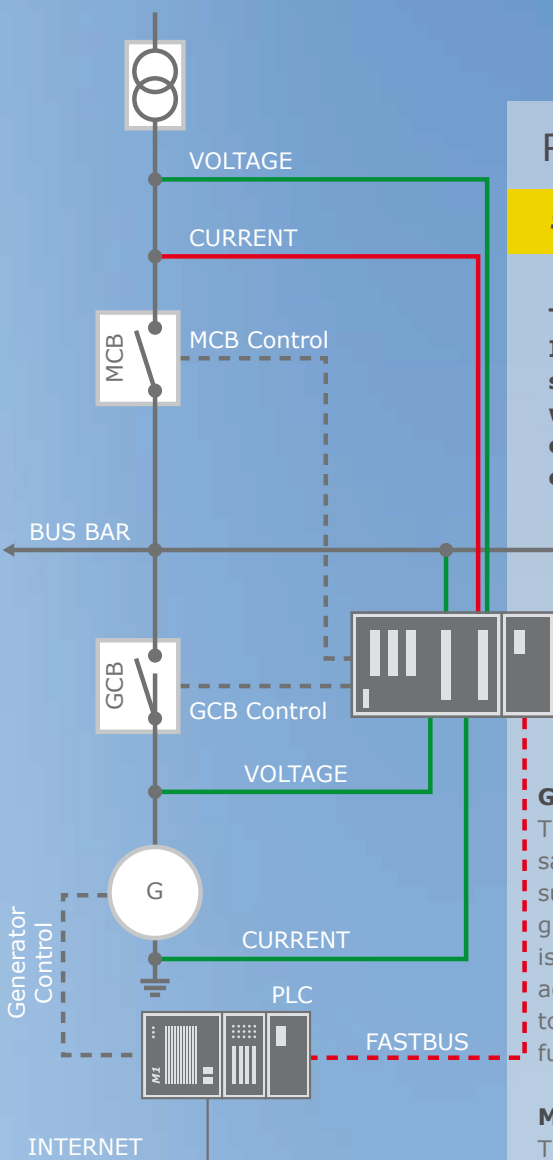


IMO regulations must be strictly observed here. In order to regulate and monitor the various cleaning stages, all the relevant process data such as quantity, load and discharge, or cleaning quality must be automatically stored and logged in a tamper-proof way. In these complex systems, the use of powerful state-of-the-art controllers is making a critical contribution to environmental protection. Bachmann's expertise in maritime applications extends far beyond ballast water management: The M1 system covers all aspects of ship operation, ranging from drive control, power distribution and management, auxiliary drives, loading and unloading control, right through to process

having to replace hardware. Internationally accredited testing institutes have furthermore verified conformity of the system with the most important global standards of GL, ABS, DNV, BV and Lloyd's Register. This has been confirmed with the appropriate type tests certifying approval of the Bachmann M1 system for use in the most demanding shipbuilding applications. The Coldclimate series can also operate with maximum reliability in extreme conditions (extreme temperatures from -40°C to +70°C). Appropriate engineering tools and HMI solutions complete the range of Bachmann products for the marine sector. ■

- **Type tested reliability.** System solutions from Bachmann for marine applications.





MCB: Main Circuit Breaker
GCB: Generator Circuit Breaker

RELIABLE AND SAFE GRID CONNECTION

Synchronous generator switching with the GSP274

The energy in supply grids must be provided reliably and quickly. In smart grids this places multiple requirements on the control system. The GSP274 grid synchronization and monitoring module, which will be available from autumn 2012, will further expand the capability of the Bachmann M1 controller for use in the field of energy generation.

With the growing number of decentralized power generation plants using for example solar or wind power, regulation tasks must be increasingly handled by the power station itself. As well as guaranteeing safe operation in the event of momentary grid faults, the power station must ensure safe and grid compliant operation (in terms of frequency, voltage, phase) during switch operations.

GSP274 – RELIABLE AND SAFE AUTOMATION

The GSP274 grid synchronization and monitoring module enables the safe, reliable and automated synchronization of generators on the energy supply grid. The module here monitors the synchronization of distribution grids and generators by taking measurements at three points. Once this is established, the connection switch is actuated from a relay output, in accordance with the defined switch delay, and the generator is connected to the distribution grid. In addition to this, a large number of protection functions are integrated in the module.

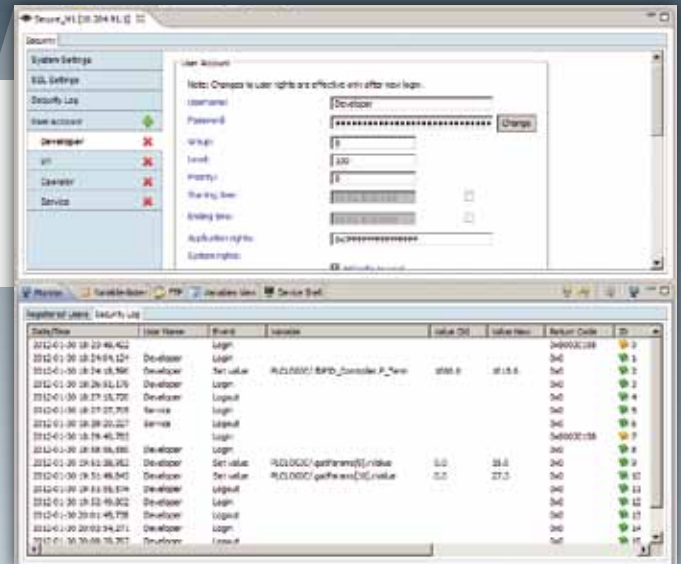
MAXIMUM FUNCTIONALITY

The GSP274 is fully incorporated in the Bachmann SolutionCenter. The module comes with an integrated data recorder for the high precision recording of up to 16 measuring channels. All r.m.s. values are also transferred via the Service Variable Interface at the end of a grid period. This then simplifies the analysis of all measured values in the SolutionCenter.

Fault events are also permanently logged and stored with a highly accurate time entry based in the Precision Time Protocol (PTP). This data can also be exported as a file in .csv format. Thanks to PTP, it is also possible to access geographically separated measuring stations using a central time base. This enables both the chronological and geographical tracing of fault events. ■

EVERYTHING UNDER CONTROL!

Rights management directly at the source



Access control is a subject that is becoming increasingly more important in the field of automation. If it was previously enough to differentiate between experts and operators, today's applications require the issuing of access rights and the creation of access logs. Bachmann has further optimized its tried and tested rights management system.

In the machine building sector, however, particularly with energy suppliers, the plant users involved have a wide range of different qualifications and interests: For example, whilst the manufacturer may have access to all the internal parameters of a system, the operator at an energy supplier only requires access for starting, stopping and setting reactive and active power values for his power generation plant. It can thus no longer be assumed that data access can be implemented with a visualization program supplied by the manufacturer. The more visualization tools, control station and operational data acquisition systems are used in parallel, the greater the probability that someone might gain access to data which is not intended for them. This kind of access can often no longer be traced.

ADVANCED SOLUTION FOR ACCESS RIGHTS

The M1 automation system from Bachmann integrates a user-dependent management system for certain aspects of access. This element has been further optimized in the latest system software: A multi-level rights system can store the read and write access rights according

to user for each individual process variable. This setting applies irrespective of the visualization tool in use. Bachmann is thus providing a complete solution for storing the authorization levels of each user. A customization of the system is possible at any time.

LOGGED ACCESS

All write accesses to process variables that are made externally via the network are fully logged and listed with user name, time stamp, old and new value. This information is stored in the form of log files that can be shown in the Device Manager or some other visualization tool via a suitable visualization interface.

Bachmann's optimized rights management starts directly at the source: Impermissible accesses to process variables are a thing of the past. ■

BUILDING ON EVEN GREATER SAFETY

Continuous progress with the
integrated safety solution

Since 2009, Bachmann has been offering an integrated safety system in the controller concept that has been impressing customers from the machine building and energy sectors. Due to the new Machinery Directive in force since the beginning of 2012, the new ISO 13849 safety application standard must be observed for wind turbine generators. This change must be regarded as the starting signal for state-of-the-art safety technology in the wind sector.



The advances in the size and complexity of wind turbine generators also place new challenges in terms of the safety technology. Whilst hardwired emergency stop sequences were sufficient for small installations, the linking of operational management and safety technology on several layers is not possible without additional costs. Plant builders are therefore being increasingly confronted with the issue of safety technology. The regulations of the key certification authorities have been adapted to meet the requirements of the new directive. ISO 13849 is recognized as a common basis and its implementation is mandatory.

Bachmann provides its customers with the know-how of its safety specialists in the implementation of safety applications. Contact with the relevant certification bodies provides a continuous dialog for questions and shorter routes for acceptance tests and concepts. This proximity and the close cooperation with customers enables Bachmann to make continuous improvements.

DELAYED DISCONNECTION OF DIGITAL OUTPUTS

Susceptible plant sections and machinery must be protected from damage in the event of unscheduled stops which may be triggered, for example, by a cable break. Up to now the disconnection sequences were implemented using positively driven relays. In order to provide this function for the user simply and cost-effectively, the time delayed emergency disconnection is integrated in all safety modules with digital outputs that can be configured independently. This function can be used by simply updating modules already installed in the field.

ENHANCED PROJECT AND VERSION MANAGEMENT

The version management tool "Subversion" offers full support for the already in place project organization and archiving of safety programs. This ensures the long-term stability and compatibility of safety projects. Projects can be password protected so that any accidental overwriting of project data is no longer possible. This measure prevents any unintentional modifications and possible misuse.

▼ The specially coated modules withstand these extreme temperatures of -30°C even when condensation is present. This is a clear benefit for critical application ranges such as offshore installations or in wind and solar power plants that are subject to large temperature deviations.



ColdClimate
-40°C .. +70°C



The integrated automated version comparison now also documents with detailed error reports any possible incompatibilities of hardware modules. If a new project is opened in an older version of the Safety Developer, a warning message appears since extended functions and options may be lost.

MAXIMUM SAFETY – EVEN IN EXTREME CONDITIONS

Even the basic series of the safety modules offers an impressive degree of robustness and a long service life, as is standard for all Bachmann modules. The unique operating temperature range from -30°C to +60°C in the functional safety range could now be improved with the certification of the coldclimate versions: The specially coated modules withstand these extreme temperatures even when condensation is present. This is a clear benefit for critical application ranges such as offshore installations or in wind and solar power plants that are subject to large temperature deviations.

PROGRESS AS THE KEY TO SUCCESS

The safety products of Bachmann electronic stand out on account of their uniquely robust design, optimum performance and simple operation and programming. Considered and careful interventions by the development department protect already created projects and ensure the long-term compatibility for which Bachmann is renowned. ■



MEETING THE MOST DEMANDING REQUIREMENTS

New ATOM processors in the CPUs of the MC200 series

Maximum performance for demanding closed-loop control tasks, process control and signal processing, as well as extensive communication protocols – these are the promising benefits of using the latest ATOM-E600 processor from Intel®. It is integrated in the new generation of MC210 and MC205 CPUs. The Bachmann M1 controller uses it to also process complex applications at the highest level.

A generous 1GByte DRAM was integrated as the working memory: This enables the most demanding applications to be handled easily. The use of mirroring in the DRAM considerably accelerates memory access to retentive data in the NVRAM: In this way, machine parameters such as parts counters can be updated with every cycle.

An autonomous process image controller was also integrated in order to fully utilize the performance of the new processor. This processes the cyclical communication to the input and output modules independently and thus ensures performance for the fastest process cycles. The performance of the CPU is made available in the meantime for other tasks.

COMPLETE INTEGRATION IN THE BACHMANN CONCEPT

Besides the tried and tested COM1 and COM2 serial interfaces, the new generation of the processor module comes with two Gigabit Ethernet ports. The time synchronization required for distributed automation and the synchronization of real-time fieldbus protocols is implemented with precise time stamps in accordance with IEEE1588. A USB device interface enables the connection of a service laptop. This allows the link to the SolutionCenter to be established quickly and conveniently. The mass storage memory was also improved: The new CFAST card operates up to 80 times faster than its previous generation. An ejector at the side enables the memory card to be exchanged quickly and simply.

The features of the new MC200 series are impressive: In relevant applications using the modern interfaces and the process image controller, a considerable improvement in performance can be achieved compared to the corresponding MPC200 CPUs. The MC205 CPU with the 600MHz ATOM processor is thus in the performance range of the MPC240. The MC210 has the equivalent performance range of the MPC270 and MPC293.

By combining the latest technology in a robust design, Bachmann has been able to produce a power package that is also compact. It comes with an impressive lifespan and a broad temperature range from -30°C to +60°C. ■

M-BUS – THE ENERGY BUS

Simple configuration with the MBUS201 adapter

Power stations use a large number of energy meters for measuring gas, heat, water and electricity. Appropriate additional devices such as routers are normally used to connect these devices to the automation system via standard fieldbuses. However, these intermediate devices make maintenance and configuration tasks more difficult. The MBUS201 adapter from Bachmann now simplifies this issue.

The M-Bus specified in the EN61334-4-1 standard enjoys widespread use for the connection of energy meters. The MBUS201 adapter makes it easy to connect to the Modbus communication network. Each M-Bus station is configured as a virtual card in the Bachmann SolutionCenter. In this way, the status of the meters can be queried effortlessly. It also simplifies fault detection, the initiation of restarts or the reading of data from the connected units.

Provided with a robust metal housing, the MBUS201 adapter is fitted directly onto a COM port of the M1 controller. Up to five energy meters can be connected to the adapter. The serial interface is galvanically isolated in order to ensure maximum safety and availability. An LED integrated in the MBUS201 indicates the bus status and that of its power supply. ■



▲ Inexpensive and straightforward connection of energy meters to the M1 via M-Bus: **The new MBUS201 adapter**



ENHANCED FUNCTIONALITY

New application options for the DIO280

The DIO280 digital input and output module will be available from the 3rd quarter 2012 with an extended range of functions. The integrated counters and outputs for pulse width modulation (PWM) provide the DIO280 with a number of new and interesting application options.

The DIO280 comes with 32 digital inputs and 32 digital outputs, as well as 16 digital channels that can be configured as either inputs or outputs. Eight of these freely configurable channels could already be used as interrupt sources. These can now be configured via the SolutionCenter into four full-featured 32-bit counters, for either up or up and down counting.

The integrated PWM function is an absolutely new feature: These can be used, for example, to operate valves economically. The period duration can be set as required between 500µs to 1s with a freely selectable mark to space ratio. Once configured, the signal is always active as soon as the appropriate output is triggered.

HIGH SERVICEABILITY

All the previous functions of the module have been completely retained with full compatibility. The module can be replaced during servicing without any additional effort. Only the I/O driver has to be updated beforehand in order to use the new features. The new functions are then fully available. ■

"WE ARE SHAPING THE FUTURE – AND THINKING IN SOLUTIONS"

Interview with
Werner Elender, COO

The financial year was 2011 characterized globally by several highs and lows. Whilst words like financial crisis or recession were common on the one hand, extraordinary growth was reported by a wide range of different sectors on the other. With its focus on the wind and renewable energy sectors, as well as on maritime applications, Bachmann electronic is a well diversified business. We spoke to Werner Elender, COO and member of the management board at Bachmann electronic, about the past year and about the outlook for 2012.



How would you personally sum up the past year?

In spite of some in parts difficult circumstances, the market also developed positively last year. We were able to achieve double digit growth in segments of the renewable energy sector and in the machine building and maritime sectors. Despite the drop in sales figures due to the delayed expansion of wind energy in important markets, we nevertheless also increased our market share here worldwide.

What innovations have there been in terms of R & D?

We have intensively pushed ahead with the further development of our product portfolio. We have focused on integrated solutions, always with the aim of keeping the total cost of ownership of a plant as low as possible and offering our customers a single-sourced solution.

In this respect, there were two main focuses in the past year: The first and certainly the most important change was the acquisition and integration of Bachmann Monitoring GmbH based in Rudolstadt, Germany: The condition monitoring (CMS) technologies and services available have enabled us to considerably expand our offer and strengthen our position as a solution partner for the wind sector. Secondly, we have launched in the past year our own product solutions for grid monitoring and have already successfully installed modules from this newly developed product series in wind energy plants. We have therefore for the first time brought together conventional control technology and grid management, thus preparing the way for the further conversion of our supply grids for stable operation with decentralized power generation plants.

For even greater efficiency in engineering, we have further upgraded our SolutionCenter all-in-one tool and optimized its functions in terms of "usability". We have added redundancy functions to the M1 and thus considerably increased the level of application safety and availability that can be achieved. This is of major importance for our target sectors in maritime applications, but also equally in the wind sector.

**How do you see the market developing in the current year?**

The industrial and machine building sectors have grown considerably. We assume that this trend will continue in 2012. Considerable growth is also forecast in the medium and long term for the wind sector. Several new customers could be acquired in the Asian market for the coming financial year 2012. These will bring considerable increases to our incoming orders and sales. The offshore sector is also increasing in significance. Our robust products that have been developed for severe climatic conditions have enabled us to establish ourselves here very well and gain market shares. One thing is clear: The expansion of Bachmann electronic is being continued through the addition of new technologies, business sectors and areas of expertise, as well as through further possible acquisitions.

What are the next steps for Bachmann electronic?

We are optimistic about the future and will continue to further invest freely in R & D in 2012. Here we will consistently pursue our strategy of focusing on new and innovative solutions in the expansion of the product portfolio for our target sectors. This includes the expansion of our offer in the field of grid monitoring, the expansion of condition monitoring functions, but also in software solutions for plant supervision and operation (visualization, SCADA).

The number of employees at Bachmann has grown by 16 percent in the past year. We will also be creating new posts this year, particularly in the expansion of our international presence and in R & D. As well as the expansion of our non-European offices at two locations in China, in India and in the USA, we will also set up a branch in South Korea this year. As before, however, the controllers will continue to be "Made in Austria" – and this will remain so. For us quality is the highest priority.

Our customers rely on our innovation capability and trust us as technology leaders – this also has to continue. Simply being average isn't enough for us. We don't just want to serve our customers, we want them to be delighted to work with us.

Many thanks for talking to us. ■

»» The expansion of Bachmann electronic is being continued through the addition of new technologies, business sectors and areas of expertise, as well as other possible acquisitions.

ONE STEP AHEAD ...

M1 automation system controls the world's most unique stencil and screen printer

For soldering machine manufacturer Erska, communication and exchange with their customers are of utmost importance. Experience gained jointly is used proactively in order to keep one step ahead of the competition. In this way, the customer's wishes and requirements of tomorrow can already be met today. This requires partners that can respond with the highest level of flexibility. With Bachmann electronic, Erska has found a company that enables these goals to be realized.

» *Thanks to Bachmann we can offer our customers higher production speeds and greater flexibility.*

Michael Schäfer, R&D director at Erska

 **kurtz erska**

In the electronics industry, the name Erska is synonymous with soldering. For over nine decades, the company has been developing and producing high-end machines and equipment for electronics manufacturing. Since 1993 it has been part of the kurtz erska Corporation and is today one of the largest manufacturers of soldering systems in the world. The company's headquarters is based in Wertheim, Germany.





◀ **Dual dispenser unit**
in the ERSA stencil and printer

▶ **SMT production line**
with ERSA stencil and screen
printer

▼ **M1 automation system**



ERSA is renowned in the electronics sector for high-end machines and equipment for electronics manufacturing. When the development of the first inline stencil and screen printer with integrated 100% inspection was started in 2005, Ersas started looking for a reliable partner. The specifications for the automation required a high performance level and real-time capability, as well as a powerful bus system, transparency and the easy configurability of the system. It was Bachmann that made a good impression: The M1 automation system offers exactly these features. Today, the M1 handles the processing of all open-loop and closed-loop control tasks in real time and ensures the functionality of different expansion stages of the Versaprint series.

UNIQUE APPLICATION RANGE

The Versaprint S1 is currently the only stencil and screen printer on the market with an integrated 100% post print inspection. This is made possible by means of an integrated line sensor based camera instead of the otherwise usual area cameras. The Line Scan Technology (LIST) enables the PCB to be aligned for printing as well as the subsequent inspection of the entire layout. Bachmann's M1 automation system is equipped with powerful processors that are essential for the use of the line scan camera.

The S1 also features a dispenser for glue and solder paste. Due to the increasing miniaturization of circuits, stencil thicknesses in use are being reduced to within the 120 µm range. The result is that the volume of solder paste that can be made available for some components in a typical complex assembly is not enough. In the S1, this challenge was solved through the use of a dispenser. This

enables the exact amount of additional solder required to be applied. These systems are already renowned for their distribution of glue:

Heavy components such as coils are fixed with a glue to prevent them from falling down during the soldering process. This requires the dispenser to be capable of positioning the glue dots at high speed and precision. This therefore places considerable demands on the control algorithms used. The M1 automation system used ensured that the performance required was achieved.

FLEXIBILITY AS A SELECTION CRITERION

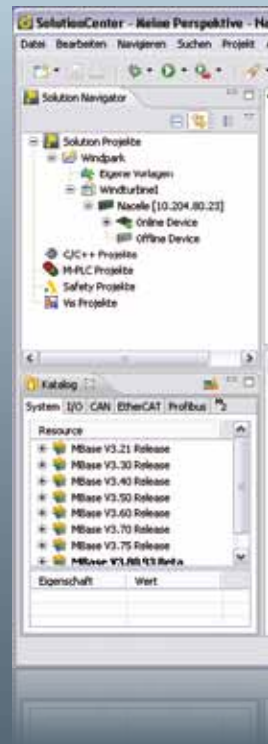
Bachmann controllers are used in a wide range of Ersas systems, where they have demonstrated their outstanding capabilities. The large number of options and the customized solutions particularly called for a highly flexible system that could always be adapted to the latest developments. "The M1 automation system from Bachmann handles the entire control of the selective soldering systems, including the entire multi-axis and temperature control," Michael Schäfer, R&D director at Ersas, explained. "For our customers, this means faster production speeds and greater flexibility."

A BALANCED PARTNERSHIP

If you take a look at the SMT production at Bachmann, you will also find Ersas machines there: The Versaprint S1 stencil and screen printer is used here for the high precision printing of PCBs round the clock. As a result, both companies benefit from the collaboration: Ersas offers its customers a high level of flexibility and production speed. Bachmann in turn can utilize the benefits of its controller on the machines for its own in-house production. ■

FLEXIBILITY WITHOUT LIMITS

Maximum freedom
for SolutionCenter users



The Bachmann SolutionCenter is an all-in-one package that integrates all the tasks required over the entire life cycle of an automation solution. The software therefore accommodates the particular individual needs of the user: The user interface can be adapted at virtually every point. The highly modular plug-in concept makes the central tool easy to expand and can even integrate user-specific extensions and tools. In this way, the SolutionCenter combines maximum functionality with the “feel good” factor that supports users.



bachmann.
SolutionCenter

Already with the arrangement of the windows required for a particular working step, the user can make a selection to suit individual requirements. Different plug-ins, i.e. subcomponents of the SolutionCenter, open up their own editors. This enables the user to specify the windows to be opened, as well as their size and position. This feature is therefore an ideal way of accommodating the individual needs and abilities of the user.

STRUCTURING THROUGH WORKING AREAS AND PROJECTS

The number of saved projects normally increases over time. A structuring system entirely adapted to the user therefore helps to maintain the overview: Different project types can be stored systematically according to a structure in different working areas. All data for a particular project can be managed centrally. The user therefore has the overview over all current versions, thus allowing several team members to work in parallel on the same project with maximum safety.

INDIVIDUALLY TAILORED TO THE SMALLEST DETAIL

Several user-specific settings can be made for each working area: Thus the particular fonts of the editors can be selected, in the same way as



M-BASE V3.80R

NEW

New Software Release

the position of buttons. Shortcuts can also be defined as required. Many experienced users of the SolutionCenter have been trained beforehand in other software tools. The ability to use the shortcuts they are familiar with is consequently a particular benefit. This makes initial training for users considerably simpler and faster.

EXPANDABILITY WITHOUT LIMITS

When a new software is introduced, it is mostly the basic requirements that are used as the decision criteria. However, the possibilities for further expansion in particular should rightly also be given consideration. This is where the Bachmann SolutionCenter especially stands out: The modular plug-in system enables new functions to be added at any time. A large number of software packages are available for download worldwide. The expansions are easy to implement and are integrated seamlessly into the SolutionCenter. Existing developments remain available without any problems.

This is where the SolutionCenter stands out: Individuality is a top priority at Bachmann as well as maximum functionality. ■

The comprehensive M-BASE software package Version 3.80R is now available. All software products from Bachmann can be updated and extended with it.

The new features mainly focus on the area of PLC programming. The M-BASE V3.80R version now makes it possible to use up to 16 tasks simultaneously in a program. The development of modular software for the M1 is thus even simpler.

The controller software was also further improved in terms of safety and stability. The implementation of NAT (Network Address Translation), which makes the M1 into a gateway of the internal networks of a machine or plant, means that any additional hardware such as an external router is no longer required. The configuration can also be completed quickly.

The new intuitive libraries simplify programming even more. These are available in a number of programming languages. They can be implemented on the one hand as standard applications quickly and simply. On the other hand, there is no limit to the highly complex custom applications that can be created.

With M-BASE V3.80R, Bachmann is further rounding off its range of software products and thus is ensuring outstanding stability. ■

INTEGRATED CONDITION MONITORING

A look into the future of automation
systems for wind turbines



Wind turbine generators are becoming considerably more complex and similar to power stations. As there are hardly any empirical values, particularly in the case of machines in the offshore sector with outputs in the multi-megawatt range, their construction is increasingly pushing engineers to their limits. The continuous collection of data is therefore crucial in ensuring the planned lifespan of the turbines or even to extend it. Condition monitoring systems record this data and enable proactive operational management in the future to forecast how the condition of wind turbines will develop. For this Bachmann is offering a unique solution and will continue to further support this trend-setting development.



CMS

Condition
Monitoring
System

Wind turbines, unlike the majority of conventional machines, operate continuously under extremely dynamic environmental conditions with considerable changes in load. The knowledge gained from conventional machine building is therefore difficult to apply here. When decisions have to be made during the design phase of wind turbines, there is therefore a growing lack of experience to draw on concerning the lifespan of the selected design. It is virtually impossible to determine in advance the loads resulting from the various vibrations occurring in different subsystems.

HIGHLY COMPLEX SYSTEMS

The operation of a wind turbine generates an enormous volume of data for which in many cases the internal correlation does not exist. The identification of typical patterns of "unhealthy developments" is therefore difficult: The number of possible influencing factors make an evaluation impossible. The tremendous dynamics involved in electrical process variables that can change considerably in fractions of a second add to this difficulty.

SERVICE AND REPAIR AT A HIGH PRICE

The physical presence of service personnel is often necessary in order to rectify any damage or faults that occur. These service technicians carry out the necessary inspections or repairs directly on site. Expensive technical resources such as special ships or helicopters are required in this case, especially in the offshore sector. Adding to this difficulty is the fact that weather

conditions often restrict the possibility to access offshore installations to half the number of days in a year. This may then lead to considerable downtimes in electricity generation. Not only do reputations and the establishment of wind energy suffer: The shutdown of a wind energy plant usually means a considerable loss in turnover for the operator.



The lifespan of a wind turbine can be increased with a proactive operational management.



OBJECTIVE: ECONOMIC VIABILITY

The economic viability of wind energy plants is critical for their success. The time and energy availability of these installations must be ensured. The linking of online analysis and diagnostic functions with the operating data of a wind turbine is therefore vital. This enables the operator or service company to determine any harmful or unwanted developments in the systems at an early stage. The latest and most reliable process for this is currently the body sound based monitoring of bearings and gears as a basis for condition monitoring (CM).

CONDITION MONITORING FROM BACHMANN

The possibilities resulting from the necessary connection of operating data from the wind turbine controller and CM data were recognized by Bachmann early on and in a groundbreaking development. With the M1 automation system and the AIC212 CM module, Bachmann has been offering a combination that has as yet been unique in the wind sector for measuring and processing vibration and operating data in the continuous operating process. This integrated solution is now even going one step further. Example: The startup and shutdown of the generator, emergency stops or sudden changes in wind direction cause peak loads. The CM system can mask out the resulting higher level of accelerations or characteristic values. Determining the development of damage parameters is clearly possible. This simplifies the diagnosis of the cause of damage and improves the reliability of forecasting the further damage trends. After all, diagnostic reliability is currently one of the most important reasons for the establishment of condition monitoring on the market.

RAPID TROUBLESHOOTING

The collected data can be divided into different operational categories such as wind or turbulence classes, as well as braking or startup situations. When a signal or other fault indicators increase, the cause can be identified more quickly and accurately. The values of any number of controller variables can be linked with the CM data via an internal interface, the so-called standard variable interface (SVI). This eliminates a weakness of the autonomous CM systems used in the past: These previous systems only enabled a few parameters, such as speed, wind and output to be recorded, in order to save costs and to minimize the measuring technology required. Nowadays large volumes of data can be collected. Furthermore: With the Bachmann solution, the separate processor required for the CM system in the past is no longer needed.

KEY PERFORMANCE INDICATORS AS A BENCHMARK

The Bachmann automation system allows any amount of data to be correlated. In future, Matlab™/Simulink™ tools will even be able to use a model comparison to perform complex, multidimensional examinations of the "health" of a wind turbine subsystem, in which key performance indicators or KPI are formed. Whilst the exact interrelationship of the variables is unknown, it can be compared in a self-learning matrix in relation to a "healthy" original state. If these KPIs change during the operation

of the wind turbine, measures can be taken to reduce any harmful loads. The output of the wind energy plant can also be restricted to a lower but more optimum value until the next inspection or maintenance operation.

TRANSITION TO PROACTIVE OPERATIONAL MANAGEMENT

The growing professionalization of the wind sector has increased the importance of the overall costs of wind energy plants. A knowledge of those operating parameters that extend lifespan – primarily load reducing parameters – is therefore becoming increasingly more important and valuable. In future, considerably more importance will be placed on damage prevention by optimizing operating parameters, in other words proactive operational management. Reactive operational management or the early detection of possible damage will have less of a priority.

FUTURE DEVELOPMENTS

Automation systems for wind energy plants will also in future take over the damage-related area of operation. Their main task however will shift to load management. The Bachmann controller, or more precisely the AIC212 module, already measures some of the loads of the drive train. In future, the systems that generate these loads, i.e. the rotor blades and the pitch system will increasingly take center stage. The tower structure and its foundations that direct the load into the ground will also have a greater importance.

Bachmann will also here offer competent solutions for manufacturers and operators. The developments of the company in the past have already been trend-setting. In future also, Bachmann will be taking the lead. ■

Maximum profitability

The benefits of a networked wind energy plant equipped with the Bachmann Condition Monitoring System are obvious:

- ▶ Longer service life of components
- ▶ Lower maintenance costs
- ▶ Lower insurance premiums
- ▶ Low life cycle costs
- ▶ Higher plant availability
- ▶ Efficient utilization
- ▶ Plannable service intervals
- ▶ Higher yield

LOOKING AHEAD

HMI and SCADA systems from Certec EDV GmbH strengthen the expertise of Bachmann electronic in complete solutions



▲ Michael Haas, CEO of Certec and Bernhard Zangerl, CEO of Bachmann electronic



The long-term and worldwide development of new technologies can only be achieved with a close partnership with manufacturers like Bachmann. The participation will also ensure the long-term availability of our products.

Michael Haas, CEO of Certec

The increasing complexity and the constantly rising level of automation in a wide range of different installations require future-oriented technologies for monitoring and controlling processes. SCADA systems make a key contribution here and ensure the highest level of safety. This is particularly the case if they offer operation that is not restricted to a particular location or device. Certec EDV GmbH headquartered in Eisenstadt (Austria) specializes in the development of web-based HMI and SCADA systems. With the takeover of Certec, Bachmann electronic GmbH is strategically expanding its product and service portfolio.

BROAD-BASED KNOW-HOW AND MANY YEARS OF EXPERIENCE

With 20 employees at present, the company has an extensive application know-how and many years of experience. The company, which was founded in 2005, has demonstrated this with its atvise® product line: atvise® offers the world's first fully featured HMI in pure web technology as well as a SCADA solution that is fully compliant with the OPC Unified Architecture (UA). This enables efficient object-oriented engineering and extensive plant operation at any location and with any device and any standard web browser.

BACHMANN FURTHER EXTENDS ITS EXPERTISE IN COMPLETE SOLUTIONS

As a supplier of complete system solutions in the automation field, Bachmann electronic aims to expand its existing portfolio with the innovative technologies and further extend its expertise in offering complete solutions. As of January 1, 2012, Bachmann electronic GmbH has held the majority stake in Certec EDV GmbH in Eisenstadt (Austria), which has thus become part of the Bachmann Group. The company management of Certec remains unchanged. The Certec headquarters will also remain in Eisenstadt, as well as the distribution network and the broad availability of the product line.

TAILORED TO CUSTOMER REQUIREMENTS

"With this step we are taking the requirements of our customers into account and are continuing to pursue our strategy as suppliers of complete solutions," Bernhard Zangerl, CEO of Bachmann electronic, explains the merger. ■

ELECTRICITY FROM WASTE HEAT

Recovering Waste Heat from CHP Plants for Electricity Generation

There are approximately 6,000 gas installations in operation in Germany, where biogas is produced from renewable materials and converted to electricity using combustion engines. These systems can be designed to be more energy efficient not just by optimizing engine operation, but especially by using the waste heat produced. The Gesellschaft für Motoren und Kraftanlagen (GMK) is a company that supplies complete solutions for producing an electricity supply for onsite use from the waste heat of the CHP plant. Bachmann electronic supplies the control elements that represent a fundamental part of the entire process control system.



The Gesellschaft für Motoren und Kraftanlagen mbH (GMK) based in Bargeshagen (Germany) was founded in 1994 within the scope of a research project of Rostock University. Today GMK with around 25 employees at its Bargeshagen site in Germany belongs 100% to Germania Technology Holding GmbH. Its core competence is the engineering and development of ORC modules.

GMK is headquartered in Bargeshausen (Germany) and is a leader in the development and production of innovative energy efficiency technologies. The company focuses on the generation of electricity from geothermal heat and the waste heat produced in industrial and energy sectors: Organic rankine cycle (ORC) modules are supplied as complete solutions. GMK has been awarded several prizes for its R&D activities in the field of environmental and efficiency technology: the Biogas Innovation Prize 2011 of the German Association for Agriculture, the Ludwig Bölkow Technology Prize 2009 and the prize of the Climate Protection Campaign 2006, awarded by the Federal Ministry for the Environment.

INNOVATIVE ORC TECHNOLOGY

It is the declared aim of the legislators to replace the energy produced from coal, mineral oil, natural gas or uranium as much as possible with renewable energy carriers, and to deploy these as efficiently as possible. As well as optimizing engine operation directly, the recovery of waste heat for electricity generation with ORC is an important approach towards sustainable energy generation. The ORC module thus supplies electricity to the entire biogas plant, the farm, including milking parlors, slurry pumps, ventilation and lighting, as well as residential buildings and stables, thus reducing the load on the public utility grid.

IC60 SYSTEMS WITH THE BACHMANN CONTROLLER

The IC60 module is an ORC module from GMK for recovering the waste heat from biogas engines, in which excess heat previously had to be discharged unused. The series production of the IC60 modules uses Bachmann control elements as a key component in the process control system. The automation system was adapted here to the requirements set by GMK: The close partner-based

collaboration and the user-friendly compatibility of the controller elements enabled Bachmann to supply an individually tailored system solution for the customer.

COLLABORATIVE CREATION OF A CUSTOMIZED SOLUTION

The logging of all key process data directly in CSV format was specially implemented for GMK. This allows day and hour log files to be stored on an external data carrier and to be fetched directly for teleservice tasks from the company headquarters. As the data with exact time stamps can be evaluated as a cross table, this software optimization enables the operation of the entire system to be considerably improved. The data logging and processing as a CSV file was completely programmed by Bachmann and integrated in the customer application.

Bachmann also supported the company in the implementation of the bus systems (Modbus TCP/RTU, CAN, Mbus). For example, direct speed measuring with the CNT module and averaging were implemented for GMK. As well as the possibility to remotely access their plants, GMK also recognized the Java code based visualization as a clear benefit of the Bachmann automation system. The visualization can be designed with little effort as a Windows, Linux, VxWorks or web application.

EXCELLENT AND PROFESSIONAL COOPERATION

To GMK the benefits of the Bachmann automation system are obvious. "The outstanding feature of the Bachmann controller is the flexible and user-friendly data logging and evaluation for optimizing the ORC process," Dr. Ulli Drescher, head of R&D at GMK mbH enthusiastically explains. "The impressive price/performance ratio of the integrated automation system was in no small part a key factor in our final decision to enter the close collaboration with Bachmann." ■



"The outstanding feature of the Bachmann controller is the flexible and user-friendly data logging and evaluation for optimizing the ORC process."

Dr. Ulli Drescher
Head of R & D at GMK

Organic Rankine Cycle (ORC)

The organic rankine cycle (ORC) is a process for operating steam turbines for electricity generation. Instead of steam, organic fluid is used that has a lower evaporation temperature. In this way, the waste heat of the process can be used with greater energy efficiency.



▲ IC60 ORC module in the container

SIMULATING REALITY

GMP232 grid measurement module in operation at the Fraunhofer IWES

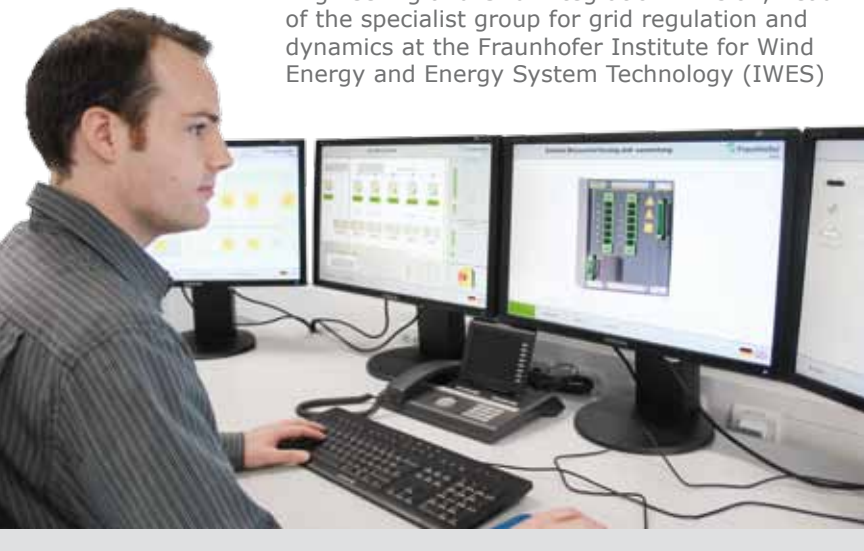


▲ The activities of the research and testing laboratory for grid integration (PNI) include the testing of grid components and equipment.

The energy transition has put the spotlight on renewable energies as key sources of energy supply. In this process, the redesign of the power supply grid is of critical importance: After all, a wide range of different energy producers have to be integrated. The fact that the energy from the sun, wind and other sources cannot be supplied at a constant rate poses a major challenge. The PNI testing laboratory for grid integration at the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) in Kassel, Germany, provides the facilities for testing the necessary innovations on grid components and for testing grid operation in practice. It is here that Bachmann's GMP232 grid measurement module is making an important contribution.

» ***The GMP can be adapted to our requirements and that is exactly what we need here.***

Dipl.-Ing. Dominik Geibel of the Systems Engineering and Grid Integration Division, head of the specialist group for grid regulation and dynamics at the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES)



At the PNI laboratory, grid components and equipment can be developed and tested in realistic conditions in terms of new system functions. The main focus of the laboratory is the investigation and testing of the grid interface of storage facilities, generators and combined heat and power generation plants. The PNI also focuses on adjustable load appliances, electric vehicles and transformers. Tests in the low-voltage grid up to 1.25 MVA and in the medium-voltage range up to 6 MVA are carried out here.

TECHNICAL INFRASTRUCTURE

The test facility and the test sequence is controlled from a central control room. All relevant electrical data, in particular power quality parameters, can be acquired, recorded and analyzed here: This is where the GMP232 grid measurement and protection module from Bachmann electronic is used. "The GMP is integrated in the central controller and provides for a wide range of functions that are very important for the flexibility of our measurements," explains Dipl.-Ing. Dominik Geibel, head of the specialist group for grid control and grid dynamics in the Systems Engineering and Grid Integration Division. The module can measure up to 690 volts. "We haven't been able to find this anywhere else," the graduate engineer sums up. "As we don't have to incorporate any external module, it offers us a considerable degree of freedom."

ADAPTABLE AND EASY TO INTEGRATE

The GMP232 enables a grid point to be monitored completely. In all, 17 of these modules are installed in the PNI. "The GMP can be adapted to our requirements and that is exactly what we need here," Dominik Geibel explains. Applications developed in Matlab™ and simulated



Fraunhofer IWES

The research activities of the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) founded in 2009 cover all aspects of wind energy and the integration of renewable energies into energy supply structures. The IWES in Kassel currently employs around 240 scientists, staff and students. The annual budget for the institute section was around 15 million euros in 2011.

in Simulink™ can be loaded directly onto the controller without any intermediate steps. This is important for future projects: Online simulations can be carried out without any training in special programs required.

"The GMP was one of the key factors in our decision to work with Bachmann," the expert explains. What's more, compliance with IEC 61850 was also a persuasive argument. This protocol is used in the PNI to activate the switch panels and the decentralized generators in the grid. We also received very good support from Bachmann for the initial training. All entry obstacles have been as good as overcome. "We were greatly impressed by the overall concept of Bachmann electronic," Dominik Geibel sums up.

VISUALIZATION WITH ENHANCED MONITORS

The controller is configured via the visualization of the Bachmann SolutionCenter – both for the web terminal displays in the laboratory itself as well as for the computers in the control room. "Here we use enhanced monitors for the GMP," the engineer explains, "the Scope function and the grid diagram in particular are very helpful for our work." Measurement information, such as the actual grid status or the power flows are clearly displayed. The data is synchronized using the Precision Time Protocol (PTP).

The static and dynamic behavior of all kinds of decentralized generators can be tested on the grid interface in the PNI. Simulators for emulating

PV installations are available for creating the all weather test conditions for PV power inverters. The benefits are obvious: For example, configurable distribution sections for low and medium voltage not only enable the testing of individual components, but also the testing of their behavior as part of a system. Mobile test apparatus also enable onsite testing, for example in large wind farms and solar farms. The IWES also offers these services to companies. However, the key interest of the PNI is the development of reliable new system components for the supply of power from renewable energies.

Bachmann is actively engaged in the renewable energy field: The company is helping with its products to use these energies efficiently, safely and reliably. With the implementation of the GMP232 in the laboratory of one of Europe's leading research organizations, the company is helping to further advance this development. ■

▼ The main building of the Fraunhofer Test Center for Smart Grids and Electromobility in Fuldatal-Rothwesten near Kassel, Germany, is the site of the PNI research and testing laboratory for grid integration. With this facility, the institute has further developed its unique position in Europe.



SYSTEM BACKUP AT THE PUSH OF A BUTTON

BSM Stick: Small, time saving and cost effective

► **BSM Stick:** 8 GB USB stick for Linux and Windows devices with pre-installed Bachmann System Maintenance Utility



Faults in the operating system of visualization devices also frequently give rise to the failure of the machine. The Bachmann System Maintenance Stick (BSM Stick) enables the affected devices to be reset simply and quickly. This increases the availability of terminals and industrial PCs (IPCs) at the same time, thus also increasing overall system availability.

The BSM Stick combines an 8GB USB stick with the Bachmann System Maintenance Utility, a graphical backup and restore program for Linux and Windows terminals or industrial PCs from Bachmann electronic. A standard PC keyboard is all that is required to operate the program. Complete backups of the operating system on the USB stick can be created virtually "at the push of a button". The restore operation can also be completed with the "One click recovery" function, even by inexperienced machine operators.

The Bachmann System Maintenance Stick supports all operator terminals of the OT200 (from Q3/2012) and OT1300 series, as well as the industrial PCs of the IPC1400 and IPC300 series. ■

WE'VE MOVED!

The Bachmann Office Bochum has a new location



Since November 1, 2011, the Bachmann office in Bochum can now be reached at its new address in Konrad-Zuse-Straße. After over ten years, the space available in the premises at the Ruhr Technology Center was being pushed to its limits. It was therefore necessary to look for a new site.

The Bachmann Office in Bochum currently employs nine application engineers and two student interns. The impressive new building offers 310m² of office space for 16 workplaces thus providing reserve for a further expansion of services. As well as a well-equipped laboratory for testing and simulating all customer applications, there is also a seminar room that can accommodate up to 15 people.

The new address Bachmann Office Bochum
Konrad-Zuse-Str. 3,
44801 Bochum (Germany)
Tel.: +49 (0) 234 / 93 25 98-0



FAST, SAFE AND USER FRIENDLY

Attractive Linux terminals for HMI applications

Bachmann presents a new generation of terminals: The OT 1300 series stands out on account of its slim and robust design. The LED backlight displays are available in a wide range of sizes between 10.4" and 19". The Linux operating system makes them an ideal platform for HMI applications and ensures outstandingly easy commissioning.

The operating system and application data of the OT 1300 are stored on the 2 GB SSD. If required, the memory can be expanded through the use of an optional CFAST card. The SLC (single level cell) memories outperform the frequently used MLC (multi level cell) memories on account of their higher speed and level of safety. They also offer a longer service life and an extended temperature range from -40°C to + 85°C. The Linux file system used also ensures safety in the event of sudden power failures, as well as enabling short boot times and fast data access.

Thanks to the browser-based terminal setup software (TSSW), the commissioning of the terminals couldn't be easier: Device settings can be configured directly on the device or, if required, remotely from an engineering PC connected via Ethernet. Multi-lingual operator interfaces are created in the usual manner using the VisDesigner integrated in the Bachmann SolutionCenter. ■

Technical data OT 1300 series

- ▶ Embedded E640 processor with 1 GB onboard RAM
- ▶ Linux-based operating system
- ▶ Display diagonals of 10.4", 12.1", 15" and 19"
- ▶ Resolutions from VGA to SXGA on integrated 2 GB SSD
- ▶ LED backlight, dimmable via software
- ▶ Optimum platform for HMI applications
- ▶ Terminals: 4 x USB2.0, 1 x Gigabit Ethernet

THE WHOLE WORLD OF AUTOMATION

Visit us at our fairs:

Learn about latest developments and see for yourself the power of our automation solutions – even in extreme operating conditions.

1

Wind power

We are the driving force behind the automation of wind power. See the power of our future-oriented automation solutions with **integrated condition monitoring**.

2

SolutionCenter

The SolutionCenter engineering tool **saves time in the engineering process**. The highly modular plug-in concept makes this central tool easy to expand and integrate user-specific add-ons and tools.

3

Safety

See for yourself the **integrated safety technology** in our applications and the system's extensive standard connectivity.

5

Marine & offshore

Bachmann solutions open up a countless number of applications on ships and on offshore installations. Our **redundant systems** in particular, maximize availability to virtually total freedom from failure and secure productivity.



4

coldclimate

Whether for condensation or extended **temperatures from -40°C to +70°C**, the coldclimate modules are the answer to extreme climatic conditions.





6

Condition monitoring

Condition monitoring can be implemented either autonomously or as an **integrated condition monitoring system** in the Bachmann controller, that monitors the state of machines and plant components online and is certified to Germanischer Lloyd guidelines.

7

Energy efficiency

The Bachmann automation system is particularly suitable for the control and networking of decentralized power generation systems. Special M1 modules such as the GSP294 allow the **synchronous switching of generators**.



8

Energy park network

Bachmann offers an extensive range of different network components such as the **communication solution with bluecom**.



6

7

8

WE'LL BE THERE



EWEA

Copenhagen, Denmark
16.-19.04.2012
Hall C4, Stand B20



HANNOVER MESSE

Hannover, Germany
23.-27.04.2012
Hall 027, Stand J40



CWEE

Shanghai, China
26.-28.04.2012
Stand 7T18A



OFFSHORE WIND CHINA

Shanghai, China
30.05.-01.06.2012
Stand N4-B020



AWEA

Atlanta, USA
03.-06.06.2012
Stand 5101



SMM

Hamburg, Germany
04.-07.09.2012



HUSUM WIND

Husum, Germany
18.-22.09.2012



BIOENERGY DECENTRAL

Hannover, Germany
13.-16.11.2012



SPS/IPC/DRIVES

Nuremberg, Germany
27.-29.11.2012

When it really counts.

Wind force: 11–12

Wave height: 14 m rising

Humidity: 97%

Controller: >99.96% availability



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