

P&A

PROCESS DIGITALIZATION
AUTOMATION

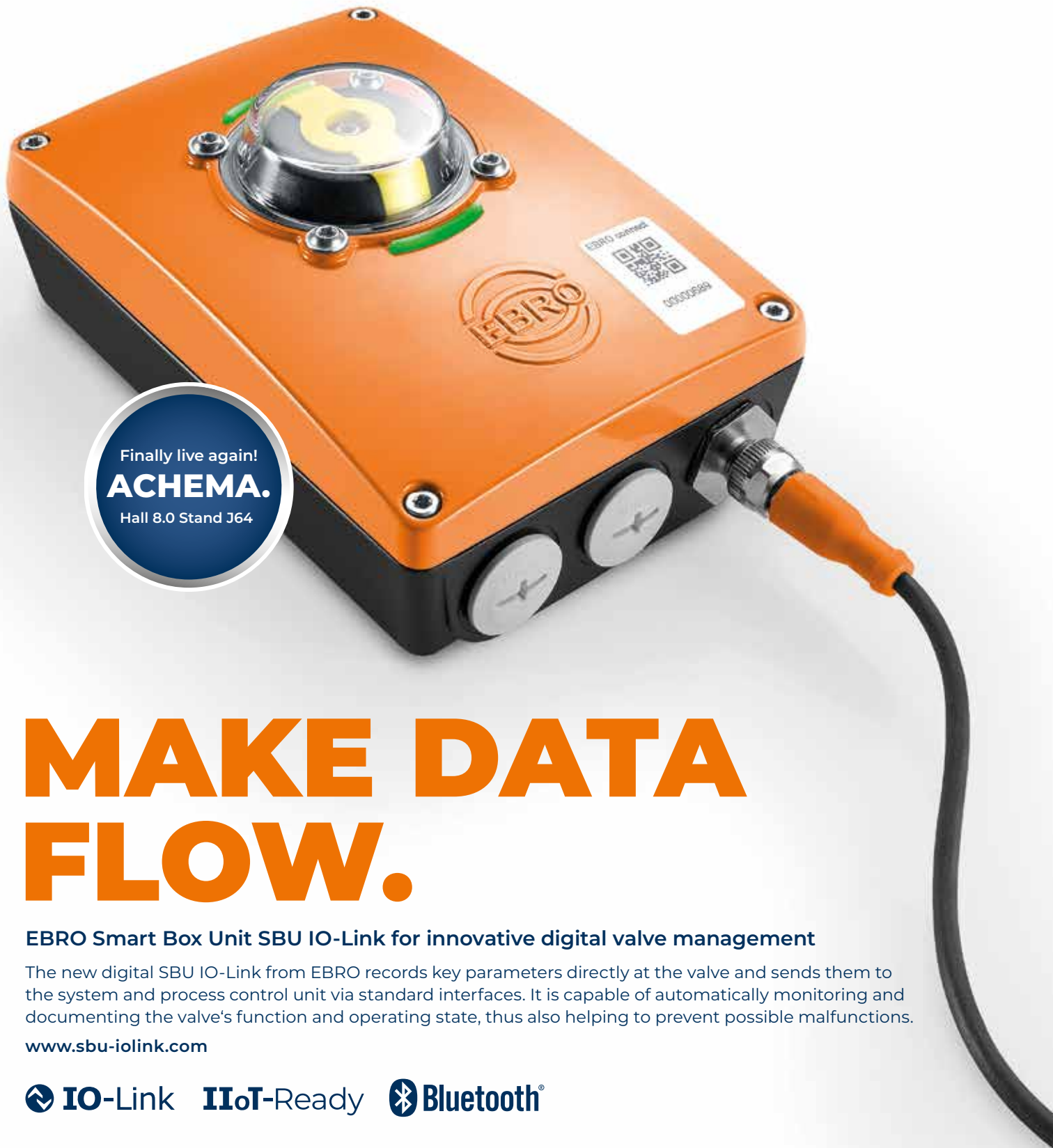


REDUNDANT CONTROL TECHNOLOGY **ACE UP YOUR SLEEVE**

MODULAR ENCLOSURE
For electrical explosion
protection p. 10

MORE POSSIBILITIES
Operating tool
for ex areas p. 12

ACHEMA 2022
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trends p. 17-28



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Ragna Iser, Editor P&A: A spirit of optimism is palpable in the chemical industry worldwide. Projects for the development of a global circular economy and for the reduction of greenhouse gas emissions are being pushed further and further. These are all tasks that are not easy and, above all, cannot be solved alone. So I ask myself:

WHAT IS THE KEY TO TOMORROW'S SUCCESS?

Dr Björn Mathes, Member of the Board of Dechema Ausstellungs-GmbH: As the innovation driver of the global economy, the process industry has impressively demonstrated its strength, innovation power and resilience during the pandemic: From the unprecedented successes in vaccine development to pioneering climate neutrality approaches without the wealth of ideas in our industry, none of this would be possible. But no less challenging times lie ahead of us: Europe aims to become climate-neutral by 2050. In line with this target, the chemical and pharmaceutical industry along with its suppliers is working on new processes and technologies to achieve this goal. Besides the global sustainability shift, the current geopolitical situation also poses massive challenges for the process industry. Last but not least “digital” is driving the industry with ground-breaking innovations and unforeseen challenges coming in fast.



Key to succeed in such an ambitious environment will be cooperation: With this year's Achema – perhaps more than ever – we are sending out a signal that technological cooperation across industry boundaries, but also across national borders, is indispensable for solving the significant crises of our time. To finally reach Net Zero, companies need to focus much more on engaging with their ecosystems and being open to new ways of collaboration. As leading industry platform, Achema will create a nucleus in its lecture and networking formats and in the discussions at the stands, in which the industry works together on solutions.

After so many months of digital meetings, the entire industry is longing for an in-person trade show. So, let's take the opportunity and look forward to what Achema as the world's only comprehensive showcase of pioneering technology and the latest trends in our industry will offer: Inspiration, interaction, innovation. Be there, too, when in August 2022 Achema is finally kicking off the post-Covid recovery and the decade of action to deliver the global sustainable development goals!

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COVERSTORY
Scalable, open, available

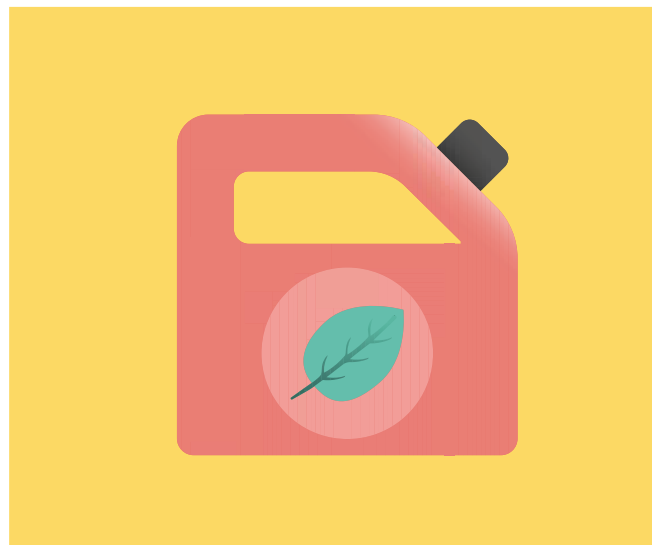
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High-precision fluid bed coating



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PH MEASUREMENT
Biodiesel from waste





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Achieving modern plant automation with PC-based control technology

Scalable, open, available

In the future, greenfield as well as brownfield plants will have to be equipped with innovative automation solutions in order to withstand the increasing competition in the process industry.

In concrete terms, this calls for efficient and flexible plant automation which also meets availability requirements. This goal can be achieved with the universal control system from Beckhoff based on PC-based control technology.

TEXT: Franziska Rostan and Lennart Winkler, both Beckhoff Automation PICTURES: Beckhoff Automation; iStock, allanswart

PC-based control from Beckhoff provides customers with a holistic control system for automating their plants. The industrial PC is the core component of PC-based control technology and forms the basis for managing and monitoring processes in process plants. Thanks to the precisely scalable portfolio, it is possible to use an industrial PC individually tailored to the task at hand to control the plant: industrial PCs are available

in all kinds of different form factors. Support for many standards and protocols ensures cross-system data communication at both the higher-order control level and the field level.

Two different concepts have become established for the architecture of plants. In the centralized approach, all information comes together in a control cabinet, while the sensors



Beckhoff's PC-based control has already been used to successfully implement numerous applications in the process industry.



and actuators are connected via remote I/Os. A decentralized architecture consists of several control systems that are assigned to a specific plant section and take over its process control. Modern automation systems support both concepts – not only on the control side but also through I/O systems that can be operated both as remote I/O and directly on embedded controllers. Beckhoff offers appropriate I/O modules for each scenario for installation in the control cabinet (IP20) or directly in the field (IP67).

In addition to flexible topology, explosion protection requirements are a frequent prerequisite for the use of electrical equipment in the field in the process industry. The greatest challenge for automation here is data acquisition from zone 0/20 via intrinsically safe signals. The I/O modules of the ELX series offer a compact and integrated solution in which intermediate barriers are eliminated. All EtherCAT features can be used, from fast data communication to end-to-end diagnostic options. The portfolio is supplemented by various series of control systems, I/O modules, and control panels for installation in zone 2/22. This enables decentralized control and visualization in close proximity to the process.

Customized software solution

The advantages of PC-based control technology come to the fore not only when considering the hardware, but especially with regard to the flexibility of the software. The TwinCAT automation software has a range of functions, including for visualization or data analysis, but at the same time offers a large number of interfaces to make the data available to other systems. Above all, this means that the user is free to choose their preferred software solution, enabling them to use the best possible tools for their application in a future-proof manner.

The industrial PCs execute the program code for process control as a soft PLC in real time, and their high computing power enables them to process large amounts of data in a short time. This database can be evaluated on the IPC either directly in real time in the PLC code or by integrating external software tools to which the data records are transferred. Data exchange in Industry 4.0 scenarios or IoT solutions is also possible directly in the control system without additional devices via integration into the IT infrastructure. This results, for example, in applications for condition monitoring of entire plant parks, which monitor all field devices with cloud support and recommend measures for predictive maintenance in order to minimize downtimes.

Redundancy for increased availability

To further increase the availability of a plant, redundant architectures can be used to safeguard against failures of individual control components. In this way, communication interruptions can be intercepted by implementing cable redundancy. By creating a ring structure, this ensures that all I/O modules of the system can still be reached in the event of a cable break, for example. With TwinCAT Controller Redundancy, on the other hand, it is possible to run the industrial PC and thus the control program redundantly. For this purpose, standard components are enabled for redundant operation by the TwinCAT software – which means that special hardware is not required. Control redundancy ensures that in the event of a failure of one control system, the second one takes over operation. To this end, the two control systems are connected via network lines which enable synchronization and, in the event of a fault, switchover without loss of information. □



Hall 11.1, Booth C53

Interview on TwinCAT Controller Redundancy

“We make redundancy easy to use”



A control system failure can have fatal consequences, especially in the process industry. This is precisely why redundant systems should be mandatory in critical processes, although they are often highly sophisticated and expensive to implement. Dr. Henning Mersch, Product Manager TwinCAT at Beckhoff, explains in an interview with P&A how fail-safety can now be maximized very simply with redundant control technology.

THE INTERVIEW WAS CONDUCTED BY: Christian Vilsbeck & Jessica Bischoff, both P&A PICTURE: Beckhoff Automation

Dr. Mersch, haven't redundancy solutions from Beckhoff been around for many years?

Yes, that's correct, but until now we were focusing on the fieldbus level. To put it simply, if a cable between the controller and the actual fieldbus elements no longer transmits data correctly due to breakage, mechanical damage, or weak contacts, then we enable redundant communication via EtherCAT using a second cable. Now we are taking things one step further by making our TwinCAT controller itself redundant. If this should fail due to excessively harsh environmental influences, unintentional mechanical stress, or even a technical defect, the second controller can step in seamlessly and take over.

Could you outline the functionality of the new TwinCAT Controller Redundancy solution?

Of course, our controller redundancy is based on taking two controllers that run the same program. This means there are symmetrical images on both sides, and these must be executed with absolute synchronicity. Since it is usually impossible to determine exactly when and if a controller will fail, the second controller always has to be ready to take over the process control along with all important current process values. This requires there to be a data connection between the two controllers. It's a pretty standard requirement across the market and our competitors work on the same basis. Where we differ, however, and what makes our solution so special is that we use a normal Ethernet connection for this, so we don't need dedicated hardware components for synchronization between controllers, unlike our competitors. The technical progress we have made with our TwinCAT controllers means we already have network connections in the gigabit range on board for real-time synchronization as standard. And then there is the communication of the controller at fieldbus level. To this end, each controller features our CU2508 real-time Ethernet port multiplier, and we also link these with a connecting cable. If the data link between the two controllers fails, we need to make sure that each side can decide whether the other controller has failed or just the data link. We do this further down via this second communication channel between the two CU2508s, thereby offering additional fail-safety. From the port multipliers, it all continues downstream quite normally via EtherCAT, where we can also offer redundancy.

Surely there are special requirements for synchronizing the two controllers via Ethernet? Have you developed your own synchronization protocol here to meet your needs?

Absolutely – this is an independent protocol. It doesn't have much in common with EtherCAT either, because we have to transfer completely different data there. In this horizontal communication between the two controllers, the process images not only have to be transmitted as quickly as possible, but also provided in highly optimized packages. This is the only way that the other side can also process the data quickly again in real time. To meet this requirement over Ethernet, we had to develop a new synchronization protocol.

Does TwinCAT Controller Redundancy actually have a primary and secondary system, or does the solution handle this automatically?

Customer feedback and our own experience have shown that it makes the most sense for users to determine this for themselves. It starts with the most trivial applications like commissioning the systems, where very different situations can occur in practice. One controller is therefore defined as the primary system in the control operation, making it the active component, while the secondary system acts passively in the background. In process technology, it is also common to make routine switchovers for control purposes – for example, with redundantly designed pumps. And that's exactly where our controller redundancy comes into play. Users can therefore safely test a critical fault at any time without provoking a deliberate failure.

Is your TwinCAT Controller Redundancy actually completely software-based, or did you have to adapt the controller hardware?

Yes, the solution is an out-and-out software product, which also makes TwinCAT Controller Redundancy extremely appealing in terms of price. But as I mentioned earlier, we use the CU2508 real-time Ethernet port multipliers as additional hardware, which we have had in our range for a long time and so these were not specially developed for this purpose.

So now we can ensure redundancy not only between the controllers, but also right down to field level. But how do the controllers communicate with the higher-level systems in the event of a critical defect?

Our upward communication interface provides a virtual redundancy address with TwinCAT Controller Redundancy. Higher-level systems always use this to communicate automatically with the active system with no indication of whether it is the primary or secondary control. We also offer the possibility of addressing both controllers via their real address. This is necessary in the case of diagnostic programs, for example, if they want to check the status of the redundancy solution. Another new feature is that our TwinCAT controller can also communicate upward via two redundantly designed Ethernet networks using the Parallel Redundancy Protocol (PRP). To this end, two separate network interfaces are used per industrial PC. Users can therefore also implement redundancy above the control level, which is then automatically supported by our controllers.

To finish up, what would you like to say to customers wondering why they should rely on Beckhoff for redundant solutions?

Here at Beckhoff, we still offer a very open interface with our PC-based control and the protection between these two controllers. So rather than having a completely closed redundancy system, we can run customer programs on the controllers without any issues, as is usual with Beckhoff solutions. We are therefore offering something really quite special here that makes redundant control solutions much more suitable for everyday applications with significantly greater usability. At the same time, the state-of-the-art processors in our controllers give them a computing power that far exceeds that offered by our competitors in the field of redundant control. □

Customized solutions for electrical explosion protection

Modular enclosure

Process automation is a field full of customer-specific requirements. No plant or project is the same as any other, and individual requirements vary accordingly. Customers and their suppliers work closely together to optimally adapt plants and processes to the specific environments and environmental factors. These conditions have an enormous impact on the way suppliers work and on their products. This is why a company for electrical explosion protection is providing its customers in the process industry with a enclosure series that meets almost every requirement.

TEXT: Alexander Aust, Pepperl+Fuchs PICTURES: Pepperl+Fuchs; iStock, Larineb

The developers of the SR stainless steel enclosure series did not have an easy task. They faced the challenge to develop a product range that would be able to cover the entire spectrum of stainless steel-based enclosure solutions for ATEX and IECEx applications in the process industry. This meant that all possible customer requirements regarding enclosure sizes, mounting options, operating temperature, and optional accessories, etc. had to be considered.

These and many other requirements have been met to an impressive extent by the developers of this series. The brand-new SR enclosure series is more flexible and modular than almost any other on the market. Customers work together with sales specialists to build their specific solution from this modular system. More than thirty enclosure sizes can fulfill almost every requirement for enclosure solutions in process automation. All of the size options have the flexibility to be installed horizontally or vertically, as needed.

Hinges can be mounted for both vertical and horizontal orientation. Of course, this is only if the customer chooses hinges for their solution in the first place. Furthermore, the customer can opt to position cable entries directly in the individual enclosure sides, or they can choose a solution with gland plates, which can be equipped as desired. Each side of the enclosure can be equipped with a gland plate. Customers can also choose how to mount the enclosure solution. The customer can either use the mounting brackets included in the scope of delivery, which can be rotated by 90°, or screw the solution directly to the wall or a designated frame using a rivet nut.

The array of possible solutions is almost limitless. For requirements with access restricti-

ons, Pepperl+Fuchs offers optional cover security hasps or 1/4 turn key locks. The number and orientation of DIN mounting rails can also be selected completely individually. The customer can even choose the material for the earth stud (nickel-plated brass or SS316 stainless steel) and mounting plates (galvanized or stainless steel).

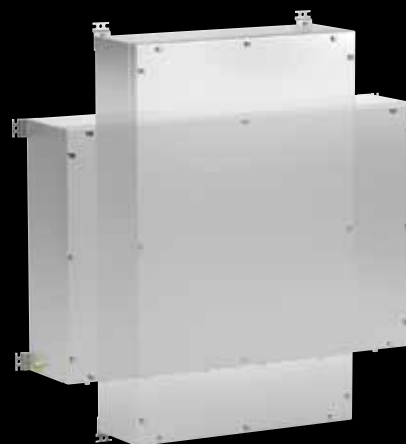
The highest level of explosion protection

However, the modularity and flexibility does not offer added value if the actual customer benefit, namely explosion protection, is not guaranteed. And as expected, Pepperl+Fuchs does not let its customers down here. This is because the SR enclosure series is certified according to the types of protection for increased safety (Ex eb), protection against dust (Ex tb) and intrinsic safety (Ex ia) for use in hazardous areas in Zones 1/21 and 2/22.

Depending on the electrical components installed, the solutions can be used in ambient temperatures from -60 °C to 120 °C. The especially good heat dissipation of the brushed enclosure also enables use in temperature classes (T Class) such as T5 and T6. The enclosure series also meets all require-



The SR series is a modular enclosure system consisting of over 30 enclosure sizes, which are fully customizable – from small junction boxes to large remote I/O units.



ments of safety class IP66. This is ensured by a foamed silicone seal on the cover, which rests on a return flange that is angled 45 degree when closed. This guarantees permanently safe IP protection, since water can drain off to the right and left of the drainage edge without exerting pressure on the seal. Of course, the enclosures are also impact-resistant up to 7 joules and offer protection against electrostatic charge (surface resistance < 1 GΩ). Highly qualified Pepperl+Fuchs employees make sure the electrical components requested by the customer are installed safely. In consultation with the customer, the solution shall be designed to ensure compliance with the maximum power dissipation and the creepage and clearance distance requirements to prevent the occurrence of sparks.

To provide customers with the best possible support in this area, Pepperl+Fuchs serves as a full-service provider for Ex-certified enclosure solutions. In close cooperation with customers, the engineers design customized solutions for on-site use. The SR stainless steel enclosure series is used as the basis for many explosion-protected enclosure solutions. By using electrical components that are also explosion-proof, we can then create customer solutions certified according to the Ex

eb, Ex ia or Ex tb types of protection, such as terminal or control stations, switch disconnectors and safety switches, control units, fieldbus distribution panels, and remote I/O field units.

In addition to customer-specific solutions, standardized or partially standardized solutions are also offered. These are especially attractive to customers who are looking for pre-assembled solutions with especially short delivery times. Usually, these are products that often have the same intended purpose, such as junction boxes and control units. However, fieldbus distribution panels and remote I/O field units are also offered as standard versions, which can be ordered either directly with the item number or after a simple configuration with the type code provided. For the latter, for example, predefined enclosure sizes and enclosures equipped with backplane(s) and cable glands are offered, which the customer can then have equipped with up to 64 I/O modules (FB or LB system) for Zone 1 or Zone 2 applications according to their intended purpose.

Ex e control and distribution solutions

All solutions based on the SR enclosure series are combined with the overarching service concept from Pepperl+Fuchs, which is characterized by a high degree of vertical integration and constant close support for the users. In addition to the globally represented regional sales team, product specialists are on hand to implement all project steps in the Solution Engineering Centers (SEC) – also located around the world – from solution design and detailed engineering to approval and on-time, high-quality production of the customized control and distribution solutions. □



Hall 11.1 Booth A41



Operating Tool for Ex areas

MORE POSSIBILITIES

In device and machinery building, the operation of devices and some machines via computer has long been standard. Even more important is the design of the Human Machine Interface (HMI) for a secure and comfortable usage and a reliable guarantee of functionality for the production process. This is especially important for device elements being used in the demanding Ex field. The requirements here are especially high.

TEXT: Reiner Englert, Bartec PICTURE: Bartec

A deciding criteria for device users is that the operating components are compatible with the software application being used. Every additional software application requires more programming and increases the risk of interfaces, namely functionality problems. The new Smart HMI 12,1 inch W, a self-protecting device from Bartec – world market leaders in explosion protection – is intended for use in areas at risk for explosions (zones 1 and 21), and is an expansion of the proven POLARIS Smart 7 inch line of products. It is based on a Windows operating system for external visualization software. Applications can be used without additional modification in zones 1 and 21, due to the conventional display resolution of 1280 x 800 pixels. The system is also compatible with the Bartec Visualization Software BMS-Graf-Pro.

The Polaris Smart HMI 12,1W is clean-room-compliant due to its gap-free design; through optical bonding, the capacitive touch display is low-reflective and readable in sunlight. The repair-friendly construction is modular, with the display and processing unit separate. The standard Panel PC comes equipped with an Ethernet interface and multiple USB interfaces. The system can also be expanded retroactively to include additional interfaces and functions, through the use of expansion modules and smart devices.

Reiner Englert, Product Manager for HMI at Bartec: „The features that the Polaris

Smart HMI-Series possesses are unique in the market and are evidence of our unequivocal customer focus, as the requirements of our customers are our highest priority. The device is not only available in multiple variations, but is also equipped with a standardized display resolution for direct integration of application projects. The customer can use this to install their own control software under the protection of their company-specific IT security standards.“ The front panel insertion allows for an easy installation. The devices are also available, on request, as ready-made system solutions in stainless steel enclosures for wall or floor mounting. The Smart HMI 12,1 inch W compels with its slim, modern design and effects the visual impact of every machine. □



Hall 11.1, Booth E76



Precision manufacturing method

PRECISE BURST BEHAVIOUR IN HARSH PROCESSES

Ever-changing challenges in various different manufacturing processes are increasing the demands of plant operators for smooth efficient and totally safe processes.

TEXT: Claire Lloyd, Rembe PICTURE: Rembe

The continued development of in-house technology by the German rupture disc manufacturer Rembe allows the company to manufacture rupture discs with sustainable advantages and industry-leading performance characteristics for a wide range of industries and sectors.

The secret lies in the so-called Contour Precision Lasering (CPL) process where the predetermined breaking points are sublimated using a laser with high-tech equipment and not, as is the case with other manufacturing methods, mechanically scored. This high-tech production method includes a digitisation of the rupture disc contour, whereby extremely high structural stability of the rupture disc as well as the most precise burst pressure and opening geometries are achieved when bursting. Based on this innovative technology, the Sauerland-based company is creating the CPX technology series. Thanks to its improved, high-precision and at the same time robust features, CPX is excellently suited for industries with harsh conditions, aggressive process media and even for processes in which strict hygiene standards must be met.

In contrast to traditional mechanical scoring, with the CPL manufacturing method, the material structure of the rupture disc (including the opening lines of the rupture disc) is not thermally affected or mechanically integrally weakened. The surface facing the process remains completely smooth and without unevenness, scratches or indentations, which means that the rupture disc cannot be affected by product deposits from the often-aggressive process medium. Two common

causes for a premature failure of the rupture disc, namely corrosion and pin-holing, are therefore virtually eliminated. These phenomena in conventional scored rupture discs can ultimately lead to leaks in the process or to premature bursting of the rupture discs. The loss of toxic or expensive process media into the environment as well as the premature operational shutdown are only the most serious examples for the undesired and sometimes devastating consequences of a rupture disc failure in running processes.

The IKB-, IKB-X- and SFD types are the classics of the CPX series. Even rupture discs already installed in plants can easily and quickly be replaced with a CPX version, which means that, in addition to maximising plant availability, the incurred operating costs can also be reduced without much effort. □



Halle 11.1, Stand A27

Esomeprazole pellet production for MUPS applications

HIGH-PRECISION FLUID BED COATING

MUPS formulations are a widely used pharmaceutical dosage form for esomeprazole, a proton pump inhibitor. Micropellets are coated for this purpose with the active ingredient and administered in the form of tablets or capsules.

TEXT: Bastian Käding, Romaco Innojet PICTURE: iStock, Evgeniy Skripnichenko

Esomeprazole blocks the production of stomach acid and is therefore used, amongst other things, to treat gastric and intestinal ulcers and prevent reflux symptoms. The acid-labile proton pump inhibitor is absorbed in the intestine and either administered parenterally or taken orally as an enteric-coated preparation. The drug is accordingly available as an injection solution or in the form of tablets or capsules, for example so-called multiple unit pellet systems or MUPS for short. For these preparations, micropellets containing active ingredients are either mixed with powdery excipients and then compressed into tablets or alternatively filled into capsules.

One big advantage of MUPS tablets is that they dissolve easily, so that the pellets with the active pharmaceutical ingredients (API) pass through the stomach quickly due to their small diameter, regardless of whether or not it is full. The medication is consequently characterised by a highly controlled release profile and high bioavailability. Since the active ingredient of MUPS tablets is distributed between a large number of pellets, the tablets can also be halved. By contrast, dividing coated sustained-release tablets in two would have negative effects for consumers: the active ingredient would be released immediately after swallowing, which would be tantamount to dose dumping. MUPS formulations, on the other hand, facilitate compliance.

Esomeprazole pellets for MUPS applications are often produced in a fluid bed coating process comprised of three stages. First of all, neutral starter pellets made from glucose are sprayed with the aqueous API suspension. A protective insulating layer is applied next, followed by the enteric sustained-release coating, which ensures controlled release of the drug in the intestinal tract.

Depending on the formulation, the diameter of the micropellets increases from approximately 300 µm (microns) to 1300 µm during the coating process. Parallel to this, their weight is roughly trebled from about 1.5 g to 4.7 g per pellet. Several days are usually scheduled for this method in the pharmaceutical industry. The fluid bed processors in Romaco Innojet's Ventilus series meet all the requirements of this demanding production process, which is based on the air fluid bed process technology developed by Dr. Herbert Hüttlin.

Three functional units make it possible

The interaction of three functional units – Orbiter, Rotojet and Sepajet – in these fluid bed processors from Romaco Innojet lays the foundation for high quality and efficiency in the pro-



duction of esomeprazole pellets. In this innovative process, the process air is introduced into the cylindrical product container through the Orbiter booster, resulting in a spiral product movement. The spray liquid is applied with the central Rotojet nozzle by the bottom spray method and the process air is subsequently discharged again via the Sepajet filter system.

The so-called Orbiter booster plate consists of overlapping circular plates that ensure homogeneous flow inside the container. The speed of the micropellets and their path through the container can be precisely controlled in this way, preventing the particles from colliding and agglomerating. The risk of this happening is particularly great when spraying on the very sticky enteric suspensions. Esomeprazole coatings, on the other hand, tend to be highly abrasive, which is why gentle intermixing of the batch without any mechanical stresses is so immensely important.

Due to the controlled movement of the process air, the coating liquid can be applied very precisely with the central Rotojet spray nozzle. The liquid spray is directed upwards at the product bed (bottom spray), so that spray loss is significantly reduced. In addition, the rotating nozzle head effectively prevents blocked spray nozzles. This is especially vital when the sustained-release coating is applied to the esomeprazole pellets, because the enteric coating liquid polymerises easily. To optimise the coating process even further, the air temperature – and hence the product temperature – around the nozzle can be controlled differently than in the rest of the process container. This ensures particularly efficient drying and enables very short processes.

The particle droplet size is defined by the spray air introduced above and below the circular spraying gap, so that no over-wetting of the product occurs during the MUPS coating pro-

cess, which takes several hours to complete. The pellets are built up homogeneously, which results in maximum moisture extraction. This shortens the drying time by up to 25 percent and reduces the system's energy consumption dramatically. What's more, the Rotojet nozzle can be easily replaced during the actual process without having to stop production and empty the product container. Far shorter batch processing times are the outcome.

Process air is discharged via the Sepajet filter system, which was specially designed so that the particles are constantly returned to the process. Conditioned process air cleans the individual filter bags continuously throughout the production cycle. This hot, conditioned cleaning air prevents condensation and helps extend the filter system's service life. At the same time, the geometry of the filters permits a compact machine design.

The space saved in the cleanroom is another advantage on the sustainability side, first and foremost because only one machine is needed to produce esomeprazole pellets. The fact that the cylindrical product container allows filling from ten to 100 percent means there is no need to empty the batch and divide it into sub-batches in the event of a process-inherent increase in pellet weight. This leads to a smaller carbon footprint for the process and time, money and storage capacity are saved.

Scale-ups made easy

The production-scale fluid bed processors in the Ventilus series are designed for batch sizes from 60 to 1600 litres. Since the geometry of both the cylindrical product container and the spray nozzle is scalable, scale-up processes are greatly simplified. For instance, once the spray rate, product temperature and process air volume are optimally matched, maximum leverage can be obtained from the fluid bed processor's capacity in terms of performance and quality – as the ideal starting point for developing new esomeprazole products. □



Hall 3.0, Booth B49



Hydrocarbon Processing Industry

EXPLOSION-PROOF AND NON-INTRUSIVE

A manufacturer of measuring devices has a new explosion-proof ultrasonic measurement system for non-intrusive flow measurement and product identification of liquid hydrocarbons brought to the market. The flow measurement is carried out non-intrusively with ultrasonic transducers.

TEXT: Jörg Sacher, Flexim PICTURE: Flexim

With Fluxus H831, Flexim presents the most advanced ultrasonic measurement technology for use in the hydrocarbon processing industry (HPI). It combines highly precise non-invasive measurement of volume flow and sound speed with sophisticated calculation features and is approved for operation in ATEX/IECEx zone 1. Fluxus H831 has two intrinsically safe (Ex-ia) process inputs for connecting pressure and temperature sensors. This allows the transmitter to directly determine API gravity, operational density, density at base conditions and kinematic viscosity. Temperature and pressure compensation allows for precise standard volume flow measurement of liquid hydrocarbons.

Flexim's ultrasonic measuring systems Fluxus measure from the safe side – the outside of the pipe. The practical advantages are obvious: no wear and tear by the medium flowing inside the pipe, no risk of liquid leakage, therefore highest operational safety, and, above all, unlimited plant availability. For conventional wetted instrumentation, high pressure and large pipe diameters mean high costs. Not so with Fluxus. Flow measurement from outside the pipe is independent of the line pressure inside, covers a very large range of pipe diameters and flow velocities.

Moreover, the system is highly cost-effective. For installation no pipework modification is needed, and the system can be installed even within limited space conditions. Capital expenditure is further reduced as Fluxus is highly flexible regarding applicable pipe sizes, does not create inefficient pressure-losses and is virtually maintenance-free.

The new Fluxus H831 is equipped with a database for a wide range of applications from light hydrocarbons (LPG, NGL, TP25 liquids) to crude oils / refined products (ASTM1250 liquids) to heavy hydrocarbons (ASTM1250 liquids). Since Oil and Gas processes and operations vary from location to location, application-specific parameterization is also easily possible via a user-friendly editable table residing in the transmit-

ter and allowing customization of liquid names and physical properties (density, API).

Typical applications for the Fluxus H831 are mass balance, leak detection and interface detection, product identification in tank farms and oil terminals, quality check measurements and verification or temporary replacement of stationary measuring devices. □




Hall 11.1, Booth A16



ACHEMA 2022

Everything Under Control

Ex protected switchgear cabinet for
controlling vaccine production p. 18



Ex protected switchgear cabinet for vaccine production

EVERYTHING UNDER CONTROL

The production of pharmaceuticals and vaccines as well as the preparation for them is complex and demands high standards of precision, purity and safety. Too much is at stake in every respect. That is why strict standards are applied to control components of (production) processes in particular.

TEXT: Robert Kancar, Bartec PICTURES: Bartec; iStock, Toshe_O

Principle of the Ex p pressurized cabinet: The positive pressure on the inside of the enclosure ensures that no explosive gasses are able to penetrate the enclosure from the outside.



Bartec, as safety experts in the Ex field, have collaborated with their client GfS Automation near Frankfurt, a specialist for industrial automation, to develop and deliver a switchgear cabinet that will be used in the Ex field during vaccine production for vaccines against the Covid-19 virus. These were constructed according to the Ex protection principle of pressurized enclosures: the switchgear cabinet is flushed through the introduction of a protective gas and kept under positive pressure so that a potentially explosive gas from the outside environment is unable to penetrate it. The ignition source in the switchgear cabinet that is under this protection would be unable to ignite explosive gas. „We are very pleased that we were able to make a small contribution toward fighting the pandemic," said Robert Kancar, Business Development Manager ESS at Bartec Sales Germany.

The solution as constructed by Bartec differentiates itself from competing products through the high level of vertical integration, more specifically through the use of Ex components and assemblies that were developed and manufactured in-house. Especially in the case of pressurized enclosures, it is of considerable advantage if all of the components installed in the enclosure- such as switches, buttons, Comex control stations, operating and display units (Polaris), as well as the control of the pressurized enclosure (the Ex p Silas control unit)- come from the company's own portfolio. Factors such as accuracy of fit, production quality, and reliability play an extremely important role in this. This also makes construction easier and

accelerates approval; delivery times are more easily calculated and cost benefits realized. On the other hand, the interior doesn't change much at all: the control components specified by or installed by the customers are largely identical to those in the (non-explosion-proof) industry version.

Successful Collaboration

Jochem Halberstadt, Team Leader Hardware Planning Automation at GfS, was impressed with the high amount of flexibility from Bartec and the cooperative partnership: "We work in very close contact to develop client specific solutions. The seminars about explosion protection from the Bartec Academy were exceptionally valuable and helpful, as our employees received the best possible training for the challenging requirements of explosion protection." In the meantime, the basic model of the control/switchgear cabinet has been manufactured and delivered several times; the only differences were in the choice of cooling system, which was changed according to the particular application. Both an air cooling system as well as an air/water cooling system were used. Following successful approval by GfS and the end client, the switchgear cabinets are now in use – Covid-19 remains an issue in the year 2022. Bartec has once again demonstrated its competence and efficiency. □



Hall 11.1, Booth E76

Inquired: „How does the German industry perform in international comparison?“

DIGITIZATION AS A PERENNIAL FAVORITE

Digitalization has established itself as one of the top items on the process industry agenda. The topic is also becoming increasingly important at Achema 2022. How does the German industry perform in international comparison?

SURVEY: Ragna Iser, P&A **PICTURES:** Samson; Siemens; Bilfinger; Pörner; iStock, imaginima





DR. ANDREAS WIDL

The German process industry has been and still is strictly operating based on two main targets: Safety and Security. In times of raising operating costs, digitalization, connectivity, smart devices, APL-based IIoT and last not least ESG measures, a third parameter rightfully enters our industry: Sustainability. Samson has always been a highly recognized manufacturer of first class control valves, on/off valves, positioners and actuators. Since five years we also provide process intelligence to our customer because we strongly believe that hardware and software, solid valve design and self diagnostics, actuators, sensors and field device communication will increase safety, security and operational performance. The German Process Industry is considering the 4th industrial revolution as an opportunity and the Achema 2022 will be our show case.

CEO, Samson

ACHEMA 2022 Halle 8.0, Booth C74



DR. FRAUKE JORDT

Industrial innovation continues to accelerate, supporting German chemical companies to drive digital transformation. Most companies have Industry 4.0 in their sights, and a large proportion are already using digital applications and solutions for production. Leading companies are succeeding in integrating digital technologies into all areas of their business, fundamentally changing the way they work and offer added value to their customers. This is just as true for Germany as for other industrialized nations. For future competitiveness, there is a need to become a digital enterprise by embracing the concept of the Digital Worker, cloud-based process control systems, and ultimately the convergence of all enterprise IT with the manufacturing floor. Another massive driver for transformation is the upcoming shift to sustainable operations. Efficient and quick change requires a comprehensive digital transformation.

Vice President Vertical Management
Chemie, Glass, Oil & Gas, Siemens

ACHEMA 2022 Halle 11.0, Booth F50



GERALD PILOTTO

Digitalization in the process industry is an important factor for achieving the industries goals of safety, efficiency, compliance, and quality. Looking at the market outside Germany, the level of digitalization in Germany still lags behind. The digital infrastructure abroad is more advanced. In emerging countries outside of Europe, significantly more greenfield plants are being built that are thought of digitally from the start. In addition to technological developments, digitalization requires above all organizational development. Both have to be implemented as close as possible to the operational unit. Bilfinger supports their customers in the digital transformation of their work processes, develop intelligent systems for data collection and analysis, and increase efficiencies through the implementation of digital solutions.

Senior Vice President Global
Development, Bilfinger

ACHEMA 2022 Halle 11.0, Booth G4



THOMAS HERMANN

Digitalization led to many advantages for plant engineering companies. We at Pörner Group have been working almost completely digitally with advanced software tools since the turn of the millennium. Database-based 2D/3D CAD systems coupled with 3D laser scanning lead to projects in high quality finished in even shorter time while reducing the presence in the factory. As part of our Plant Engineering 4.0 concept, we started networking our programs early on and made them available wherever needed via Citrix. This avoids data redundancy from the start. The CAD systems with digital virtualization are connected to an ERP system with integrated project and documentation management. Thus, the project is completely digitally documented and can be handed over as 3D viewer with linked documents. These are advantages our customers value.

Head of Piping, Pörner
Ingenieurgesellschaft

ACHEMA 2022 Halle 9.1, Booth B3

New nozzle separator

CLARIFY LIQUIDS

A nozzle separator is mainly used when continuous separation of large quantities of solids from liquids is required together with maximum clarification or separation. A nozzle separator is therefore particularly suitable for use in the starch industry as well as in ethanol production.

TEXT: Tobias Tratner und Julia Deliano, beide Flottweg PICTURES: Flottweg; iStock, DeeNida

Flottweg from Lower Bavaria is now presenting a nozzle separator for the first time and has brought a sustainable and high-performance separation unit to the market using the experience and knowledge gained from more than 60 years as a separation technology specialist.

According to Matthias Gaube, Product Manager at Flottweg, customer inquiries played a key part in the development of a nozzle separator: „Together with our customers, we developed the nozzle separator and focused on one goal: Developing a nozzle separator that is perfectly tailored to customer needs. The result is an innovative, energy-optimized, low-wear design.“ The planning and realization of the nozzle separator took just one year, which meant that we were able to react quickly to the customer's requirements and wishes.

Functionality of the nozzle separator

Flottweg nozzle separators (2- and 3-phase nozzle separators) are used for the continuous separation of solids from liquids and ensure highly efficient clarification or separation. The product to be clarified or separated flows via a stationary inlet pipe into the inside of the bowl and is gently accelerated to operating speed by the distributor. Large solid

particles are separated directly in the centrifugal field of the 2-phase nozzle separator. Finer solids are separated when they flow through the disk stack. The solid particles collect in the bowl's outer solids chambers. From there, they are continuously discharged via the nozzles. The clarified liquid flows from the disk stack and is discharged under pressure via an impeller.

Larger solid particles are separated in the 3-phase nozzle separator as they flow through the disc stack and are then directed to the edge of the bowl by the high centrifugal force. There, they collect in the bowl's outer solids chambers and are continuously discharged through the nozzles. The remaining product stream divides into a middle and upper flow outlet. Solids with a smaller particle size form the middle flow, which is discharged under pressure. The remaining liquid flows through the disk stack, thus creating a nearly clear upper flow. This is also discharged under pressure via an additional impeller.

The nozzle separators also have the largest possible clarification area and can process large quantities of solids

thanks to continuous solids discharge. Customers receive consistently pure solids in the lower outlet. At the same time, the upper flow outlet is optimally cleaned and is ready for subsequent separation processes. Depending on the separation task, the throughput of the nozzle separator can be varied from 40 m³/h to 160 m³/h.

Starch for use in the food industry

Starch can be used in many processes – in the food industry as a binding or thickening agent in the production of baked goods, in soups and sauces, in the paper and corrugated cardboard industry, and in the chemical, pharmaceutical, and cosmetics industries. Optimum



Pump technology for complex media



The bowl is the heart of the new Flottweg nozzle separator.

clarification or separation combined with high solids content is required in the starch industry. Flottweg's nozzle separators are primarily used here. The Flottweg nozzle separator's spectrum of use covers various starch applications. In addition to the production of wheat and potato starch, the nozzle separator can also be used in the corn or tapioca starch production process.

Outstanding results are achieved with the Flottweg nozzle separator, especially in conjunction with the washing or recirculation device. This device makes it possible to feed process/wash water or an already concentrated product directly into the solids chambers upstream of the nozzle outlet, at operating speed, to reliably compensate for product fluctuations. In addition, the washing device separates fiber fragments and dissolved substances from the starch fraction with greater efficiency. The optional 3-phase version of the Flottweg nozzle separator offers a further benefit in the production of wet starch. It can produce a near-clear upper flow that can be returned directly to the process as process water, removing the need for additional fresh water and further steps.

During the development of the nozzle separator, the focus was primarily on sustainability: The saving of resources

and materials together with the efficient design of the nozzle separator allows the product innovation to be energy-efficient yet powerful: The nozzle separator provides high throughput and excellent separation results while consuming very little energy. Influential criteria that also have a particular impact on operating costs and enable costs to be reduced.

Key to these energy savings and efficiency is the heart of the machine, the bowl. The revolutionary design of our bowl saves drive energy. In addition, the nozzle separator bowl is significantly lighter than a conventional bowl and therefore requires less drive energy. The separator bowl design ensures reliable and low-vibration operation. Solids chambers integrated into the bowl prevent uncontrolled sedimentation and can prevent vibrations. The concentrate can be conveyed out of the bowl via the solids chambers without leaving deposits. The size of the nozzles' outlets is optimally adapted to the respective process and to the product to be processed.

Simple and fast maintenance

Already in the design phase, great importance was attached to another feature of the nozzle separator: The design of the separator is optimized for ease of main-

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The nozzle separator is the newest member of the Flottweg family and is particularly suitable for use in the food industry.

tenance. „For us, this means not only optimal maintenance but also the general avoidance of parts requiring maintenance or are subject to wear“, explains Matthias Gaube. „Thus, our contactless sealing system allowed us to significantly reduce potential wear already in the design stage.“ But even maintenance work that must still be undertaken has been optimized to the greatest possible degree thanks to the innovative and low-wear design of the separator bowl. The arrangement of the nozzles creates a natural wear protection of solid material in the bowl. The nozzles of the Flottweg Nozzle Separator are equipped with carbide wear protection for maximum service life. These nozzles can be replaced quickly and easily via a maintenance opening in the housing. The compact spindle drive also deserves special mention: Thanks to the clever design of the nozzle separator, the spindle can be released and replaced quickly by removing just four screws, if necessary.

Whether for food, biotechnology or chemistry, the nozzle separator is ideally equipped to meet the hygienic standards

in highly regulated industrial sectors. The innovative solids chambers in the separator bowl ensure that the concentrate is discharged from the bowl without deposits and that no deposits remain when the machine is shut down.

All components of the separator that come into contact with the product are made of high-quality stainless steel. The hygienic design of the Flottweg nozzle separator avoids dead zones and thus makes cleaning the centrifuge easy. In the food and biotechnology industries, all components that come into contact with the product are CIP-capable (Clean-in-Place) and can be easily integrated into existing cleaning processes.

Ready for use

The first tests with the nozzle separator have already provided clear results: „Since this is a new separator, we were expecting to have to make some changes during the first tests“, explains the product manager, „but the first tests proved us wrong. Almost from the very first moment, we were able to integrate our separation unit into our test partner's process. We were delighted to see that our nozzle separator far surpasses the efficiency targets we have set ourselves.“

Matthias Gaube is also very optimistic about the nozzle separator's field of application: „We have already been able to successfully test our nozzle separator in the areas of wet starch and ethanol production. However, we are in a constant process of expanding our range of applications and are continuously conducting exciting and highly interesting trials.“ □

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pH measurement in a demanding application

Biodiesel from waste

The components used in a biodiesel refinery are subjected to heavy demands – all the more so if the plant is operated with waste oils from food production. At a plant of this type in Singapore, one company is using the technology of a german company for its pH measurements.

TEXT: Dr. Michael Kogej, Knick Elektronische Messgeräte PICTURES: Knick; iStock, Enis Aksoy

There is a long history of producing biodiesel from plant oils. Originally just a by-product in the process of obtaining glycerol for soap production in the mid-19th century, it represents an important source of fuel in efforts to achieve a more sustainable energy supply and reduce our dependence on fossil fuels. Especially in recent years, however, the use of palm oil as the base material for biodiesel production has been controversial, since it requires large areas of land, some of which are created by clearing rain forests. Consequently, biodiesel made from these raw materials will no longer be eligible for tax breaks from 2023 on. A further issue to consider is the “food-fuel dilemma,”

where agricultural land used to produce alternative forms of energy is then no longer available for food production. The use of oils from other sources, such as waste products from food production, therefore represents an interesting alternative to previous forms of production.

Transesterification as a key process

In chemical terms, plant oils are glycerol esters. By adding a monohydric alcohol – usually methanol – these triglycerides react to form biodiesel and the glycerol mentioned above.



Knick's cCare technology enables regular cleaning and calibration of the sensor element – entirely automatically.

Bases are used as catalysts in this transesterification reaction, for example sodium methoxide, which is dissolved in methanol before being added. In the process steps following transesterification, the resulting glycerol is eliminated from the biodiesel through phase separation. The biodiesel is washed, neutralized, and dehydrated, and is then available for use in internal combustion engines.

Transesterification is the key process step in biodiesel production. In addition to temperature and an optimum balance of methanol and plant oil, the efficiency and reaction rate are strongly dependent on the exact pH value, which is set by adding the alkaline catalyst. This value must be measured continuously wherever possible in order to optimize the process and achieve a high level of efficiency.

Waste oils as a base material

Typical biodiesel production plants have a capacity of 100,000 to 200,000 tons per year. One such plant in Singapore is currently being expanded – and its capacity will be significantly increased once the conversion is completed in 2022. Various oils generated as waste in food production, for example, are used as the base material here.

Compared to palm oil, however, these materials are more difficult to handle. Solid particles, viscous greases, organic acids, and ketones, pose a challenge for the components in the plant. This also applies to the pH sensors used for online monitoring and control of the process. These unwanted substances can contaminate or block the sensor junction and thus interfere with the measurement or, in the worst case, render it impossible. Regular, frequent cleaning and recalibration of the sensors is therefore essential in this application. In addition, all components must be able to withstand the highly corrosive media of sodium hydroxide and phosphoric acid used in the process. And since the

production of biodiesel is a potentially explosive application, components with the appropriate Ex approvals are required.

Automatic sensor maintenance system

The pH sensors usually need to be cleaned daily – sometimes even several times a day – and then recalibrated. To make this process as efficient as possible, the plant managers decided to use a fully automatic measuring point from Knick as part of the conversion and expansion of the refinery. The automatic sensor maintenance system is made up of proven components – from the sensor element to the Protos process analysis system and a suitable retractable fitting – and is used for automatic sensor cleaning and calibration. This system, which Knick will present at Achema under the new product name cCare, is unique and significantly increases the degree of automation. It is also the only fully automatic measuring system on the market that is suitable for use in hazardous locations.

One of the challenges in the application was that the SE554X pH probe needs to be immersed two meters into a tank. A Ceramat WA160X retractable fitting was used to facilitate this immersion depth. This retractable fitting operates with a patented ceramic seal; in this version, with a coating of polyvinylidene fluoride (PVDF) on the immersion tube and the sensor housing, it also resists the aggressive media in the process. Even particles or viscous greases in the medium cannot interfere with the function of the retractable fitting.

In the highly automated plant, cleaning and recalibration of the sensors is intended to be fully automatic as possible, without the intervention of personnel. The Unical 9000X programmable electro-pneumatic controller is ideal for this purpose. It actuates the retractable fitting and can remove and clean the sensor without any interruption to the process. To do so, the controller pumps the required cleaning and rinsing solutions from the



Simple Sensor replacement even for 2000 mm immersion depth.

connected storage tanks into the Ceramat chamber – entirely automatically. The sensor is then calibrated with the appropriate buffer solutions. All the steps are carried out fully automatically every day by the controller, with no need for any user intervention. The only thing that does need to be done is refilling of the storage tanks with the cleaning, rinsing, and buffer solutions.

All components with Ex approval

Digital Memosens technology is used for data transmission to the evaluation circuits/transmitters, which practically eliminates measurement errors due to interference on the signal line. At the same time, this technology enables galvanic isolation between the measuring electrode and the evaluation circuit. To record the measured values, the sensor is connected to a Protos 3400 XS process analysis system, which, like all components of

this cCare system, enables use in Zone 1 hazardous locations. Profibus PA is used for the connection to the higher-level process control system (PCS). For this purpose, the flexible Protos system is simply fitted with the relevant communication module. With the bus connection via Profibus PA, the measured pH value can be made available to the PCS, and error messages and alarms are also transmitted directly to the PCS. Thanks to Knick's cCare system, a reliable solution for continuous pH measurement was installed in the biodiesel refinery. A high level of automation ensures optimal measurement efficiency without the need for personnel to perform cleaning and calibration procedures. The measuring point withstands the demanding media and meets the necessary explosion protection requirements. □



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ACHEMA 2022

Stay up to date and experience trends in the field of chemistry, pharmacy, biotechnology, environment and energy from August 22 - 26, 2022 in Frankfurt am Main.

01 Stay up to date

In addition to the transformation towards a climate-neutral chemical industry and the perennial topic of digitalisation, the global political situation also poses massive challenges for the process industry. Which technologies can be used to achieve defossilisation? How to secure and enhance supply chain networks? ACHEMA provides the answers.

02 Fossil Free Production

Production without the use of fossil raw materials is an important and ambitious goal to reduce greenhouse gas emissions in the process industry. The idea of fossil-free production is simple, but there are still many unanswered questions. These will be addressed by the „Fossil Free Production“ theme day on August 23th.

03 Green Innovation Zone

The special area „Green Innovation Zone“ highlights green innovations and the challenges faced by the process industry on its way to climate-neutral production. This area for a more sustainable future brings together pioneers, experts and solution providers from industry, politics, and science with decisionmakers and users.