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CHEMICAL PRODUCTION PLANTS PROCESSES

01-2021

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ALL BORDERS

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Achema Pulse 2021

The past 15 months of Covid-19 have changed the world we live in. Pictures of overcrowded hospitals, mass graves in New York and convoys of trucks carrying away the coronavirus dead are indelibly etched in our minds. Repeated lockdowns in Asia, America and Europe have had a massive impact on our private lives. And ump-teen major international events like the Hannover Messe, Interpack and Achema 2021 have become victims of the contact restrictions imposed in the fight against the virus.

Like numerous other trade fairs Achema, too, has developed a digital path – Achema Pulse. A whole host of trends and innovations, devised and perfected over the last year in splendid isolation, will be on show at this live virtual event. The platform will provide a welcome opportunity for global exchange.

Digitalisation, hydrogen, resilient supply chains or faster R&D processes – the topics currently at the top of the process industry's agenda are as international as the industry itself. The past 15 months have highlighted even more how important digitalisation, flexibility and resilient supply chains are – how important it is for production lines to be set up or adapted rapidly – while simultaneously demonstrating that data security is a matter of utmost business critical relevance. All these issues will be covered during the Achema Pulse live programme on 15 and 16 June 2021. The Highlight Sessions with thought leaders and practitioners will be among the most prominent features along with lectures and discussions that take a close look at today's hot topics. The digital event offers a hub for all those who want to join in the discussion – whether on the interactive platform or in the virtual conference halls.

Around 500 registrations have so far been received from 23 countries – proving just how vital the process engineering community considers this kind of dialogue to be. You can learn how this platform works, which topics are to be debated there and the possibilities available for networking in our Special Subject on Achema Pulse starting on page 7.

We hope you enjoy reading this issue!
Regards,

— Dr. Bernd Rademacher, Editor

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8 Cover Over the last years, plant engineering has evolved from heterogeneous planning in isolated applications to integrated working – also thanks to web applications such as Comos Mobile Solutions.

13 5G could be a turbo boost for numerous applications such as asset monitoring, predictive maintenance, and big data analysis.



20 For many years, Levaco has relied on phenolic resin filter cartridges to homogenise an amine condensate that is used in coatings. Now the Loftrex Nylon filter cartridges are in use, which offer advantages in terms of availability and service life.



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Kick-off on June 7th with the opening of digital fair Krohne Insights KROHNE CELEBRATES ITS 100TH ANNIVERSARY



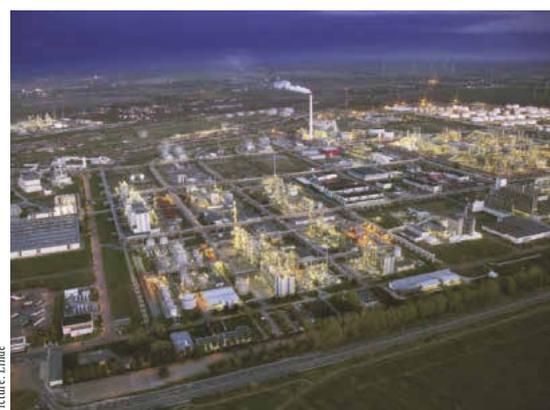
Picture: Krohne

The start of digital fair Krohne Insights on June 7th marks the anniversary kick-off

Krohne is celebrating its 100th anniversary. With the main message “The Spirit of Creativity”, the anniversary highlights the sides of the company that go beyond measuring technology: “Krohne is a multi-layered combination of values. Our goal is to offer added value with our products, solutions and services. We can achieve this only by knowing or even anticipating the wishes of our customers from various industries and their applications,” explains CEO Dr Attila Michael Bilgic. “Meeting them requires creative ideas that equally drive technical innovation and organisational development, and continue to help Krohne to accomplish pioneering achievements.” “The foundation for this is our family-oriented and appreciative corporate culture and Krohne’s special connection to art,” adds Michael Rademacher-Dubbick, Chair-

man of the Advisory Board and spokesman for the owner family. The anniversary kicks off with the start of Krohne Insights: the digital fair offers an overview of trends and industry topics in the form of industry-specific exhibition rooms with video messages as well as live presentations. At the same time, visitors have the opportunity to learn more about the spirit of the company and the anniversary in a 100 years Krohne showroom. Krohne Insights will be accessible worldwide and in 12 languages from June 7th at insights.krohne.com. Parallel to that Krohne is also going live with the anniversary website krohne.com/100years. It bundles all information on the anniversary that will include many different activities to which Krohne will invite and involve customers, partners and employees alike.

24-megawatt invest in Leuna PEM ELECTROLYZER PLANT



Picture: Linde

Linde will build the world’s largest PEM electrolyser plant at the Leuna Chemical Complex in Germany

Linde announced it will build, own and operate the world’s largest PEM (Proton Exchange Membrane) electrolyser plant at the Leuna Chemical Complex in Germany. The new 24-megawatt electrolyser will produce green hydrogen to supply Linde’s industrial customers through the company’s existing pipeline network. In addition, Linde will distribute liquefied green hydrogen to refueling stations and other industrial customers in the region. The total green hydrogen being produced can fuel approximately six hundred fuel cell buses, driving 40 million kilometers and saving up to 40 000 of carbon dioxide tailpipe emissions per year. The electrolyser will be built by ITM Linde Electrolysis GmbH, a joint venture between Linde and ITM Power, using high-efficiency PEM technology. The plant is due to start production in the second half of 2022.

Seven companies from the GET H2 initiative EUROPEAN INFRASTRUCTURE FOR GREEN HYDROGEN



Picture: GET H2

Seven companies from the GET H2 initiative want to build a cross-border infrastructure for hydrogen

Seven companies from the GET H2 initiative show how rapidly the planning of the national and European hydrogen economy is developing. The consortium wants to build a cross-border infrastructure for hydrogen – from the production of green hydrogen to transport and industrial use. From Lingen (Emsland) to Gelsenkirchen and from the Dutch border to Salzgitter, production, transport, storage and industrial acceptance of green hydrogen are to be connected in several steps between 2024 and 2030 under the umbrella of the overall project. For this project, the companies bp, Evonik, Nowega, OGE, RWE, Salzgitter Flachstahl and Thyssengas have now submitted an expression of interest for funding under the IPCEI programme (Important Project of Common European Interest) to the Federal Ministry of Economics and Technology. By using green hydrogen in refineries, in steel production and for other industrial uses, the overall project outlined here should be able to avoid CO₂ emissions of up to 16 million tonnes by 2030.

Social media platform for process technology

How Achema Pulse works

With Achema Pulse on 15 and 16 June 2021, a brand new format for the process industry will be launched. The global virtual live event's primary goal is to bring people, ideas and technology together to explore opportunities for collaboration and establish new contacts. A strong focus is on innovative matchmaking opportunities. Read below how it all works.

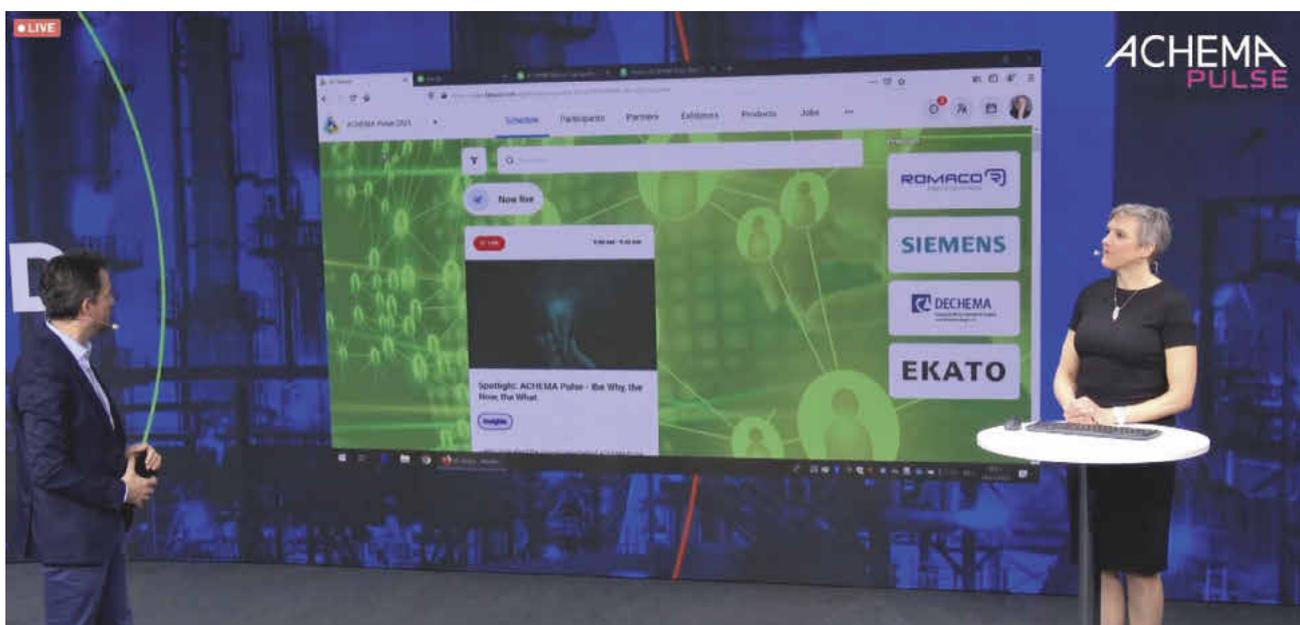


Bild: Screenshot Bernd Rademacher

Kathrin Rübberdt and Martin Kloß present the Achema Pulse platform and its possibilities

Making new business contacts and discussing current trends with industry experts worldwide has been dearly missed in recent months. "Achema Pulse is a new digital format supplementing Achema and Achema Asia and serving the global process industries", says Björn Mathes, Head of the Achema Pulse project. The two-day event will offer what industry experts and decision-makers are looking for: highly inspirational talks and panels streamed from live stages in Frankfurt and a focussed congress programme covering trends and developments from all sectors of the chemical and pharmaceutical industry. „Achema Pulse is not intended to be a virtual trade fair, but to have a strong social media character. We will set off real fireworks for process technology," says Mathes. Achema Pulse will stream around 150 hours from various halls and forums on the two days of the event on

15 and 16 June. The highly attractive congress and live stages alone will account for 90 hours. A total of around 160 workshops will take place on the two days. In total, more than 500 companies are taking part in Achema Pulse. The exhibitors are categorised according to the usual Achema topics and can be easily found in the various subject areas. Achema exhibitors showcase their technologies and solutions on the digital platform, supplemented by videos and presentations.

Interactive matchmaking tool

An algorithm-based matchmaking technology enables participants to meet the contacts they are actively looking for and make new connections suggested based on their profile. With the integrated communication tools, establishing common ground is easy, comfortable and fast.

With Achema Pulse, the organisers want to create a digital event for process technology that is as interactive as possible. To this end, the organisers have also designed an app for smartphones. All functions of the platform can be used with the smartphone, whether chat, video call or participation in a lecture.

CEO Thomas Scheuring is optimistic that Achema Pulse will be a valuable addition to this year's digital event agenda: "With Achema Pulse we will capture the unique essence of Achema bringing innovative ideas and a very diverse technology and service spectrum to the movers and shakers of the global process industry". Achema Pulse is an event designed for the virtual environment and based on the organisers' extensive experience.

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Online search: Achema Pulse



COVER

Engineering in a global environment

EFFICIENT ACROSS ALL BORDERS

In some respects, the internet is often equated with the invention of printing: Both phenomena have radically changed our access to knowledge, the dissemination of information and the way we communicate. Internet-based technologies have also had a major impact on plant engineering. Over the last years, it has evolved from heterogeneous planning in isolated applications to integrated working – also thanks to web applications such as Comos Mobile Solutions.

The VDI/VDE guideline 3695 (2010) informed the industry about optimisation possibilities in the use of computer-based engineering tools along the planning process. At that time, data consistency across all trades was defined as a desirable target state. Including automatic electronic data exchange with independent consistency checks. With the integrated, object-oriented software system Comos, Siemens ensures holistic plant management over the entire life cycle of process plants. Comos considers the fact that the engineering process represents the interaction of different disciplines and thus the system offers specific views of the data. In this way, all specialists are optimally supported. However, planning projects are no longer limited to the above-mentioned domains: project managers, legal, procurement or finance departments are now involved as well as external service providers. In order that this extended group of knowledge bearers can also be optimally integrated, modern planning systems must master further challenges like worldwide access to current data under highest IT security aspects or high-performance multi-user access with simple operation.

Work anywhere and at any time

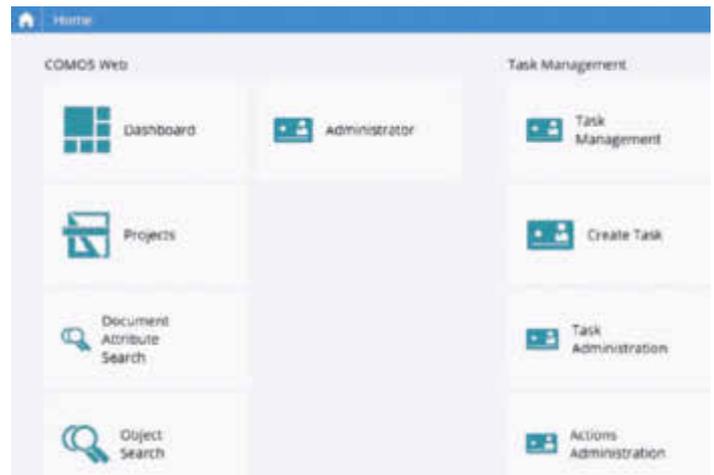
Comos Mobile Solutions is the technical basis that enables globally networked cooperation for all project participants. All relevant data is accessible via web-based services. Whether access is via PC, tablet or smartphone is irrelevant. The user interface (UI) is based on HTML5 and only requires a current version of a browser such as Chrome or Edge.

A Comos web server acts as interface for accessing the Comos database. Authenticated users access the server via encrypted SSL (Secure Socket Layer) access or via VPN (Virtual Private Network). A client gateway service for connection and access management as well as other internal services runs on the Comos web server. The client gateway service manages all requests that are sent to the web server via Internet. The internal services are responsible, for data exchange, UI display, user administration or task management. This modularity allows a customer-specific configuration of the scope of services during server installation. The advantages of such a concept and the browser-based functionality are obvious: The user does not have to carry out any installation on his device, can completely dispense with the installation of software updates, does not need any Comos individual licenses and can use any operating system.

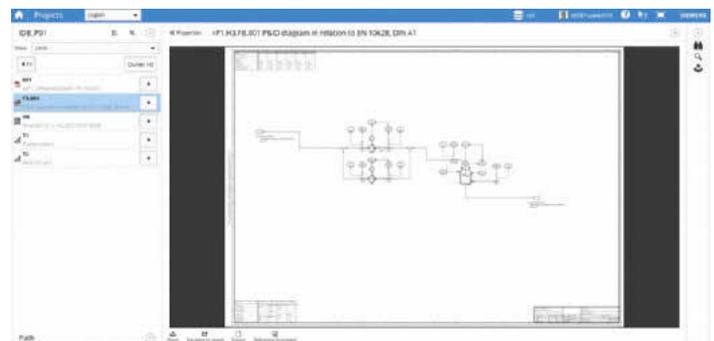
Graduated integration concept

Basically, there are two forms of access for Comos Mobile Solutions: authenticated users can either have read-only access, or they are granted a combined read and write access. In the first case, users are given read access to projects, documents, revisions, or working layers via Comos WebView, tailored to their rights/role characteristics. With Comos WebView, current engineering data can be called up – without local Comos installation by simply clicking a link and viewing it in the browser.

As a result, departments that hardly encounter planning and CAE systems are directly supplied with the data that is crucial for their respective work. For example, central purchasing will in future receive the order data as a link rather than via an Excel spreadsheet sent by e-mail. This saves time, reduces errors, and ensures that data is always up to date, as the web server serves the inquiries with live data from the Comos database. In this way, additional internal and external users can be integrated into the project in no time at all.



Control centre: after logging into Comos Mobile Solutions, the home screen displays the individual web applications

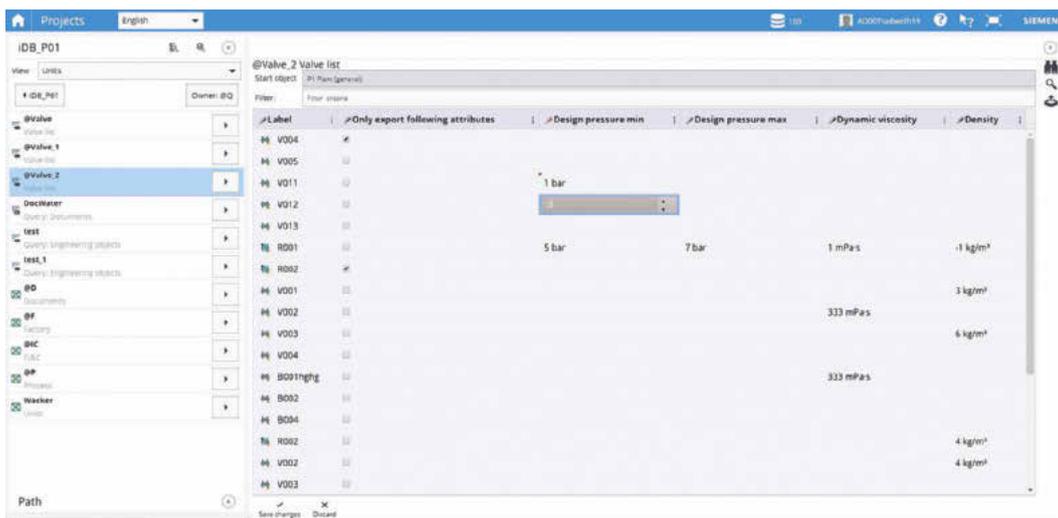


Project work regardless of time and location: documents such as P&IDs are not only quickly found, they can also be edited, checked, released, etc

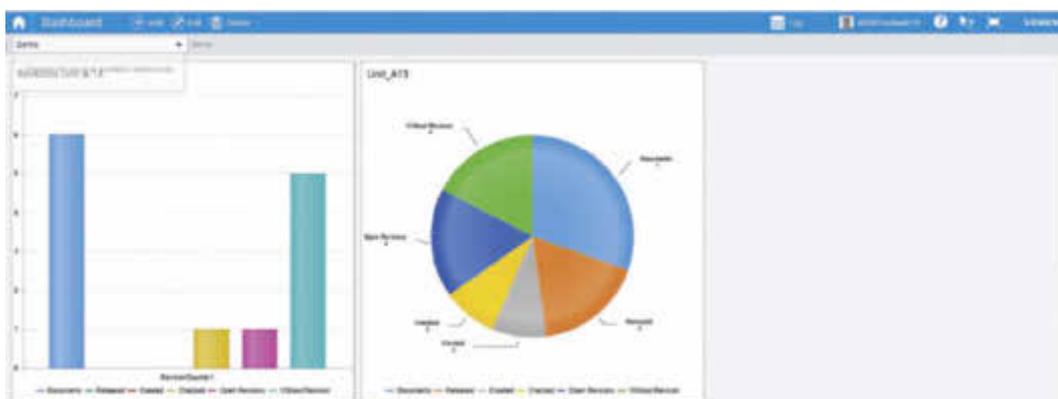
Additionally to hyperlinks, users with read access can also access relevant and up-to-date information via quicklink in the home screen of the application or via the full text or document search by means of attributes.

More flexible work and accelerated workflows

The purely read-only access to project data in Comos ensures a significantly simplified flow of information and facilitates the integration of specialist departments. Web-based engineering with Comos WebPQM takes one step beyond: documents can be checked out and in, data can be changed and commented on, test and revision steps can be released, redlining can be carried out, etc. All these typical project work activities can be carried out via web browser regardless of time and location. No reformatting, sending, or releasing of the corresponding data is necessary, since the Comos data is accessed directly via the web server. On the other hand, this always ensures the consistency of all project data. The data handling also includes permanent traceability and documentation of all changes. On this technical basis, Comos WebPQM offers a wide range of possibilities for up-to-date work. Via mobile data access, project managers or technical decision-makers can go about their work at any time – in the office, in the plant, on the train, from home or from the other end of the world. External service providers are given the opportunity to contribute the data you supply directly



Search, modify, and release: attributes of objects can be changed individually or in bulk processing



At a glance and always in the frame: with the dashboard the user gets a quick overview of the documents and data relevant to him. The dashboard can be created according to individual preferences.

to the Comos project without high licensing costs, inconsistencies, duplicate entries, manual checks, or transmission errors are basically avoided. This not only increases the engineering quality but also accelerates all processes from project planning to commissioning and operation.

Simply a better overview

Another central component of Comos Mobile Solutions is the dashboard. This customizable overview page welcomes the user with the information relevant to him/her after logging on to the system. It shows a list of Comos favorites, quick links to data and documents, or the result of predefined queries, users can define key performance indicators (KPI) on the basis of which line or pie charts can be output. For example, the current project progress can be noticed briefly. Furthermore, a task management system that can be used independently of the classic Comos facilitates the structuring, assignment and tracking of tasks, work packages and activities. The integration of task management queries enriches the project overview with clear answers to important questions. Which tasks are currently in progress? Which milestones have already been reached? Which releases are still pending? Both the tasks and the queries can be adapted to the specific project, so that all users can be sure to get answers to their most important questions and has a clear overview of the project status.

Ready for modern work – even in a state of emergency

The use of Comos Mobile Solutions helps to ensure that even complex planning projects with hundreds of participants are reliably implemented within shorter project times. For the smooth international cooperation of very different teams, the web-based infrastructure allows secure multi-user access to centrally managed data and simultaneously offers trade-specific work support. These features turn the system also into the perfect companion even in exceptional situations: For example, the Covid-19 pandemic has created a completely new and unexpected reality that requires permanent staff, specialists or external service providers to be able to work from home without restrictions. It is precisely here that this mobile multi-disciplinary approach with optimised information flow and higher data quality with less coordination effort becomes a prerequisite for uninterrupted project work.

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Online search: Siemens

AUTHOR

STEFANIE WESTERHAUS

Marketing Manager Comos,
Digital Industries Process Automation,
Siemens

Flange monoblock with shut-off valve

Wika's monoblock with flange connection has been designed for applications in the process industry. The compact design integrates a shut-off valve to separate the process from the instrument side. The one-piece construction and the double sealing (metal and plastic), tested in accordance with BS6755 / ISO 5208 leakage rate A, give the compact instrument the greatest possible safety. Its high-quality manufacture ensures smooth handling, even at high process pressures. The model IBF1 can be fitted with either a ball valve or needle valve. The instrumentation valve complements the existing monoblock portfolio which includes the models IBF2 (block & bleed) and IBF3 (double block & bleed). On request, Wika supplies a customer-specific assembly



Picture: Wika

of measuring instrument and monoblock, ready for operation and leak-tested. All IBF models can also be fitted on level indicators and differential pressure measuring instruments for level measurement.

www.cpp-net.com

Online search: Wika

Single-use disc stack separator

GEA is entering the single-use separator market. The Kytero separator is designed for harvesting fermentation broths and cell cultures and comes equipped with GEA Westfalia Separator disc stack technology for maximum yield, high separation efficiency and gentle product handling. Kytero integrates a low noise centrifuge technology – the breezdrive. The robust and reliable single-use separator reduces the amount of production space required thanks to its small footprint. Likewise, it can be used without buffer addition and substantially reduces filtration requirements.

Every aspect of the Kytero is user-friendly and easy to handle. Any product contact parts, such as cartridges or pathways, are replaced after each use. This prevents cross-contamination and guarantees contained cell harvesting. The design of the aseptic connector system means exchanging single-use components is quick and very easy to do.

www.cpp-net.com

Online search: GEA

Software suite for digital lab management

The Covid pandemic has challenged laboratories worldwide to quickly adopting digital technologies to cope with the new norms of social distancing, remote work away from laboratory benches. Eppendorf offers smart lab management software solutions for laboratory management, such as the Visionize Lab Suite, which enhance productivity for all routine tasks in the laboratory.

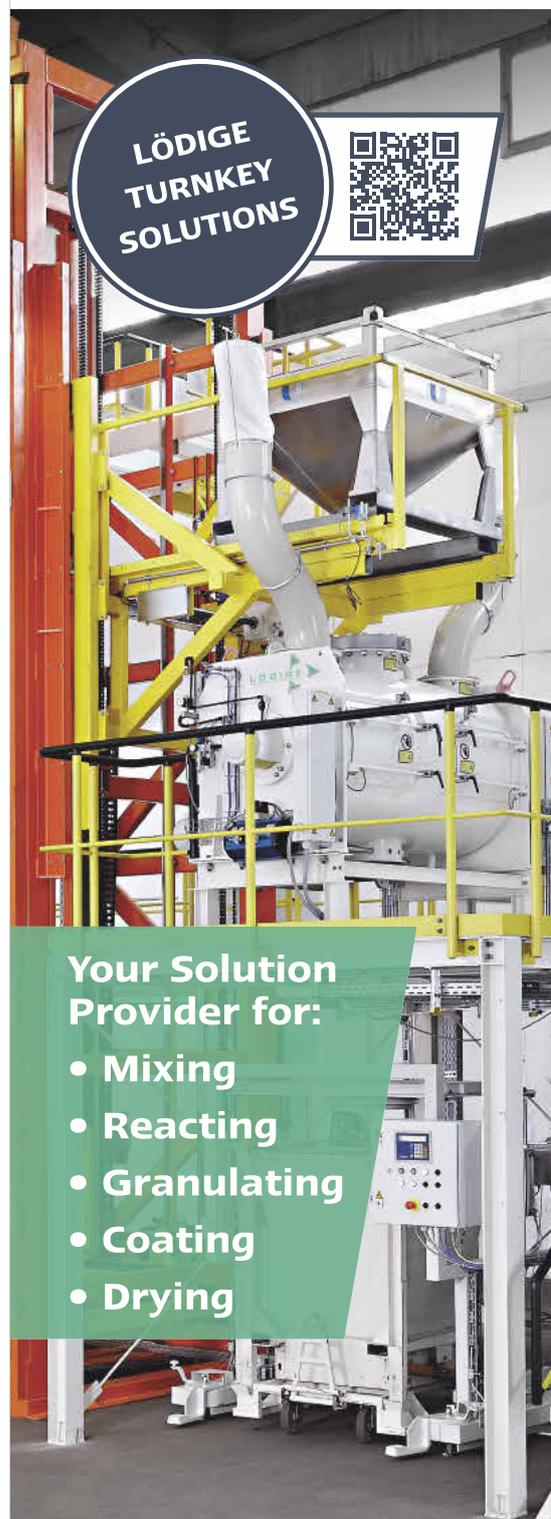
Visionize Lab Suite is the solution for effective lab management in the areas of remote monitoring, alarm notifications, device management and task management. The service suite is continually updated and as such, it represents a sustainable investment in the laboratory of the future.

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Online search: Eppendorf



Picture: Eppendorf



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More security for engineering platform

With the latest version of its cooperation platform Engineering Base (EB), Aucotec induced a security package. From quality assurance tools via automated intrinsic safety calculation (Ex-i) to the justiciable e-signing of the digital twin, the issues of security have been expanded. The quality management not only checks automatically for inconsistencies or non-compliance with requirements, it also automatically creates a list of all discrepancies per check and describes them. If everything is correct, the delivered project contains a certificate in the form of a test sheet with a green seal.

Ex-i data can be directly catalogued and maintained in order to design intrinsically safe circuits. In addition, intrinsic safety can be calculated and documented directly in the system by an Assistant. The Ex-i-Assistant, however, calculates all relevant circuits of a plant in accordance with IEC 60079-14 at the touch of a button, in only one process if required.

The e-recording feature allows cross-disciplinary tracking of all changes to each asset, including its complete change history. Due to its multi-layer architecture, this information can also be accessed in a securely encrypted manner via a web service. In addition, EB now also enables legally-compliant e-signatures on plant documents.

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Online search: Aucotec

Easy to mount float switch

Due to the horizontal design, the float switch Jumo Nesos R40 LSH can be easily mounted on the side walls of tanks and containers, from where it can then measure the respective point level (Min/Max-level). The measurement is independent of many media properties, pressure conditions, and container geometries. It provides up to two switching contacts – which do not require auxiliary power (voltage supply) – for redundant level measurement. Jumo Nesos R40 LSH is available with a guide tube length of

up to 1 m. The device can be operated at temperatures from -52 to +240 °C and process pressures of up to 88 bar. It is available in protection classes IP 65 to IP 68 and optionally with ATEX as well as IECEx approval ([Ex i] and [Ex d]) for use in zone 0. A version with a temperature probe/switch is also part of the product range. As a result, no additional tank or container opening is required for temperature measurement.

www.cpp-net.com

Online search: Jumo



Picture: Jumo

Process thermostat line expanded



Picture: Lauda

In response to high demand for powerful temperature control in the pharmaceutical industry, Lauda is expanding its product line of Integral T process thermostats with the IN 1830 TW, offering 19 kW cooling capacity. The process thermostat is aimed at users who need professional temperature control with a working temperature range from -30 to 150 °C. Thanks to their open hy-

draulic system, the Integral T process thermostats are ideal for temperature control processes with frequent changes in the consumer or test object. The new generation of devices features a modular interface concept and ensures maximum connectivity of user processes.

www.cpp-net.com

Online search: Lauda

Atex-approved flowmeter

Bürkert Fluid Control Systems offers its Flowave flowmeter Type 8098 as an ATEX-certified version up to Ex zone 2 for production processes in potentially explosive atmospheres. The compact and lightweight device measures the volume flow independent of the medium's conductivity and is, therefore, also suitable for measuring ultrapure water and alcohols. The flow sensor also measures the temperature and the density factor and can quickly and reliably detect any media change, e. g. during rinsing processes. It supports EDIP (Efficient Device Integration Platform) for easy digital integration into the system control.

The flowmeter operates according to the SAW method (Surface Acoustic Waves). When using this measuring principle with acoustic surface waves, there are no dead legs or sensor elements



Picture: Bürkert

in the measuring tube. The CIP/SIP-capable flowmeters can thus be cleaned just as easily as normal pipelines, which reduces operating costs. All media contacting parts are made of stainless steel. The sensors thus meet the highest hygiene standards and facilitate the validation of production or cleaning processes.

www.cpp-net.com

Online search: Bürkert

Turbo boost for many applications

Use of 5G in process industry

What are the benefits of 5G for the process industry? While some pilot projects are already running in large integrated sites and industrial parks, many small and medium-sized companies can only imagine what the answer to this question is. The fact of the matter is that 5G could be a turbo boost for numerous applications such as asset monitoring, predictive maintenance, and big data analysis.

The idea of communication via wireless networks has been propagated within the industry for years. In particular in process engineering, however, Bluetooth, WLAN, and various proprietary transmission technologies have only been able to open up a few individual special applications. Even the WirelessHart standard has not been able to make a successful breakthrough, despite relatively high transmission reliability. For many users, establishing this network, developed especially for process automation, appeared to be too expensive and complex to be used merely to perform monitoring and optimisation tasks. Professional asset monitoring can, however, save considerable

resources and significantly increase system reliability and efficiency. Unfortunately, the expenditure needed to make the necessary data usable was high. This is changing due to digitalisation and the associated approaches, such as Namur Open Architecture (NOA), that extend existing automation structures through open interfaces. The associated information models such as PA-DIM (Process Automation – Device Information Model) allow device and diagnostic data to be acquired through a second communication channel and be made available in standardised form to an application, for example a web-based asset management system.

Common infrastructure

Can 5G be used for this – more successfully than previous cellular communication technologies? 5G technology is ideal for establishing private networks. Moreover, 5G is a full-fledged communications infrastructure that also opens up a range of services. In contrast to WLAN, it is possible to assign resources and distribute priorities to the participants within a 5G network. 5G allows different applications, for example, simple condition monitoring, critical function monitoring, and also controlling automated guided vehicle systems, to be operated within this one communication infrastructure. A low data rate and, at the same time, low priority are normally necessary as part of condition monitoring. Emergency shower monitoring requires even lower data rates, whereas the priority here is very high. In contrast, controlling automated guided vehicle systems that are equipped with cameras requires a very high bandwidth which, however, does not necessarily correlate with the priority.

The critical difference in comparison to all previous wireless technologies is the fact that all of these applications can be realised with 5G transmission via a shared infrastructure. Any investments made in such infrastructure will normally be returned very quickly if several different applications are realized effectively. Such an orchestrated network topology supports system and device monitoring and optimisation, which NOA is targeting within an open system environment and which has a significantly lower priority than the core automation. In



Picture: Alexander Supertramp@shutterstock

5G could be a turbo boost for numerous applications such as asset monitoring, predictive maintenance, and big data analysis



Picture: Phoenix Contact

Picture: jun peng@shutterstock.com, David Tadevosian@shutterstock.com

Communication with emergency showers requires a low data rate with the highest priority

Via 5G, the data can be forwarded to higher-level asset monitoring systems

principle, however, it is possible to develop 5G technology so that it can also be used in the core process. This is due to the fact that due to prioritisation, data transmission can be realised as a part of highly available applications. In addition to the emergency shower safety application, there may be production-relevant applications in which the failure of communication would result in the loss of valuable products or the danger of explosions.

Different systems in test

This is still very much in the future. But there is no question that 5G is already making waves in the process industry today. In some pilot projects, operators are developing private 5G networks to test the announced properties of the new mobile communications standard. In an extensive chemical park or an integrated site, the application possibilities can be diverse, which tends not to be the case in numerous medium-sized companies in the process industry. However, 5G picocell networks, already in existence with 4G technology, will also be possible for such companies in the medium term, for example for forwarding sensor data for monitoring and optimisation applications. Particularly in the brownfield sector, systems equipped with cost-effective additional sensors for monitoring and optimisation (M&O) in the non-Ex area could achieve significant productivity gains with the additional connectivity. Currently, the costs for medium-sized businesses to establish a private 5G network are high. This is

also true of sensors for potentially explosive areas. Equipping every M&O sensor with 5G will therefore also be too expensive. However, intelligence is moving ever-closer to the field level. With this development, the data from existing and additional field devices (brownfield/greenfield) could also be collected, preprocessed, and standardised (NOA-compliant) using a decentral control system. This standardised data can then be transmitted wirelessly to higher-level asset management systems or to the cloud via 5G routers. It will also be possible very soon to equip certain areas of a site, for example a tank storage facility, with a 5G edge gateway. M&O sensor data can be transferred there via cable and forwarded by the gateway to a cloud solution or an asset management system wirelessly.

Releases to meet user requirements

There is still a fair amount of development work to be done. The 5G devices currently available are based on release 15 of the standard published in December 2018. Release 16, published in the fall of 2020, focuses on IoT application scenarios – with massive Machine Type Communication (mMTC) that supports a large number of connections with relatively low data rates. Additional applications with the focus on reliability and lower latencies will be covered by release 17 – ultra-Reliable and Low Latency Communication (uRLLC). This specification is scheduled for publication at the end of 2021. It will then, however, be a few years before modules and devices are also available for

such applications. However, it can be expected that the first pilot users will be capable of realising the applications outlined above, from emergency shower to M&O data collection, through big data analyses, all the way to AGV control within a prospective timeframe of just four to five years. Applications as part of maintenance are obvious. An example is the digital rating plate that maintenance technicians can access in the field using their tablets. Technical details on a device, repair instructions, and short explanatory videos will then be available for every asset so equipped. The constantly networked “mobile workers” will be significantly more productive – and their work much more failsafe. Augmented reality will be available to them in the plant with the help of the 5G mobile network, which will allow a distant expert to virtually “look over their shoulder” using the camera in the handheld tool to provide them with remote support.

Setup of virtual private networks

The models for 5G industrial networks differ from those of public cellular networks. For example, a guaranteed Quality of Service (QoS) as well as structured communication within QoS classes will be of significant importance. The fully isolated private 5G network is just one possible option. Not every user will be able or willing to raise the associated resources necessary for participation. Intermediate stages, in which a campus network is connected to the public network, can also be realised. The



Picture: Phoenix Contact

Via the 5G network and AR glasses, additional information is displayed to the employee in the event of a fault



Picture: Phoenix Contact

Based on the 5G router developed jointly with Ericsson and Quectel, Phoenix Contact is setting up a campus network in its own production facility

management of devices, for example the administration of the participants, could be performed in the public area by the provider, but the data traffic would only be transmitted locally in the campus network. Virtual private networks, of which rudimentary versions are already available via private APNs (Access Point Name) in the 4G network, will also be available with 5G. They will be enhanced by “network slicing” in the 5G standard: the network of the future can meet individually fluctuating demand for data rates, speed, and capacities by making part of the public network virtually available to the user. Such scenarios will be of interest to smaller companies in particular, allowing them access to sufficient resources at all times through a service level agreement with their provider.

Further questions must be answered

The frequency assignments for local 5G networks to companies show just how great the interest is. Numerous industrial companies, including Mercedes-Benz, Audi, and BMW, are involved and have signed up to the publication on the German Federal Network Agency website. Evonik Industries is also included as a representative of the process industry. Others, such as BASF, are also actively involved. Phoenix Contact emphasises the benefits of shared experience; the company is also one of the frequency allocation holders. Phoenix Contact is setting up a local network in its own production facilities, in part as a basis for concrete discussions on 5G with

representatives of the process industry. Before the new cellular standard can be widely used in the process industry, however, many detailed questions still need to be answered, among them the issue of explosion protection. Previous protection concepts and technical rules are not sufficient to ensure safe operation in potentially explosive areas. Research cooperations, such as between the PTB and the Ex-Network e.V., are already working on safety-relevant assessments to avoid potential ignition sources.

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Online search: **Phoenix Contact**



AUTHOR WILFRIED GROTE

Director Industry Management Chemicals and Pharmaceuticals, Phoenix Contact Electronics



AUTHOR FRANK HAKEMEYER

Director Communication Interfaces, Phoenix Contact Electronics

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Frank Bungartz is the third-generation Managing Director of Paul Bungartz GmbH & Co KG

Submersible pumps for challenging applications

Every pump is unique

The submerged column pumps from Bungartz are always used when the media to be pumped are toxic, potentially explosive, or boiling liquids. We spoke with Frank Bungartz, Managing Director of Paul Bungartz GmbH & Co KG, about the benefits of submersible pumps, their special sealing concept, and forthcoming further developments.

What special features need to be taken into consideration when pumping toxic, potentially explosive or boiling liquids?

Frank Bungartz: For potentially explosive mixtures – and when ignition sources are present – the explosion prevention directives of the EU need to be taken into account (Atex 1014/34/EU). Different protection categories apply to centrifugal pumps. Pumps that, for example, are designed to be immersed in a vessel with a zone 0 atmosphere are required to conform to category 1. In an Atex zone 0, where a frequently or continuously explosive mixture is present, this means that pumps are not permitted to produce any ignition sources. Not even in the case of extremely rare faults, because safety has the highest priority. In a hazardous and potentially explosive atmosphere with mixtures of air, flammable gases, vapours or mists, the danger to personnel and the environment must be excluded to the greatest extent possible.

Why are standard submersed column pumps not suitable for these application areas?

Bungartz: A distinction needs to be made between submersed column pumps and submersible motor pumps. With the former, the pump hydraulics are submerged in the pumping liquid. With submersible motor pumps, not only the hydraulic components but also the motor are submerged in the pumped medium. Standard submersed column pumps are fitted with product-lubricated slide bearings. They are just as unsuitable for zone 0 as pumps with double mechanical seals. Neither is safe to run dry, because their slide bearings are flushed by external water or by the medium. In zone 0, increased bearing temperatures during the start-up phase can be dangerous. A potential level control failure would also be hazardous. Additional control units can provide a warning of the problems, but the result will always be an interruption in pumping. That costs time and money.

What differences are there with the submersed column pumps used by Bungartz?

Bungartz: All of our pumps, including the submersed column pumps, are designed on a requirement-specific basis and manufactured to order using series-produced components. All of them are continuously safe to run dry with a high degree of intrinsic safety, and some can pump without cavitation. Instead of using sensitive mechanical seals as the primary seal, we build units such as the submersed column pump MPCTAN with a dry-running magnetic drive. The vertical design of the pump is already an advantage. This prevents the seal and the lifetime-lubricated bearing from coming into contact with the pumping medium, even in the event of sealing gas failure. A major component here is our three-fold seal: the sophisticated design of the shaft gap concept consists of a hermetic sealing. This is achieved on the atmosphere side by the permanently dry-running, vortex-free magnetic drive (through a ceramic containment cup), which, as I say, is not in contact with the pumping liquid or its gases. A secondary seal such as a gas-lubricated lip seal can then be used. The pumping medium is beforehand pumped away from the shaft seal by the blades on the rear of the impeller. The blading counteracts the feed and pumping pressure with a greater pressure. This hydrodynamic seal ensures that the secondary seal is never in contact with the product. Furthermore, gas barriers (sealing gas) protect the bearing unit against the penetration of product vapours. The bearing and sealing unit thus remain without contact to the product or pumping liquid or to their gases, and are thus permanently dry. Even if a malfunction were to occur with the bearing or individual sealing components, vapours or liquids could therefore never escape. In addition to this, we utilise self-regulating behaviour for this type of pump, too.

“The MPATAN ensures absolutely trouble-free operation in hazardous environments. Operators report service lives of over 10 years – without any malfunctions or maintenance at all.”

What is the self-regulating behaviour about?

Bungartz: As with all pumps in the V-AN series, the self-regulating behaviour ensures that the MPATAN adapts to changing feed rates. This type of pump does not use suction, but automatically regulates its speed to the feed flow of medium (similar mode of action to a siphon). Fluctuating feed rates, sporadic use, and in particular the total emptying of tanker trucks and tank wagons are therefore amongst their specialties. The monitoring systems required by the Atex Directive can be relocated from the Atex zone 0 atmosphere to a lower Atex zone. When installed outside the sump, the typical monitoring costs are significantly reduced.

What types of application exist in practice?

Bungartz: The options are numerous. Our pumps are used all over the world – including our submersed column pumps. Frequent applications can be found in the field of refinery waste tanks. The special feature here is that the monitoring systems required are limited to the sealing gas monitoring system. These are installed outside the pit, and thus not within the Atex zone 0 atmosphere. Our submersed column pumps are in demand wherever the aforementioned challenging media are handled. Fluctuating feed rates and sporadic use are tasks that our pumps master effortlessly.



Each pump is designed on a requirement-specific basis and manufactured accordingly in the workshop



The vertical design of the pumps has many advantages in terms of life-cycle costs

Bungartz continues to develop its pumps further. What can we expect to see in the future?

Bungartz: Yes, the MPCTAN with its gas-sealed lip seal is a further development of the MPATAN, which was fitted with a gas-lubricated single mechanical seal. With an immersion depth of up to 5.5 m and capable of conveying media up to temperatures of 280 °C, the MPCTAN can be used in Atex zone 0/1 or 2 for boiling and/or toxic media containing gaseous and solid components. We are in the process of modifying the design of this pump type to also enable its use in high-temperature applications such as those encountered in salt melts.

What sort of cost-benefit ratio does this pump type offer?

Bungartz: Like all our pumps, our submersed column pumps reduce the plant engineering costs through their favourable infrastructure. This means lower planning costs, and the reduced need for signalling and components also has a positive impact on life cycle costs. Additionally, availability is increased because there are fewer sources of faults – safety from operator error is also a major point. Unplanned plant stoppages are thus a thing of the past.

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Online search: Bungartz



THE INTERVIEW WAS CONDUCTED BY ANNETTE VAN DORP
Freelance journalist

Modular laboratory concept for the development of automotive coatings

BASF relies on efficient double diaphragm pumps

With its Lean Lab BASF has implemented an ultra-modern, modular laboratory concept for production of automotive coatings, at its Münster, Germany site. The laboratory offers an optimal framework to meet the growing demands in the market for automotive coatings with even greater speed and flexibility. Approximately 300 double diaphragm pumps provided by Timmer are working in the heart of the paint development process. They ensure process reliability and energy-efficiency.

In recent years the market for automotive coatings has experienced extremely dynamic development. For series-production paint manufacturers fast response times with short-notice adjustments of the paint formulation are crucial for market survival. “The paint must meet the requirements of the painting lines – not the other way around,” emphasises Susanne Richert, Project Manager for Site Development at BASF in Münster.

BASF launched the Lean Lab modular laboratory concept in order to quickly and flexibly meet current and future market requirements, and also to make work processes more efficient, less complex and

more transparent. “Thanks to the Lean Lab we have been able to implement several innovative concepts. For example, collaborative process structures within paint labs, as well as digital recording and control of all manufacturing processes,” says Project Manager Richert. Using a special software, BASF networks all integrated work areas of the lab, where practical sample manufacturing occurs, and thanks to this network the entire raw material supply can be centrally coordinated and controlled. This considerably accelerates the work flows, since the raw materials are always available at their prescribed stations at the right time.

High degree of automation

Formerly, to a great extent, paints were developed by hand. To create a paint, lab employees added specific amounts of raw materials to the overall mixture via pipette. Today this is done with a high degree of automation. “In the Lean Lab, a laboratory dosing device, especially developed for this purpose, is used, which automates the recurring work steps,” explains Alexander Küsener, Head of Automation and Digitalisation in the Lean Lab at BASF in Münster. The automatic dosing machine is unique in the coatings industry and was built especially for the laboratory in Münster. The 12 m long, 8 t machine, which BASF developed together with the equipment manufacturer Ficke Dosing + Filling Systems can produce standard formulations from more than 300 liquid raw materials.

This means specifically: on the system, the employees select a certain stored product, the system calls up the appropriate recipe and automatically mixes the raw materials together in a precise ratio. Thus the quality of the output mixture is uniformly high. Efficient double diaphragm pumps from Timmer make this automation possible – they are the heart of the system and are elemental for its functionality. The central raw material supply for the more than 300 dosing points via the automated dosing machine occurs by means of the Timmer pumps. The materials are delivered, dosed, and regularly circulated by these pumps. For development of the coatings BASF works with several hundred raw materials that have different properties. “The materials to



Pictures: Timmer

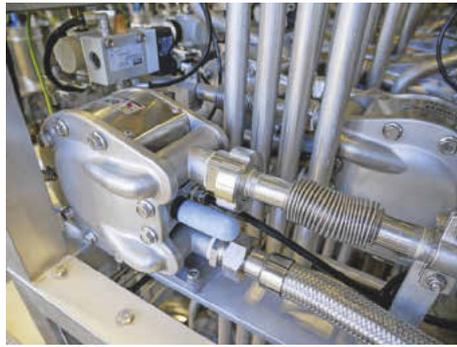
With its Lean Lab BASF has implemented an ultra-modern, modular laboratory concept for production of automotive coatings

be dosed vary greatly in their flow behaviour and wide range of viscosities. Without constant pump capacities, dosing that is accurate to the gram cannot be realised," states Küsener.

Space-saving pump technology

With the Timmer pumps BASF can pump virtually all materials. Two great advantages offered by the pumps are their compact design and ease of use. The double diaphragm pumps are only about half the size of conventional variants. BASF has several hundred of these pumps in use and they are installed in close proximity to each other; this means that the company saves a significant amount of space. At the same time the Timmer solution enables simplified access. If specific pumps must be inspected, they can be removed, i. e. dismantled, quite quickly and easily.

Another advantage: the double diaphragm pumps have an extremely low start-up pressure. Conventional variants on the market require a start-up pressure between 1.5 and 2 bar for the pump to even run at all; the Timmer solution requires only 0.5 bar to operate reliably even at 1 bar pressure. This results in significant medium-term and long-term energy savings, since less compressed air is required. Moreover, this has a positive effect when purging the lines. BASF is able to completely purge the system at a low pressure. This procedure is necessary to remove even the most minute residues, such as pigment particles, from the pipelines. Because the pumps are so small and compact, fewer residues are deposited. In addition, loss of raw materials due to emptying



Approximately 300 double diaphragm pumps are working in the heart of the paint development process



For development of the coatings BASF works with several hundred raw materials that have different properties

the system of residues is correspondingly low. This advantage reduces costs for BASF, since some raw materials, such as complex special paints, are very expensive.

Maximum process reliability

All moving parts in the heart of the Timmer pump are made of ceramics in conjunction with precision-ground, high-performance plastics. This results in minimum wear in the valve itself. In addition a short-stroke principle is used; the membrane executes shorter strokes and therefore it is subject to less wear. Shorter strokes also mean less pulsation – fewer pressure surges in the line. High pulsation can falsify measurements of the raw material quantity. Since in some cases BASF fills in the milligram range, this is an important factor. The Timmer solution has a so-called rest function. If the delivery rate is too low, frequently conventional pumps come to a standstill, and then do not start up autonomously. In contrast, with the

Timmer pumps BASF can pump even in minimal quantities with no problems. The digital networking in the Lean Lab, where the powerful pump technologies are an important component, quickly led to the desired results: BASF was able to optimise the quality of the paint samples, and leverage the efficiencies to increase the speed for the customer. "The high product and dosing quality, as well as the minimal service and maintenance requirements of the Timmer pumps, convinced us," said Richert.

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Online search: **Timmer**



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Reliable homogenisation of amine condensate

Polyamide filter cartridges replace phenolic resins

For many years, Levaco has relied on phenolic resin filter cartridges to homogenise an amine condensate that is used in coatings. However, due to increasing costs, long delivery times and the significant environmental impact of the filter material, the chemical company began to look for alternatives. Now the Loftrex Nylon filter cartridges are in use, which offer advantages in terms of availability and service life.

Being shatter-resistant, torsional-resistant and heat-resistant, phenolic resin is a popular product in industrial applications for decades. The material is a thermosetting plastic and e. g. in use as filter material. It demonstrates the high level of temperature and pressure resistance that is necessary for filtering aggressive media. However, less and less phenolic resin is being produced due to negative impact of the production process on the environment. Due to the decreasing availability of phenolic resin, prices of the filter cartridges are rising, and delivery times of up to 20 weeks are now becoming the norm. Levaco, a company based in Leverkusen, Germany, has also had to

contend with this growing challenge. In order to prepare its production processes for the future and to reduce its ecological footprint, the former member of the Bayer Group started looking for alternatives early on. The chemical company found everything it was looking for at Eaton. The filtration specialist was able to offer Levaco a solution that can outperform phenolic resin filter cartridges, both in terms of cost and environmental impact.

Filters for homogenisation

The Levaco Chemicals GmbH headquarters and production facility are located at Chempark Leverkusen, Germany. Levaco is

engaged in the contract production of specialty chemicals for well-known chemical companies. The Coating Solutions division primarily serves customers from the paint, coatings and ink industries, but wood preservatives, industrial coatings and pigment preparations can also be optimised using the chemicals from this division. One of the intermediate products in the Coating Solutions division is an amine condensate agglomerated with dichloroethane. Filter cartridges made from phenolic resin have long been an essential process component for manufacturing this product. This gel-like fluid also serves as a base material for pigments and fillers. It particularly helps



Picture: Lightboxy - stock.adobe.com

The Levaco Coating Solutions division serves customers from the paint, coatings and ink industries with intermediate products

to improve the protective properties of paints and coatings.

To achieve the desired consistency, the amine condensate is mixed with water. This produces inhomogeneous agglomerates, which have a negative influence on product quality. The filter cartridges are therefore primarily used in the process to distribute the particle sizes evenly, so that a homogeneous product can be produced. In addition to the poor availability and the resulting price increases for the phenolic resin filter cartridges that had been used up to that point, the environmental impact of these cartridges motivated Levaco to search for alternatives. The company has been a customer of Eaton for many years and so the filtration specialist receives the inquiry about the filtration technology for amine condensate.

Polyamide as an alternative

However, the exceptional properties of phenolic resin filter cartridges did not make it easy to find an alternative. High temperature and pressure resistance, strong chemical resistance — all this is standard for phenolic resin. For this reason, filter cartridges made from this all-rounder material have been the standard for a long time. Eaton suggested polyamide as a possible alternative. Polyamide can withstand greater pressure and higher temperatures than polyester or polypropylene, for example. The available filter ratings are approximately equal to those for phenolic resin and may even be better in some cases.

Lofrex Nylon filter cartridges were therefore good for the company's application. The melt-blown filter cartridges made from polyamide can withstand high operating temperatures of up to 120 °C and a differential pressure of up to 2.5 bar at ambient temperatures. The filters are made from a polyamide-6 polymer material using efficient melt-blown technology. The result is a powerful and durable filter cartridge made of a fine-pored material. Its particularly smooth surface also reduces fibre migration. This is also beneficial for the process at Levaco as any filter fibres that are released form impurities which can reduce the product quality.

Service live nearly doubled

Eaton's filtration engineers chose Lofrex Nylon filter cartridges with a retention rating of 100 µm to provide the ideal

homogenisation of the amine condensate. This turned out to be the right choice: with optimised differential pressure and flow rate, Levaco can use the same filter cartridges for up to five batches of the product. A total of 75 filter cartridges are in use at the company, spread across a 50-cartridge housing and a 25-cartridge housing. Together, they enable a high throughput of 10 m³/h. By using a number of filter cartridges in parallel, the excellent performance of the filter cartridges very quickly begins to have noticeable economic benefits. The service life of the polyamide filter cartridges is about double that of the old phenolic resin filter cartridges. For Levaco, this means that product quality remains the same, while considerably fewer consumables are required. As polyamide is an easily available filter material short delivery times can be provided without any problems. After Levaco's coating experts contacted Eaton with a request for new filter media, it took less than two weeks for them to receive

the first sample shipment for testing. Following trial runs, Eaton received the order for the filter cartridges a few months later. The fact that this process was so straightforward is mainly due to the confident relationship between the solution provider and the customer. Levaco has thoroughly tested the Eaton filter cartridges. They now help to maintain the consistently high product quality that Levaco customers are accustomed to. Homogenised with the Lofrex Nylon filter cartridges, the amine condensate gives the end products precisely the desired properties.

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Online search: Eaton

AUTHOR
JENÖ INDERFURTH
Sales Engineer,
Eaton Technologies, Germany



Picture: Eaton

Suitable for a wide range of applications, the Lofrex Nylon filter cartridge product range includes a wide variety of lengths and pore sizes. In its production processes, Levaco uses filter cartridges with a retention rating of 100 µm.

LG Chem increases glacial acrylic acid production

Crystallisation ensures high product purity

As an essential building block for a wide range of industrial and consumer products, high-purity acrylic acid is in demand and its market is ever-expanding. To meet stringent quality specifications while maintaining low production costs, acrylic acid manufacturers need advanced purification technologies that can address these requirements. For LG Chem, the right solution to effectively expand its capacity came from Sulzer.

Over 6 million tonnes of acrylic acid are produced globally every year, and approximately two-thirds of this volume are ester grade material, while one-third is glacial grade. In effect, acrylic acid monomers with high purity levels are enablers for the production of a wide range of materials for a variety of industries. Technical grade acrylic acid is used for the production of commodity esters, such as surface coatings, adhesives and sealants, plastic additives and paper treatments. Glacial acrylic acid (GAA), is key for the production of superabsorbent polymers (SAPs), which account for almost the entire global GAA demand. These

polymers are generally used in liquid-absorbing applications, such as medical dressings, sanitary products and controlled release drugs. The largest SAP segment, however, is the one for baby diapers, which consumes nearly 72 % of the total SAP throughput. GAA plants need to produce materials that achieve or exceed the desired purity level while also minimising energy usage and running costs. So competitive GAA manufacturers regularly invest in new equipment.

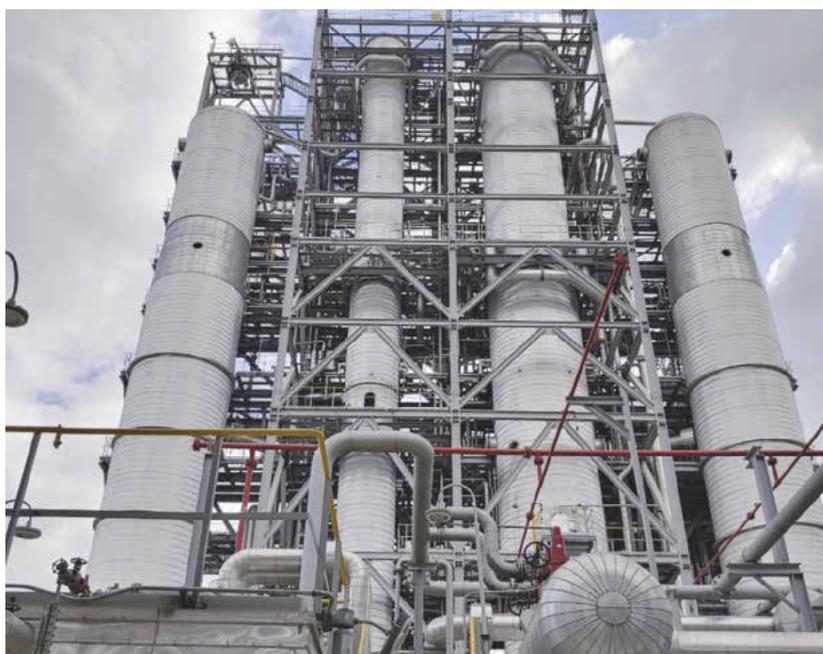
Remove impurities

Impurities such as aldehydes, dimers, acetic and propionic acid have certain properties

that are very similar to that of acrylic acid, such as boiling points. Hence, distillation methods can be extremely energy demanding. In addition, acrylic acid tends to polymerise at high temperatures. This is an unwanted reaction that manufacturers try to avoid by utilising advanced technologies and following optimum process conditions. In a recent project, LG Chem, one of the world's leading manufacturers of acrylic acid and SAPs, was able to leverage state-of-the-art processing technology to produce GAA with concentrations above 99.9 %.

Purification by crystallisation

To enhance its capabilities, the company wanted to increase its ≥ 99.9 % pure GAA production capacity in its existing manufacturing complex in Yeosu, South Korea by 145,000 t/a. In order to quickly expand its operations with a new GAA purification unit, the manufacturer contacted its long-term technology partner, Sulzer Chemtech. The solution developed by Sulzer to purify GAA quickly and efficiently relies on layer crystallisation principles, where crystals of pure material form and grow onto a cooled surface. More precisely, the setup consists of two falling film crystallisers and a static crystalliser operating in batches and multi-stage modes. The first two are essential to remove impurities and reach the glacial grade while reducing energy consumption and avoiding the thermal degradation of the product, in this case polymerisation. The last piece of equipment works as a stripping fractionator to maximise acrylic acid recovery, thus increasing product yield.



Picture: Sulzer Chemtech

In the plant designed by Sulzer Chemtech, acrylic acid is purified by means of layer crystallisation



Picture: foodfacts – stock.adobe.com

Glacial acrylic acid (GAA) is used for the production of superabsorbent polymers, such as those used in baby diapers

Cleaning by cooling and heating

The falling film crystallisers consist of a system of vertical tubes that act as heat exchangers. The acrylic acid-rich feed and the heat transfer medium both flow as falling films on the inner and outer surface of the tubes, respectively. In these units, the acrylic acid-rich feed undergoes stages of cooling and heating. First the temperature is lowered below the freezing point of the melt. This causes acrylic acid to crystallise on the surface of the tubes, while impurities remain in the liquid phase. Once all the acrylic acid fraction has been crystallised, the liquid phase is drained from the unit, while the purified crystalline layer remains attached to the plates. This is then further purified by partial melting, also called sweating. This is induced by slightly raising the temperature until the melting point of the crystalline layer is reached. After sweating, the acrylic acid layer is totally melted and collected for further processing, i. e. second falling film crystallisation and static crystallisation.

Within the static crystalliser, a very similar process occurs. There, cooled plates are immersed in a stagnant melt, rich in acrylic acid content. The same stages of crystallisation, draining, sweating and melting take place to enhance the recovery of acrylic acid.

The first falling film crystalliser would allow the manufacturer to obtain a technical grade feedstock with purity higher than 99 %. At the end of the purification train, GAA with acrylic acid content above 99.9 % can be achieved. The combination of falling film and static crystallisation would allow the production of GAA with a yield above 99 %. Throughout the process, the temperature of the melt is always maintained below 25 °C to retard dimer formation. To succeed in this, Sulzer included a refrigeration unit in

its design. This provided the cooling energy for the crystallisation and achieve temperatures below 13.5 °C, the freezing point for acrylic acid.

Installation in one day

Sulzer was able to quickly complete the project, using its global network of specialised facilities to design, manufacture and deliver to LG Chem. All the components were then installed in a record time of a single day. After the assembly of the purification equipment and an initial inspection were carried out, commissioning and start-up were completed within two weeks. This approach ensured that LG Chem could quickly start operating its new unit at full capacity to ramp up its overall production. Thanks to Sulzer's proactive approach and expert engineering capabilities, LG Chem was able to expand its operations quickly to meet market demands. In addition, the support provided allowed the manufacturer to immediately produce consistent on-spec GAA, maximizing efficiency in terms of cost, time and energy usage. Finally, the setup provided offers LG Chem a high level of flexibility in its operations. In particular, the company could benefit from a solution that is easy to use and to adjust in order to optimise process conditions throughout all the separation stages.

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Online search: Sulzer Chemtech



AUTHOR
MANFRED STEPANSKI
Director Sustainable
Solutions,
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Remote HMI firmware for Thin Clients

Flexibility in the field

Conventional network architectures from the control room to the field are increasingly being replaced by slim-line, flexibly adaptable systems. Distributed control systems running on virtual machines substantially improve the efficient use of memory and processing capacities. Thin Clients, which are tailored both in their hardware and software for the integration into virtualised server structures, ensure substantially increased flexibility in the field.

At the field level, network virtualisation is achieved by replacing traditional industrial PCs with thin front ends for DCS remote access. For this, R. Stahl's 500 series includes future- and process-proof Thin Clients, whose different versions are suitable for the specific requirements of the chemical and pharmaceutical industries, machine operation, logistics and the oil and gas industry. In addition to Thin Clients for standard industrial operation, the series includes models that are certified for worldwide operation in Zone 1, 21 and 2, 22, as well as clean-room compliant versions according to GMP class C. The operator stations can be integrated in redundantly secured network structures, are available with various display sizes and resolutions and optionally also as dual touch screen versions. To ensure secure access to process values, system status and production and maintenance processes, the

software of field operating devices must be optimised for the integration into virtual networks. The latest version of R. Stahl's Thin Client firmware covers all functions that are essential for the secure and user-friendly operation in the Industrial Internet of Things, virtual server structures and cloud automation.

Multi-functional with remote access

The Remote HMI firmware has been designed as a closed system based on the latest Microsoft Windows 10 IoT Enterprise operating system and can handle the latest versions of protocols for the remote control and process visualisation from the field. In addition to Windows' own Remote Desktop Protocol (RDP), the firmware supports the platform-independent Virtual Network Computing (VNC) protocol and the Emerson DRDC protocol, which is widely used in

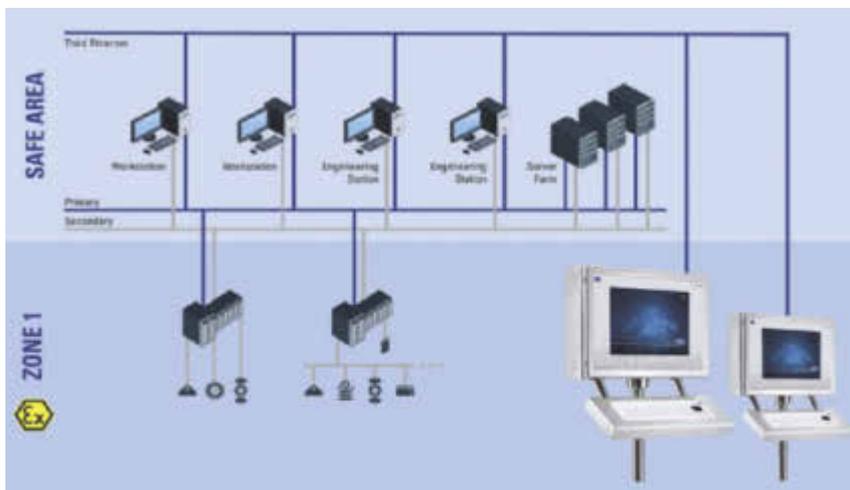
the process industry. Additionally, KVM stations can be integrated via an extender "over IP". In multi-sessions mode, the new HMI firmware provides simultaneous access for authorised users to a great many programs. Different processes such as the ERP system, maintenance management and warehousing can thus be controlled and monitored simultaneously. Fast navigation from one view to the next or simultaneous visualisation in split screen mode enable users to keep an eye on all relevant processes, even complex ones. Monitoring process information of particularly large system areas with many data points can be made easier by splitting it between up to six screens in multi-monitor mode.

System integrity and reliability

Maximum transfer security and system integrity are achieved by the firmware's various integrated diagnosis and filter functions that provide reliable protection against connection failure, data loss, manipulation or system corruption. To this end, the firmware also supports the redundant transfer structure via two Ethernet interfaces and checks the network connection during operations by means of continuous ping requests. The automatic diagnosis function spots network or host failure immediately and triggers an instant re-connect. If connectivity fails, fallback and backup options can be activated that automatically establish an alternative connection or switch to different network adapters. In addition to pre-installed Avira virus protection, a HORM and a UWF filter further protect system integrity. The UWF write filter inhibits unintentional writing and prevents registry and data system corruption by cyber attacks. HORM re-sets the



R. Stahl's HMI firmware supports multi-monitor operation with full touch functionality



Secure field access to all unlocked process levels in physical and virtual network structures

operating system to a defined starting configuration even when waking from sleep mode. Other security features include a USB lockdown to block or release individual ports as well as pre-defined user roles with different access rights for administrator, engineer and operator. Furthermore, user authentication is supported via RFID. The transparent transfer of data from RFID cards or chips to the control system or an authentication server ensures fast and efficient log on and log off.

Intuitive operating concept

In addition to the high level of security, the new firmware also features user-friendly touch operation even for dual monitor solutions. Design and menu structure are based on an intuitive operating concept with self-explanatory symbols and brief informative texts. Central features such as network test, diagnosis functions or the establishment of remote connections are available in the main menu via one-click or one-touch. The screen display features landscape or portrait

mode and can be adapted to display sizes and resolutions from 640 x 480 (VGA) up to 2560 x 2048 (QSXGA). Also, just one touch will deactivate or reactivate the right click function, adjust screen brightness or switch the screen to cleaning mode. The expanded dashboard view shows basic system information such as basic settings, connection status and the activated user roles. Last but not least, the innovative App concept allows for CITRIX access, protocols such as DeltaV Remote Desktop Connection (DRDC), browsers, CCTV apps or any other applications to be operated highly securely and without modification of the system status or the firmware. Optionally, the apps can also be operated in kiosk mode with full screen display.

www.cpp-net.com

Online search: R. Stahl

AUTHOR

HORST FRIEDRICH

Product Manager,
R. Stahl



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High-care filling and low-care palletising

Dinnissen has developed a cutting-edge technology for filling big bags in high-care zones. This innovation combines high-care filling with low-care palletising. It meets all requirements for high-care, medium-care and low-care filling, processing, sealing and transporting big bags. Moreover, this solution is equipped with a fully automatic palletising station.

The filling of big bags takes place in a closed filling process. Compaction and weighing both take place in one position, during filling. And no hydraulics are used in the high-care zone. To keep the oxygen level below 0.5 %, stretching spout technology and triple sealing are used. This results in stable high big bags without gas inclusions. The entire system of high-care filling and low-care palletising is designed, built and tested in-house.

www.cpp-net.com

Online search: Dinnissen



Picture: Dinnissen

Dosing unit for sampling system

Multiprobe from De Dietrich Process Systems is a simple solution for taking samples in complete safety which offers many advantages, including representative sampling directly at the heart of the reaction while the process is ongoing, as well

as temperature and pH measurements and a baffling function.

The sample is thus perfectly representative of the product since it is taken from the heart of the reaction process. In addition, the ability to take a truly representative sample without having to depressurise the reactor or without losing the inert atmosphere makes Multiprobe ideal for processes where the risk of contamination is usually a problem during sampling. Now De Dietrich Process Systems has introduced a dosing function that allows the injection of a reagent or catalyst into the reaction medium. It makes it possible to safely inject a defined quantity of liquid product, even a small quantity in a short time into the heart of the chemical reaction. The system is designed to ensure that all the specified quantity reaches the reaction medium.

www.cpp-net.com

Online search: De Dietrich



Picture: De Dietrich

Single-sided rotary tablet press



Picture: Korsch

The X 3 tablet press from Korsch is a single-sided rotary press with flexible technology and a new approach to architectural and ergonomic design. Suitable for product development, scale-up, clinical production, mid-range production and continuous manufacturing, the next-generation X 3 tablet press is available in two models. The

X 3 SFP is a dedicated single-layer press capable of 266 400 tablets/h, while the X 3 MFP offers flexible single-layer (266 400/h) and bi-layer (133 200/h) production capability. The X 3 incorporates a flexible manufacturing experience atypical for its size, with an integrated electrical cabinet, torque drive, fully sealed design, and unsurpassed accessibility for cleaning, changeovers and maintenance. Installation options include a conventional in-room layout, through-the-wall mounting, and a portable equipment platform. The X 3 offers a range of product containment configurations, including OEB 3, as well as OEB 4/5 with full wash-in-place and high-containment execution.

www.prozesstechnik-online.de

Online search: Korsch

Stainless steel enclosure series



Picture: Pepperl+Fuchs

The SR series – in durable stainless steel – comprises more than 30 enclosure sizes to meet the precise dimension requirements of every intended use. To further increase cost effectiveness, the IP 66/Nema 4X enclosures are always reduced to a basic version. Any accessories, such as gland plates, hinges, ¼ turn locks, and lid security, are only integrated by Pepperl+Fuchs in accordance with the corresponding customer specification. Various international approvals permit worldwide use in a whole host of applications. Depending on the application

requirements, the enclosures, which are certified for a temperature range of -60 to +120 °C, can be mounted vertically or horizontally in the operating location. All SR series versions that are suitable for wall mounting can be screwed in directly using mounting brackets that rotate by 90° or rivet nuts, without further adaptation. If the SR series is used as a control station, the contact blocks can be fixed either to a rail or directly to the enclosure cover.

www.prozesstechnik-online.de

Online search: Pepperl+Fuchs

Efficient mixing process up to 16 l

The Hauschild Speedmixer product range uses DAC technology (Dual Asymmetric Centrifuge). The special feature of this mixing principle is the dual rotation of the mixing vessel. The combination of centrifugal forces working on different planes enables a very efficient mixing process to be achieved, distinguished by a homogeneous result without the use of mixing blades. Degassing of virtually 100 % is achieved during the mixing process. Even the smallest micro-bubbles are eliminated, dispensing with additional degassing cycles. The Hauschild Speedmixer featuring vacuum technology is available for complete air extraction. Programmable cycles guarantee that every batch represents an identical, reproducible mixture, thereby speeding up the development process considerably. As the Speedmixer mixes in dis-

posable vessels without blades, there is absolutely no need for cleaning or the additional use of chemicals. The dimensions of the mixing vessels and mixing buckets range from a few grams up to ten kilogram and from a few milliliters to a nominal capacity of up to 16 l – depending on the intended size of the batch.

www.cpp-net.com

Online search: Hauschild



Picture: Hauschild

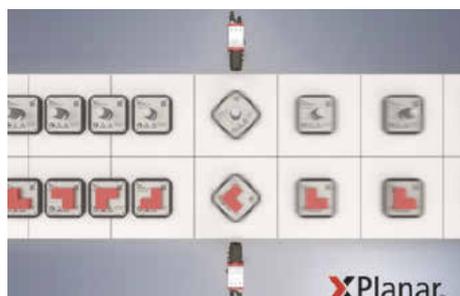
360-degree mover rotation functionality

The XPlanar planar motor system from Beckhoff enables the contactless, parallel and individual transport of products. The movers can fly freely in two dimensions over the tiles and execute lifting movements with a stroke of up to 5 mm. These system properties have now been enhanced by new software-based 360-degree mover rotation functionality. The movers can rotate now endlessly around their own axis. The rotation can be executed dynamically with a frequency of up to 10 Hz and makes a variety of ground-breaking applications possible.

The 360-degree mover rotation is made possible by the deep integration of the XPlanar system into the PC-based control technology from Beckhoff. A simple software update is all that is needed to implement the new rotation function in existing systems.

www.cpp-net.com

Online search: Beckhoff



Picture: Beckhoff



Process technology for our future

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Bio-based building blocks play an important and growing role in platform chemicals in the circular economy and reduce fossil oil usage. GEA provides advanced technologies to biorefineries for the conversion and processing of biomass into valuable products and intermediates, used across the food, feed, bioenergy and chemical industries.

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Service for field devices

Fieldcomm Group has partnered with Bilfinger Maintenance to create a usability evaluation service for FDI enabled field instruments and systems. The service is available to field instrumentation suppliers and will be managed as an optional service. Instrument usability will be evaluated by Bilfinger technicians through a series of tests with several host applications and systems. At the conclusion of the evaluation the supplier will receive a report documenting the observations.

Devices that are tested will be evaluated against a set of important criteria for usability including presence and appropriate configuration of all security certificates, successful import of the FDI Device Package into each selected host system, validation that the FDI Device Package identification parameters match the product nameplate, and operation of the FDI Device Package.

www.cpp-net.com

Online search: **Fieldcomm**

Compounds for hydrogen applications



Picture: COG

COG is presenting two high-performance materials for hydrogen applications – a blue FKM and a blue EPDM. The FKM material Vi 208 with a hardness of 80 Shore A performed convincingly in the test with a very good hydrogen permeation coefficient of only 281 Ncm³mm m⁻²day⁻¹bar⁻¹ on average. This is far above what can normally be expected from FKM compounds. A high chemical resistance and a broad operating temperature range from -10 to +200 °C round off the material profile of Vi 208.

The new EPDM development AP 208 also performed very convincingly in the H₂ per-

meation test for an EPDM (hydrogen permeation coefficient: 1317 Ncm³mm m⁻²day⁻¹bar⁻¹) and, with a compression set of <15 % and a possible operating temperature of up to 45 °C, offers a wide range of applications in the various sectors. With the two H2Seal compounds, COG provides developers and users of hydrogen technologies with two versatile specialty materials for challenging sealing solutions in this demanding application environment.

www.cpp-net.com

Online search: **COG**

Silicone sealants with bio-based methanol

Wacker is extending its silicone portfolio to include silicone sealants based on renewable raw materials. With its Elastosil eco brand now launched in Europe, the Munich-based chemical Group is able to offer products manufactured using bio-based methanol to silicone sealant suppliers. The new brand is based on the REDcert2 standard which confirms the traceability of renewable raw materials across Wacker's entire production process – from the initial upstream process to the ready-to-use silicone sealant.

Elastosil eco is Wacker's first approach to encompass and compensate all fossil-based raw materials and additives in the product formulation by using

bio-based methanol. To qualify, the purchased biomethanol has to be obtained from certified sustainable sources. Raw material volumes needed for manufacturing undergo regular audits as part of an annual recertification process.

www.cpp-net.com

Online search: **Wacker**



Picture: Wacker

Monitoring corrosion and erosion

Emerson has introduced a corrosion and erosion monitoring portfolio with digital capabilities and full integration with the Plantweb digital ecosystem. The monitoring portfolio turns existing offline corrosion probes into online tools to monitor for the risk of corrosion or erosion in oil and gas processing. The Plantweb Insight Non-Intrusive Corrosion application enables corrosion and erosion analysis at the end-user's desk. Combined with non-intrusive Rosemount Wireless Permasense sensors for monitoring metal thickness, which is a major factor in determining the health of piping and other fixed equipment, Emerson now offers a comprehensive sol-

ution to monitor both the risk of corrosion or erosion. The Rosemount 4390 series of corrosion and erosion transmitters leverage WirelessHart for reliable and robust data retrieval and work with inline probes that measure the corrosive and erosive nature of the fluid. The Plantweb Insight Corrosion applications allow users to access and analyse data from pipe thickness monitoring sensors and inline probes at their desk and gain real-time advanced analytics to assess the risk and impact of corrosion or erosion on the asset or plant.

www.cpp-net.com

Online search: **Emerson**



Picture: Emerson

Flow meter with IoT function



Picture: Nivus

Nivus offers the Nivuflow devices including a mobile phone modem with worldwide approval. The manufacturer's IoT concept allows the operators to transmit data automatically in combination with many options for visualisation and logging. Readings and system data as well as error messages or alarms can be transmitted directly via mobile networks. Due to this extension, Nivus are able to provide faster service for devices. Remote maintenance, remote diagnostics and remote commissioning open new possibilities to re-

duce time-consuming journeys for service works to a minimum. By using Nivus Connectivity, the Multiroam-SIM-Chip automatically uses the most powerful mobile network available. A benefit for operators is predictable costs since providers do not invoice roaming fees here. Data is provided on the Nivus Web-Portal and can be transmitted to other systems if required. The data transmission complies with the IT security standards by DWA, DVGW and BSI.

www.cpp-net.com

Online search: Nivus

Large flow capacity mass flow meters

Aalborg developed the XFM57, XFM67 and XFM77 digital flow meters for gases with flow rates up to 1000 l/min. Calibrations for up to 10 different gases and internal conversion factors for up to 32 gases are offered. The flow rates are displayed in 23 different volumetric or mass flow engineering units including user defined.

The XFM functions comprise programmable flow totaliser, high and low flow alarms, automatic zero adjustment, two relay outputs, jumper selectable between 0...5 V(DC) or 4..20 mA analogue outputs as well as status LED diagnostics. An optional local 2 x 16 characters LCD display with adjustable back light provides flow, total and diagnostic readings simultaneously. The flow meters can be programmed remotely via RS-232/RS-485 or optional Profibus DP interface.

www.cpp-net.com

Online search: Aalborg



Picture: Aalborg Instruments

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Control valve monitoring and management

The web-based solution Sam Valve Management by Samson implements smart monitoring and management of control valves installed in process plants. It combines the traditional world of control valves with the digital opportunities made possible by Industry 4.0 and IIoT technologies. For customers, this proves to be true added value.

Sam Valve Management gives users an overview of all connected control valves fitted with smart Samson positioners in a clearly structured dashboard displaying all relevant operating and diagnostic parameters. Malfunctions can be detected instantly. It also analyses all data

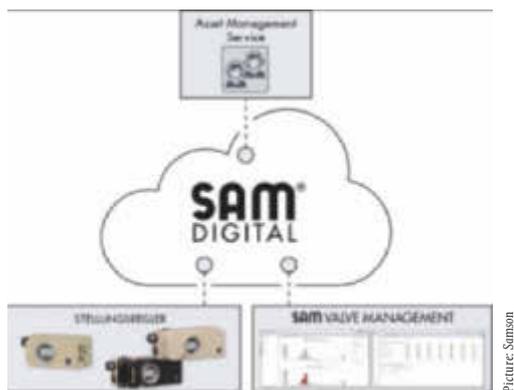
based on an extensive range of algorithms and suggests recommended action with illustrated step-by-step instructions.

The data in Sam Valve Management can be synchronised by transferring data from commonly available process control systems or Samson's Trovis-View software.

The extensive diagnostic functions provided by Sam Valve Management help increase the availability of control valves by predicting imminent valve failure and maintenance demands. Sam Valve Management also helps optimise plant profitability.

www.cpp-net.com

Online search: Samson



Picture: Samson

Process control system ensures safe plants



Picture: B&R

To protect manufacturing systems against cyberattack, B&R has enhanced the user management features of the Aprol process control system. Distributed, autonomous security cells provide simple yet efficient protection for systems against malicious software and attacks

from hackers. To achieve maximum protection, the manufacturing system must first be divided into autonomously functioning process cells. These consist of production-relevant zones, sections, sub-areas or subsystems. One or more of these process cells are then combined into security cells.

The flexible client/server architecture of Aprol allows up to 64 of these security cells.

The advanced multi-runtime server architecture of the Aprol process control system ensures that all required systems operate independently.

www.cpp-net.com

Online search: B&R

Quickly mountable single enclosure



Picture: Rittal

The Rittal VX SE single enclosure is an ideal link between the AX compact enclosures and VX25 bayed enclosures. Typical areas of application can be found, for example, in compact machines and systems whose power distribution and automation components can be accommodated in a single enclosure.

In contrast to bayed enclosures with a frame and removable side panels, the single enclosure has a body made of one piece of

sheet steel or stainless steel. As there are no gaps between side panels, roof and frame, dirt and dust cannot collect, enhancing safety. The basic version of the VX SE has an IP 55 protection rating, IK 10 impact protection, automatic potential equalisation, high strength and stability on account of exceptionally high torsional rigidity, plus 1.5 t load capacity. For challenging environments, the Rittal free-standing enclosure is optionally available with IP 66 and Nema 4/4x protection. Integrated gland plates within the base simplify cabling, even in extremely componentdense enclosures, and ensure that preparatory tasks for cabling can be performed ergonomically.

www.cpp-net.com

Online search: Rittal

Motors with efficiency class IE4

The standard version of Simotics SD is offered by Siemens in the efficiency class Super Premium Efficiency (IE4) across the entire power spectrum from 2.2 to 1000 kW and for the number of poles 2, 4, as well as from 75 kW for 6 poles and from 55 kW for 8 poles. Simotics SD in IE4 thus exceeds the so-called ErP Directive 2019/1781 (energy-related products) – both the first stage, which will be valid by July 2021, as well as the next, which will apply from July 2023. In accordance with the regulation, Siemens offers the Simotics SD motor series consistently in IE4 for all affected motors. In addition, however, also for motors with an output of up to 1000 kW as well as for 8-pole motors from 55 kW, which are still exempt from the second stage from 2023. Users of Simotics motors can thus meet the increasing requirements for energy efficiency and environmental compatibility in the long term. Highly efficient motors also allow users to save energy, lower their operating costs and reduce CO₂ emissions.

www.cpp-net.com

Online search: Siemens

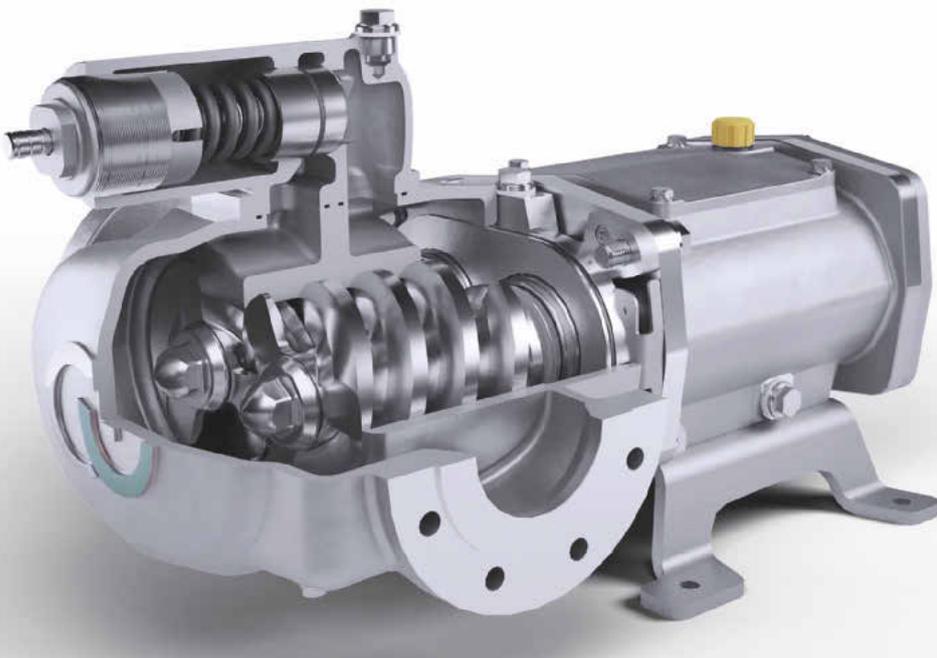


Picture: Siemens

Single-flow twin screw pumps

Easy to maintain

In the field of tank storage and chemical applications, single-flow twin screw pumps are increasingly replacing conventional displacement pumps in the range up to 500 m³/h. The team from Fristam Pumpen Schaumburg, based in Stadthagen, has completely focused on this segment with the launch of the VPS Pumpen brand.



Picture: Fristam Pumpen Schaumburg

The single-flow screw pumps of the VPS series can be used flexibly, have a simple design, are easily accessible and are therefore easy to maintain

Tanks are filled with different products such as gasoline, gas oil, VGO, heating or heavy oil as well as various chemicals. The pumps used must therefore have particularly good suction properties in order to ensure that the tanks, tankers, ships or tank waggons are completely emptied – same for the pipelines. A point where the VPS pumps show their strengths.

With only two seals

In the case of single-flow pumps, the pump chamber is sealed off from the atmosphere using only two seals, which are arranged either on the suction or pressure side. The pump housing structure is kept very simple and access to the conveying elements and

mechanical seals is quick and easy in just four steps. This makes the pump very easy to maintain. Single-flow VPS screw pumps are rotating displacement pumps that work with two intermeshing, contact-free delivery screws that are designed with different pitches depending on the application. Rotation creates chambers that move from the suction side to the pressure side and thus convey the medium. Due to the reversal of the direction of rotation, reversible operation, i.e. pressure and suction, is possible without changing the pump.

The axial conveyance enables a stable performance curve in a very wide speed range – up to a factor of 10 wider than with alternative positive displacement pump technol-

ogies. With different housing materials and feed screw pitches, a wide range of application areas are possible for the VPS series: from very thin media such as ethanol to barely flowing media such as heavy oil or bitumen.

Areas of application and variants

The VPS series conveys non-lubricating media or media loaded with solids, low to high viscosity media as well as liquid-gas mixtures with almost no pulsation. The medium temperature can be up to 210 °C. The VPS series is available as Atex (indoor and outdoor) and TA-Luft-compliant version. The available product variants are structured according to pressure range and volume flow and are each available in stainless steel or cast steel. The basic version of the VPS series covers areas of application up to 500 m³/h and up to 25 bar. It is supplemented by the inline version VPSI. The VPS Power Pack connects two pumps in series and enables up to 50 bar at 150 m³/h. The VPS Flow Pack connects two pumps in parallel and enables 1000 m³/h and up to 16 bar. It is interesting for customers who have strongly changing flow rates in operation, who do not want large motors and converters or who simply want to be on the safe side.

www.cpp-net.com

Online search: Fristam Pumpen



AUTHOR
RENÉ LINCK
Product manager,
Fristam Pumpen
Schaumburg

Understanding performance and system curves

Tips for optimising pump systems

The performance of a pump can best be assessed using reference values. They also help to diagnose performance-related problems. If the operator creates performance curves, he can correct long-standing problems and gather basic knowledge and reference points to set his pumps to optimal performance. This helps to ensure economical, safe and reliable operation of the pumps for years to come.

Context is a useful tool for problem solving and decision making. Many of life's decisions are arrived at only after a series of reference points are reviewed. For instance, anyone would call a 50 Euro loaf of bread unrealistically expensive, because a lifetime of bread buying tells you that it should cost much less. The same principle applies when attempting to analyse the performance of the pumping system in an industrial-manu-

facturing application with a liquid-handling function. When assessing pump performance and diagnosing any performance-related issues, having reference points with which to compare current performance can be an invaluable tool, resulting in a streamlined, cost-effective, durable, safe and completely optimised operation that will provide years of reliable service.

Reading pump performance curves

Performance curves – once you have attained the necessary context – are easy to understand and can be reliable allies when determining the limits of a pump's operational capabilities. The first thing to know is that all pumps, no matter the operating principle, are simple machines, meaning that they don't have a mind of their own but instead will always operate at the intersection of the pump's performance curve and system's resistance curve. So, because pumps operate so predictably, knowing as little as two performance curve data points provides the operator a lot of powerful information.

The published performance curve is only half the equation regarding predicted pump performance; the other half is the pump's system curve. You should not be put off by complex performance curves, rather you should understand the system curves for calculating the performance of the pumps. Reference values are often missing due to a lack of knowledge of pump technology. Over the years, moreover, pumps and piping may have been added or subtracted from the system. Since many alterations may occur over time, accurate system dia-

grams are then often no longer available, nor is the original designer. Operators must be able to overcome their initial fear of the system curve, knowing that a full understanding of the curve will have many benefits for the user:

- Improved ability to understand any future new installations and upgrades to existing setups
- A baseline for sanity checks on pump performance that compares input information to known capabilities
- Better ability to choose the best pump technology for the system's needs
- Increased knowledge on how to select the right pump technologies to solve even long-standing problems.

Working with the system curve

That process begins with familiarity with the system curve, which consists of two parts: flow and pressure. Every pumping system experiences flow resistance against a set flow rate. So, a basic system curve is the flow resistance plotted at fixed flow conditions. The system curve uses the same two axes as a performance curve: the X-axis is always flow rate and the Y-axis is always pressure.

There are two contributors to every system curve: friction loss and residual pressure. A system curve crosses the Y-axis at the residual pressure and slopes upward according to the friction loss. Friction loss is piping's resistance to flow. Like increasing drag on a sports car, pipe-friction loss increases as flow velocity increases. From basic fluid dynamics, the Darcy-Weisbach equation shows a very convenient square relation-



Pictures: Blackliner

A precondition for the appropriate design of an industrial pump system is to know, evaluate and analyse the specific key data

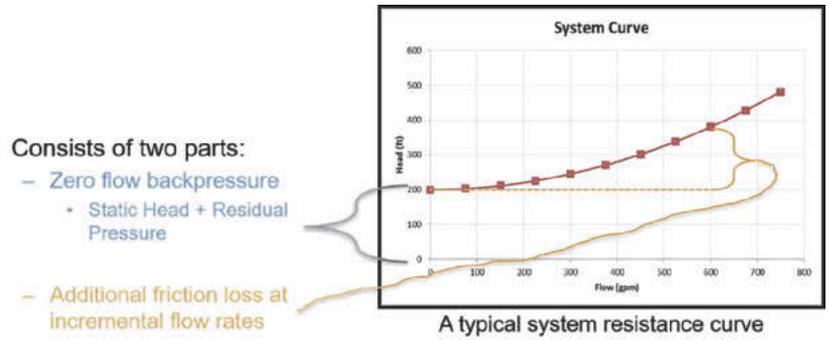
ship between velocity and friction loss. Residual pressure is the system's zero-flow backpressure. It quantifies the system's base-level resistance at zero flow rate. It consists of two parts, net elevation difference between source and destination (i.e. static head), and residual pressure difference between source and destination.

Many sources are available to calculate friction loss, including Blackmer Bulletin 33, which tracks friction loss for all pumps and all liquids at viscosities up to 1000 cP. To create a system curve, simply calculate the friction loss at two or more flow rates, add or subtract the zero-flow backpressure and plot those points on the same pump-curve axis. Then plot subsequent intermediate points using the simple square Darcy-Weisbach relationship: half the flow, one-quarter the friction loss.

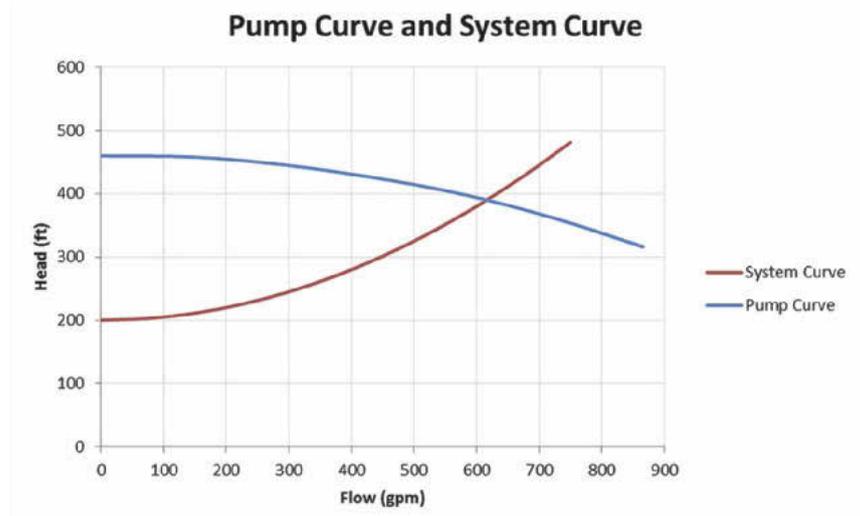
Measuring friction loss can be even easier. With two pressure gauges, you can simplify the creation and use of system curves. If you put a gauge at each of the inlet and discharge ends of the pump, the difference in the two pressure readings will indicate the differential pressure or differential head. This will enable the plant operator to quickly cross reference where the pump operates by checking the measured differential pressure or differential head against the pump curve. Plotting system curves is especially useful for systems that operate in a variety of conditions or have a wide operating envelope. Simply plot system curves that correspond to your system's extremes to see the full range at which the pump will operate.

Rise to shutoff

After assessing the operating range of a pump system, it's important to check for problem zones, especially when using centrifugal pumps. Centrifugal pumps have three zones on their performance curves: shutoff, Best Efficiency Point (BEP) and run-out. If a system operates near runout (or the steep portion of the curve far from the Y-axis), the motors will experience an overload current and pump reliability will decrease from cavitation. If it operates near shutoff (or the flat portion of curve near the Y-axis), the pump and surrounding components will have reliability issues, and even experience destructive water hammer. Rise to shutoff is defined as the difference between the pump's operating point and the shutoff pressure. For example, a 3x4-8 pump must deliver 189 l/min (50 gpm), which looks to be OK because on the system curve it is to the right of the manufacturer's minimum recommended flow rate (MRF).



The system curve indicates the friction loss or flow resistance of the piping system and the residual or back pressure of the system at zero flow



The point where the performance curve of an individual pump crosses the system curve indicates the pump's best efficiency point (BEP)

But what happens if there is a slight pressure change of as little as 0.07 bar? That 0.07-bar change may appear to be negligible, but that pressure drop can create a flow-rate flux of as much as 606 l/min (160 gpm) in this example. So, a flow rate that can accumulate between 0 and 606 l/min can result in dynamic water-hammer pulses, the level of which will be further exasperated if any control devices are being used, resulting in severe pumping-system damage. A rule of thumb for hydraulic stability is to maintain at least a 3% rise-to-shutoff factor, though 5 to 7% is more desirable. Anything less than 3% will result in fluctuation issues because, again, simple pumps don't know where they best operate because a pressure signal may be telling them they are operating effectively within a 606 l/min range.

Complex pump systems

The introduction of inline devices (filters, valves, strainers, heat exchangers, etc.) adds complexity to the pumping process. What if one of the valves is closed or a filter is clogged? You can measure friction loss where a valve is closed or a filter is clogged and then plot the new performance and sys-

tem curves. If the range of system curves shows that your pump operates in a danger zone, the filter may need to be back flushed to restore proper operation. Or it may indicate a need to maintain tank levels to facilitate a smooth, efficient pumping process. Another variable is multiple flow paths in the pumping process. Examples of this include closed cooling-water systems and burner systems, when one pump feeds multiple users. In setups like these, the overriding question is: which flow path to use to analyse the pump's performance and system curves? It doesn't matter. Like an electrical circuit, the parallel paths in a closed-loop system balance, with any friction loss the same in all parallel paths. Size the pump for the loop with the highest back pressure and the balancing valves will simulate equal back pressure for the other flow paths.

www.cpp-net.com

Online search: Blackmer

AUTHOR

GEOFF VANLEEUWEN

Product Management Director,
Blackmer

Connecting hose lines quickly and safely

Versatile quick couplings and fittings

CPC quick couplings are easy-to-use tube connectors for fluids and gases. Standard quick couplings, high flow quick couplings, non-spill quick couplings, brass chrome-plated quick couplings and multiple quick couplings cover the need for quick disconnection and connection of tube lines. In addition to the couplings, there is an extensive range of tube connectors and fittings, which offer a great number of connection options for plastic tubes, and TEF threaded fittings for connecting pipe threads.

With CPC couplings, hose assemblies in nominal diameters from 1.2 to 19 mm can be connected and disconnected easily, quickly and cleanly. Most of these couplings are available with shut-off valves on one or both ends and you have various connection options for the attachment of the couplings, depending on the medium and the tubes used. The couplings are made of different materials to cover all requirements regarding resistance to chemicals, pressures of up to 17 bar and temperatures from -40 to +140 °C. With multiple connector quick-release couplings, even two, six or ten tubes can be connected easily and without confusion. Wolftechnik, main distributor for

CPC quick couplings in German-speaking regions, stores all common CPC quick coupling series for industrial applications.

Standard and high-flow couplings

SMC couplings are the smallest coupling series from CPC. These twist-to-connect couplings provide a reliable and more secure alternative to luer-type connections. The coupling design allows tubes to rotate freely when connected, preventing both kinking and accidental disconnection during use. PMC series couplings are CPC's most popular quick couplings. They are available in two types of materials. The standard version made in Delrin acetal is extremely durable

and suitable for use with most mild chemicals. The PMC12 is made in polypropylene and is resistant to a wide range of chemicals. The EFC series has an enlarged nominal diameter to increase the flow rate. Made of polypropylene, the series is predestined for use with acids and darkroom chemicals. For particularly high flows cater HFC quick couplings. Their main features are an optimised flow, ergonomic design and low weight. They are available in polypropylene, polysulfone and in a UV-resistant material. HFC couplings are recommended for all applications with water, acids, alkaline substances and most other chemicals. The FFC35 series has been designed for extra high flow. The external design corresponds to that of the HFC series, while the inside features a much larger flow bore. The FFC quick couplings are thus only available as non-valved couplings and are made entirely from polysulfone. The series is widely used in cooling circuits and mobile devices with water supply connections.

Robust and non-spill CPC series

A stainless steel version has been added to the well-proven MC quick-release couplings made of chrome-plated brass and extends the range of applications. The couplings have a particularly long service life and are highly pressure and temperature resistant. They are used in applications with rugged conditions. The MC series is identical to the PMC series made of plastic. The LC series is now also available in stainless steel. As with the MC series, the LC series was designed to increase the service

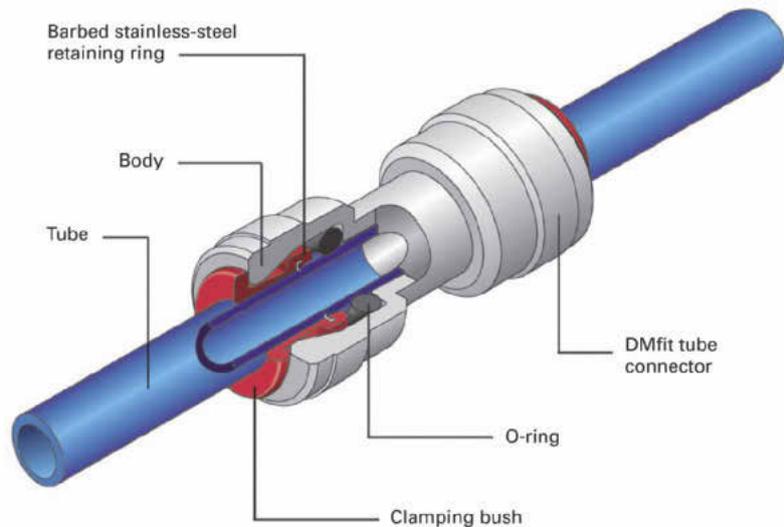


Pictures: Wolftechnik

With their different coupling series, tube lines in nominal widths from 1.2 to 19 mm can be connected and disconnected



Given the huge variety of connectors in L, Y, T and X shapes, the DM-fit series offers a wide range of connecting options



DM-fit-tube connector with push-in technology

life in harsh operating conditions. As a high-temperature version, the couplings can also be equipped with special valves and O-rings. In the new ranges of leak-free CPC quick couplings (non-spill quick couplings), the NS1 series is the smallest version and the NSH series the largest. It offers excellent throughput values. In between are the NS2 series, the NS4 series and the NS6 series. The special valve mechanism allows for drip-free disconnection. NS1 coupling bodies and plugs are made from glass-filled polypropylene and feature EPDM O-rings and stainless steel springs. The release latch is made from PEEK. This makes their use interesting for all applications in which dangerous chemicals are conveyed or where electronic components are located in the area of the tube connection.

The closed-system design of the LQ couplings provides drip-free tube connections with patented valve technology designed for frequent connect/disconnect. The redundant double sealing mechanism of the plug coupling remains drip-free even during long sealing times. LQ quick-release couplings enable shutdown in the event of pressure without any leakage. This makes them ultra-reliable for use in sensitive areas like liquid cooling applications in order to protect the electronics from the effects of liquids and to be able to change the clutches during operation.

Tube connectors, valves and filters

The push-fit connectors made from Delrin acetal for metric plastic tubes are available as standard tube connectors and also as con-

nectors equipped with ball valves, needle valves, check valves and inline filters. Given the huge variety of connectors in L, Y, T and X shapes, the DM-fit series offers an impressive range of connecting options for plastic tubes with nominal diameters of 4 to 12 mm. In addition, the DMfit connectors are available as tube-to-tube couplings and adapters with female and male threads. To connect the tube ends, simply push them into the connector port. The tube ends can at any time be disconnected. An O-ring between the tube and the outer part of the connector provides a reliable seal. The tube end is kept in its position by a barbed stainless steel retaining ring, preventing inadvertent disconnection. To open the connection, simply hold the stainless steel retaining ring by its outer plastic collar and pull the tube from the push-fit connector.

Fittings complete the programme

EJ fittings made of plastic cater for any type of connection between plastic tubes with nominal diameters of 1/16" to 3/4". They are available in virgin PP, virgin PE and PVDF, and are certified for use in the foodstuff, medical technical and beverage industries. The fittings come in many shapes and sizes – from straight connectors, threaded pieces to elbows, tees and manifold pieces – allowing for virtually any tubing layout. Special reducers and adapter plugs enable you to connect tubes of various nominal dimensions. TEF threaded fittings can be used for pipe threads in the nominal sizes from 1/8" to 1/2". The TEF range includes reducers, elbows and tees, as well as simple double



TEF threaded fittings are available as reduction pieces, L-pieces, T-pieces or simple double nipples, plugs or caps

nipples, plugs and caps. The fittings are made from Nylon 66 and dyed blue. Thanks to the excellent thermal and mechanical properties of Nylon 66, TEF threaded fittings are suitable for operating temperatures of up to 120 °C and maximum operating pressures of 14 bar.

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Online search: **Wolftechnik**



AUTHOR
PETER KRAUSE
Managing director,
Wolftechnik Filtersysteme

Reliable monitoring of solid materials

Four level switches in one go

Emerson introduced a range of Rosemount solids level switches designed to optimise operations, increase safety and reduce waste by providing reliable point level monitoring and supporting overflow prevention. The switches are based on four proven technologies for continuous and point level solids measurement. This ensures that the appropriate solution can be deployed to meet every application requirement.

Point level switches provide limit detection, which is needed in most vessels and silos to prevent overflowing and run-dry situations, both of which can have extremely serious and costly consequences. Overfills can cause safety risks to personnel and damage to the vessel and the surrounding environment, which in turn would produce a loss of storage capacity whilst repairs take place, while run-dry situations can disrupt a process or even stop production. Organisations must therefore minimise risk by installing point level

switches as part of an effective safety instrumented system.

Due to the diverse nature of the solids materials and process conditions encountered in the chemical industry, there is no 'one size fits all' solution for limit detection, and various point level switch technologies are well proven. Selection is typically based on the size and space constraints of the vessel, and the application conditions. Let's look at the different point level switch technologies and the applications to which they are best suited.

Easy mountable paddle switches

Paddle switches can be easily mounted through the wall of a vessel and positioned where limit detection is needed. Their operation is based on a small internal electric motor continuously rotating a paddle. In free air, the paddle can rotate freely at the full speed of the motor. However, when the paddle is impeded by the material, the rotation is slowed or stopped, causing a microswitch to actuate an alarm signal. When the paddle has stopped rotating, power to the motor is cut. When the material level falls, the microswitch restarts the motor, enabling the paddle to rotate freely again. The robustness of the paddle design makes these switches suitable for extreme process conditions such as high pressures and high temperatures. This makes them a cost-effective option for small process vessels and most bulk solids, and a widely applied solution in applications involving granular, pelletised and powdered products.

Reliable vibrating fork switches

The vibrating fork switches have twin prongs, which an internal piezo-electric crystal causes to vibrate at their natural frequency when in free air. The frequency varies when the prongs are immersed in the material, thereby enabling the presence or absence of material to be identified. The switch's electronics detect frequency variation, and the output state is then changed. Vibrating fork switches are reliable and have low maintenance requirements because the devices have no moving parts to wear or stick. The compact nature of these switches makes them ideal for vessels where space is



Pictures: Emerson

Point level measurement provides limit detection for the prevention of overfills and run-dry situations in tanks and silos

limited. They are suitable when high sensitivity is required, they perform well with low bulk density, fine-grained and fine-powdered products, and they can withstand high mechanical loads because of their short extension length. Vibrating fork switches with wetted parts made from corrosion-resistant stainless steel are suitable for use in hygienic applications, such as in the food industry.

Compact vibrating rod switches

As with vibrating fork switches, vibrating rod switches use piezo-electric vibration technology to energise the rod and keep it vibrating at its natural frequency in free air. As the level in the vessel rises, the vibration is dampened, and when the electronics detect material covering the rod, the switching of the output relay is initiated. As the level descends and the rod is again in free air, the vibration restarts and the relay switches back. These switches have high sensitivity, are unaffected by dust, and are suitable for hygienic applications when constructed from stainless steel. The single rod design eliminates the possibility of material build-up causing blocking or bridging, which can affect vibrating fork technology performance. They are a suitable solution for fine-grained and powdered products, and their compact design makes them a superior choice in vessels with limited space. In addition, they can withstand high mechanical loads and are reliable, with low maintenance requirements.

All-round capacitance switches

These switches form a capacitor when installed in a vessel, to detect whether they are covered by the material. A probe acts as one plate of the capacitor, and the vessel wall (or reference electrode in a non-metallic vessel) acts as the other plate. As the product level rises, the air surrounding the probe is displaced by material with a different dielectric constant. Because the dielectric between the plates has changed, a change in the value of the capacitor takes place. The switch detects this and converts it into a relay actuation or proportional output signal. Capacitance switches can tolerate challenging process conditions, including variable density, low dielectric values, high temperatures and high pressures, making it a good all-round technology, suitable for use with most bulk materials, regardless of particle size. These switches are particularly



Rosemount solids level switches are designed to optimise operations, increase safety, and reduce waste

suitable in applications where there is a risk of coating or high levels of vibration.

Four technologies in one range

The vibrating fork, paddle, capacitance and vibrating rod switches within the Rosemount range from Emerson require low levels of maintenance and are suitable for operation in extremely challenging environments, including those with high temperatures, high pressures, dust and risk of explosion. The switches can be used to provide stand-alone point level monitoring to help optimise filling and emptying cycles. They can also be deployed within an overflow prevention system, helping to prevent wasted materials, environmental impact, high clean-up costs and damage to the silo. In applications involving light, fine-grained and powdered materials where high measurement sensitivity is required, Rosemount 2511 and 2521 vibrating fork switches provide a cost-effective solution. European Commission Atex certification permits installation in explosive areas, and all wetted parts are made from corrosion-resistant stainless steel, making them suitable for use in hygienic applications. The Rosemount 2501 rotary paddle switch can be used as a full, demand or empty detector in storage silos or process vessels. The robust paddle design can withstand heavy loads and extreme temperatures of up to 1100 °C.

The Rosemount 2555 capacitance switch can be installed in pipes as a limit switch and spillage detector. The switch is suitable for use with materials that have dielectric values as low as 1.5 and is designed to prevent material build-up in applications where there is a risk of coating. The Rosemount 2535 vibrating rod switch provides high chemical resistance due to the fact that it is completely made of food-grade stainless steel. Although measuring the level of solids can be challenging, advanced technologies currently available are able to meet the demands of these applications. With careful consideration of the specific application conditions, installation constraints, and capabilities of the different technology options, it is possible to provide accurate and reliable level measurement solutions that increase plant safety and efficiency.

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Online search: Emerson



AUTHOR
ROBERT SEGOTA
Business Development
Manager,
Emerson

Wireless adapter transmits Hart signals

Brownfield digitalisation in line with NOA

Industry 4.0 concepts are comparatively easy to realise when building new industrial process systems. But when it comes to brownfield systems that have always operated with the 4...20 mA communications standard, plant operators have difficulties to convert. The Fieldport SWA50 communications module designed for Hart-capable instruments can establish a bridge to digital signal transmission without burdening the existing communication channels or impacting the system architecture.

Data is the foundation of Industry 4.0. Connectivity is one of the basic prerequisites for making it available. The challenge facing plant operators in Germany is that most of them have been operating their systems for years or even decades. As a result, they find themselves stuck in brownfield environments. This is also why Namur developed the so-called “NOA – Namur Open Architecture” and adopted the corresponding NE 175 Namur recommendation. The basic idea of the “Namur Open Architecture” is as simple as it is

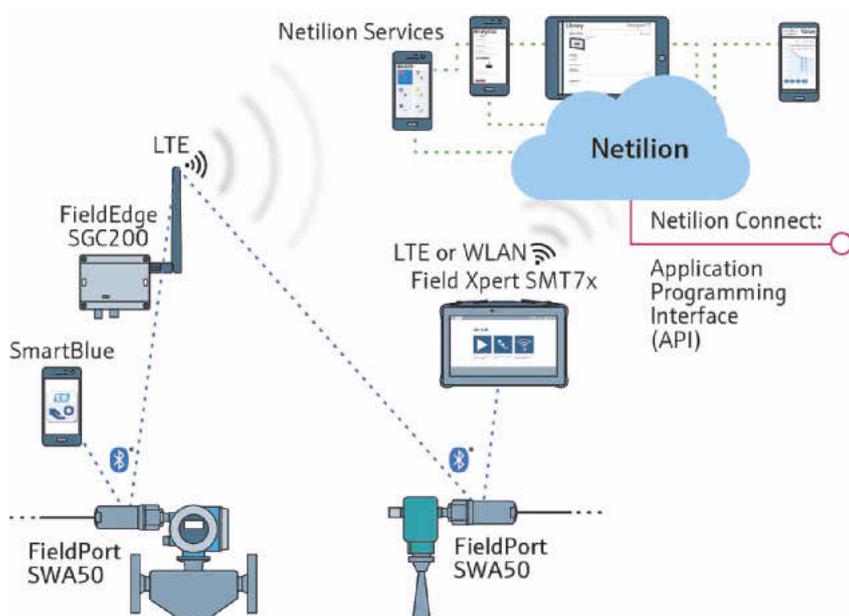
captivating: the transmission of additional digital data from the field level is carried out in parallel to the transmission of the measurement values across a second communication channel. This approach minimises the amount of additional data traffic and the impact on existing system architectures.

NOA as bridge technology

NOA serves as an important bridge technology from the strict hierarchical structures of Industry 3.0 to the fully connected, digital

Industry 4.0 environments. Implementing parallel data transmission as an extension makes it ideal for existing systems. Today, 97 % of data from field instruments is not utilised. Existing systems thus contain a huge amount of potential that could be tapped into through digitalisation. It also offers users an opportunity for permanent asset monitoring since instruments can be clearly identified and the configuration parameters and correct layout reflected in the “digital twin.” Thanks to state of the art diagnostic functions, the health condition of smart sensors can be permanently monitored.

The second channel NOA concept provides service and maintenance personnel direct access to condition monitoring while reducing the volume of data in the core processes. Digitalisation furthermore enables comprehensive asset management and process optimisation through the additional analysis of monitoring data. To realise the NOA concept in practice – for both new (greenfield) and existing (brownfield) plants – Endress+Hauser now offers a clever and simple solution with the Fieldport SWA50.



— Data from any Hart-capable instrument can be transmitted to the cloud and used for various digital services

Adapter transmits Hart signals

90 % of Endress+Hauser field instruments already feature a digital interface, including fieldbuses such as Profibus or Foundation Fieldbus, in addition to Hart, the most common technology. In practice though, the Hart signal is not utilised in most environments. With the Fieldport SWA50 wireless adapter, all Hart signals can be transmitted

parallel to the measurement values, including those from third-party manufacturers. The Fieldport SWA50 is intrinsically safe (Ex ia), loop powered, and can be easily retrofitted to work with HART instruments from any manufacturer.

The Hart signals can then be transmitted to the cloud via WirelessHart or Bluetooth. If Bluetooth is used, transmission is carried out via the Fieldedge SGC200 direct into the Endress+Hauser Netilion cloud. This provides users access to the entire range of Netilion services such as Netilion Analytics, Netilion Health and Netilion Value, which enable features such as condition monitoring and the remote display of measurement values. And with the Smartblue app, users can remotely configure the field instrument parameters. In another step, the data can



Picture: Endress+Hauser

With the Fieldport SWA50 a second channel for data transmission can easily be retrofitted for brownfield environments

also be transmitted to customer-specific clouds or ERP solutions via an application programming interface (Netilion Connect). With WirelessHart, connectivity occurs via the Endress+Hauser Fieldgate SWG70 and the Fieldedge SGC500.

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Online search: Endress+Hauser



AUTHOR
PETER DIETRICH

Head of Marketing Solutions and Digitalisation, Endress+Hauser Germany

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Dr. Henning Mersch, Product Manager Twincat, Beckhoff Automation



Laurids Wetzel, Business Management Process Industry, Beckhoff Automation

Cyber-physical modularisation in the process industry

Standardised interfaces for modular plants

With Twincat MTP, Twincat automation software from Beckhoff helps create MTP projects with automatic code generation, paving the way for efficient module development integrated into the Twincat engineering environment. Dr. Henning Mersch, Product Manager Twincat, and Laurids Wetzel, Business Management Process Industry at Beckhoff Automation, explain how module manufacturers can develop compliant modules with Twincat MTP.

Mr. Mersch, Mr. Wetzel, the term Module Type Package (MTP) can scarcely be avoided in the context of Process Industry 4.0. What is behind it?

Wetzel: The MTP describes the interfaces of an associated process engineering module. This means that this file – in other words the MTP – can be used to integrate process engineering modules into an overall context. The modules and their functionalities are combined in a Process Orchestration Layer (POL) and orchestrated from there. The functionality of the POL can be represented, for example, by a DCS.

Mersch: The Module Type Package therefore describes communication between the POL and the modules. The modules can be understood as intelligent units, which have their own control system and only communicate with the higher-level DCS via this control system. The MTP concept is described in the VDI/VDE/-Namur 2658 guideline.

Even today, process engineering plants are frequently constructed in a modular way. What is the added value of using the MTP concept for this?

Wetzel: One of the traditional approaches for modular processing plants is their purely mechanical modularisation. In particular, this allows simple transport, since the plant can be disassembled into its modules and the modules can be transported individually and then reassembled. However, no flexibility is gained with regard to the process itself in this way. This means that while I can disassemble my plant into individual modules, they cannot be reassembled in a different way again or simply extended. Such flexibility is increasingly demanded, however, since shorter production lifecycles should mean that existing plants or modules can be reused to produce other products.

Mersch: Some sensors and actuators today are still connected to the DCS directly or via a system bus, which means that if a plant is re-

purposed, the process entities have to be configured individually in the modules – the MTP will change all this. Another essential step is therefore to modularise the automation and therefore the encapsulation of the control logic into the individual modules. This too is already frequently used today, though proprietary interfaces are required for this purpose, which are used to control the modules. The MTP completes this development by defining these interfaces in a uniform and vendor-neutral manner. This means that modular process engineering plants can be constructed in the shortest possible time from existing modules from different manufacturers. Such recombination has no major impact since only the orchestration and not the control logic has to be adapted.

With the introduction of the ELX terminal series in 2018, Beckhoff expanded its product portfolio for the process industry. To what extent does TwinCAT MTP contribute to this?

Wetzel: At Beckhoff, we see ourselves especially as a system provider for module manufacturers. With the introduction of the ELX terminal series, we offer module manufacturers the possibility to connect sensors and actuators directly from zone 0/20. In combination with our other I/O interfaces, controllers, and control panels, we offer module manufacturers a complete solution for the use of automation technology in explosion-sensitive areas. Moreover, TwinCAT represents an established engineering environment for programming the module. TwinCAT MTP now extends this environment with the option of module definition, MTP export, and automatic code generation for supporting module programming.

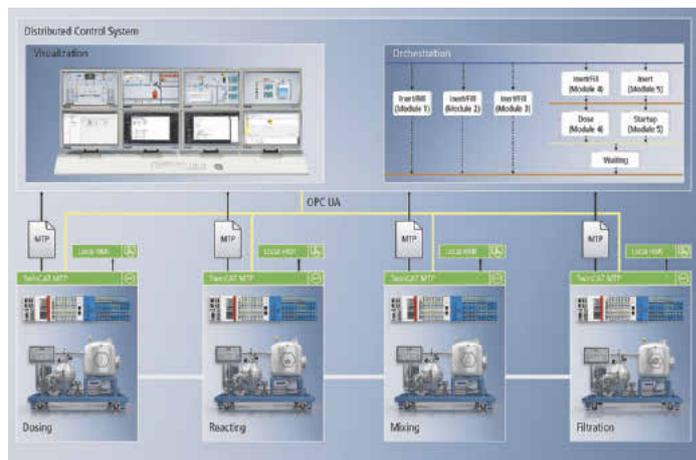
„The MTP is based on a uniform and manufacturer-independent definition of the interfaces.“

Where do you see the greatest challenges in module development?

Mersch: The crux of the MTP is the standardisation of the interfaces and therefore the possibility of interoperability. To ensure this, it is necessary to include relevant specifications concerning the behaviour of the individual elements of a module in the guideline. In turn, module manufacturers will then have to take account of and implement these specifications in their modules. However, it cannot be expected in practice that every module developer will have detailed knowledge of the guideline. The goal in developing TwinCAT MTP was therefore to minimise the guideline expertise required by the module manufacturer and have these requirements implemented automatically. This is done primarily through the automatic generation of a PLC template based on the previously defined module information of the MTP.

How can Beckhoff module manufacturers develop MTP-capable modules with TwinCAT?

Wetzel: The workflow for developing a module begins initially with the definition of the module in TwinCAT MTP Engineering. All module aspects, such as the services (functionalities) and their dependencies, can be defined in this environment. Because this information already adequately defines the interfaces of the module, the MTP can then already be exported. Furthermore, this information is now



With TwinCAT MTP, the automation software from Beckhoff will enable increasing plant modularisation in the process industry

used to generate the PLC template based on the TwinCAT MTP library. This code generation can be adapted individually if necessary with the TwinCAT XCAD interface. The pre-engineered code can then be completed through state programming of the predefined services. Finally, TwinCAT then ensures automatically when the configuration is activated that communication can be established via OPC UA from the POL as described in the MTP.

How can module manufacturers incorporate their own P&ID and other planning data into the workflow?

Mersch: The MTP additionally offers the possibility to define a visualisation blueprint. The POL can then use this to generate an overall visualisation of all modules from the MTP descriptions in the same look & feel. It therefore makes sense to extract the information needed for this purpose from the P&ID of the module. Instead of likewise integrating the P&ID editor in TwinCAT and thus making the module manufacturer dependent on it, we have opted for an open approach to integrating the planning data in the workflow. TwinCAT MTP can be used to import an incomplete MTP, which was previously generated by a P&ID editor, and then complete it. Alternatively, the TwinCAT MTP automation interface can be used to integrate proprietary data sources. The interface provides an API for the module manufacturer, which allows programmatic access to the MTP project. Existing data from P&ID editors or data sources can therefore be used even if they have not already implemented a MTP export. As a result, the module manufacturers can continue to use existing tools and databases.

In your opinion, are there still aspects that could be improved in the MTP?

Mersch: The VDI/VDE/Namur 2658 guideline contains sheets 1 to 4 in the current version. Further topics will be dealt with in upcoming sheets and published as a supplement to the existing sheets. Important aspects will, for example, include module-to-module communication, the safety MTP, diagnostics/maintenance, and validation. However, even now the concept is at a sufficient stage to develop practical modules and fully exploit their flexibility. Thanks to our collaboration in the VDI-GMA expert committee 5.16, we not only know about these enhancements early on, rather we are involved in actively shaping them. Of course this also gives rise to enhancements for TwinCAT MTP – and possibly also to early evaluation.

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Online search: Beckhoff

Listening devices on production components

Acoustic emission testing for safe pressure equipment

Evidence of the integrity of pressure vessels is imperative in guaranteeing the safe operation and availability of chemical plants. TÜV SÜD shows how acoustic emission testing (AT) can be used to realise these objectives. Modern AT systems feature fast processors and user-friendly operating software, and can process and identify up to several hundred localisations per second in real time. In recent years, data recording and analyses rates have increased a thousandfold.

Germany's Regulation on Health and Safety in the Use of Work Equipment requires pressure vessels, piping and other pressurised plant components to be inspected periodically for aspects such as tightness, cracking and/or possible spread of corrosion. This is commonly done by internal inspection including visual examination or hydrostatic test. However, this type of inspection can be time- and cost-intensive; vessels need to be drained and cleaned, which involves measures in occupational health and safety (OH&S), as well

as environmental protection and the costs of production loss due to shutdown of the system.

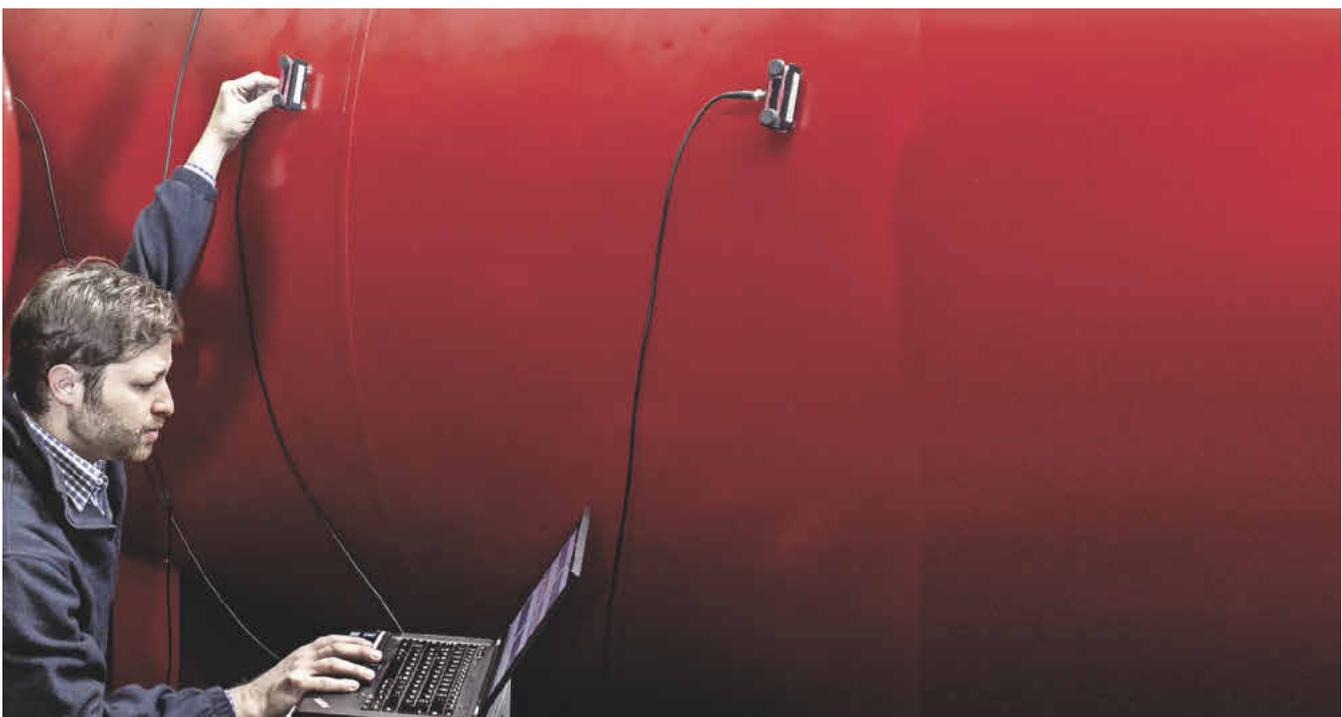
In-service testing

Acoustic emission testing (AT) can replace internal inspection of pressure vessels and serve as a monitoring tool during strength testing, also for OH&S. Under certain conditions, pressure vessels can be tested in service as well as by means of continuous monitoring. Depending on the mode of operation, the exclusion of some damage

mechanisms and the on-site conditions, draining and cleaning of the pressure vessels may not be necessary. In other words, the time and costs associated with these activities can be saved. However, pressure application during testing is one of the prerequisites for AT. The test pressure PT_{AT} should be set to at least 1.1 times the maximum pressure during operation P_{Op} .

Triggering sound waves

AT is a non-destructive test method (NDT) that allows integrated detection and locali-



Pictures: TÜV SÜD

Acoustic emission testing (AT) of pressure equipment enables reliable statements to be made during operation

sation of leakage and discontinuities. Application of the test pressure triggers changes in the structure of the metal, such as local plastic deformations or crack propagation. Acoustic emissions are generated by sudden mechanical motions in the material structure, which cause vibrations in their surroundings. The surrounding structure deforms elastically and bounces back, causing a transient elastic sound wave which propagates from its point of origin. The sound waves are absorbed by piezoelectric sensors. The signals are recorded and processed to detect and localise the acoustic emission (AE) sources. With only a few sensors at fixed positions, experts can perform 100 % testing and monitoring of a structure. Even large vessels and components with complex geometries or difficult-to-access areas and fittings can be tested easily and reliably. The sensitive measurement method “listens” to the material, recording discontinuities as they arise or propagate. Given this, the test method offers real-time capability and can also be used as an OH&S action for monitoring gas-pressure tests. Using AT, impending failure of the test object will be displayed at an early stage. This allows the test process to be safely interrupted or terminated at any time.

Classification of AE sources

The signals are grouped into clusters based on their local accumulations. The number of signals detected in a single cluster indicates the degree of activity at that point. Categorising the signals and clusters into three classes by their AE activity and intensity has proved to be helpful in the evaluation of measurement results:

- Class 1 – insignificant source, no actions required
- Class 2 – active source, visual examination or other NDT method for follow-up inspection and evaluation
- Class 3 – highly active source, interruption/termination of testing, pressure relief, visual examination and other NDT methods for follow-up inspection and evaluation before operation of the pressure equipment is restarted

This provides a good basis for planning and implementing the next steps and possible actions to be taken. As a matter of principle, the plant manager and the organisation

commissioned to carry out the test should agree on the quantitative evaluation criteria and the actions derived therefrom before measurement is performed, and document them in a test instruction.

AT of a large vessel

A refinery manager commissioned TÜV SÜD to perform acoustic emission testing of a C4 column. AT should replace visual examination of the inside walls of a large vessel in internal inspection without process interruption. The industrial-sized vessel, manufactured in 2006 from fine-grain structural steel (P355 NH), had the following dimensions: height 74.3 m, diameter 4.44 m, volume 1,160 m³ and wall thickness 22 to 26 mm. The inside structure of the vessel was complex, with several features and valve trays.

Before AT could be carried out, certain preparations had to be made. For example, the column first had to be scaffolded to grant access for the installation of the 88 piezoelectric sensors across the outside wall of the vessel according to the layout plan. To install the sensors to the blank metal surface of the pressure vessel with the help of magnetic holders and a couplant, the insulation of the column first had to be locally removed over an area of 20 x 20 cm at each sensor location.

The test pressure ($P_{T,AT} = 1.1 \times P_{OP}$) was applied from the plant manager’s control centre. Vessel testing was performed over a

period of 12 hours as online monitoring in real time. Result: Testing showed active class 2 AE sources in some areas. TÜV SÜD recommended carrying out follow-up inspection of these zones in the form of classic weld testing and surface inspection using UT phased array technology.

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Online search: TÜV SÜD Chemie Service



AUTHOR
KLAUS MICHAEL FISCHER

Innovation Manager & Technical Director for Fire and Explosion Prevention, TÜV SÜD Chemie Service



AUTHOR
LEVENT SAHIN

Manager Acoustic Emission Testing, TÜV SÜD Industrie Service



AUTHOR
HERMANN SCHUBERT

Head of Digital and Continuous Inspection, TÜV SÜD Chemie Service

ACOUSTIC EMISSIONS TESTING

STANDARDS

Acoustic emissions testing (AT) of pressure equipment must comply with specific national or European standards. The general approach is described in EN 13554. The harmonised EN 14584 standard governs the test method for metallic pressure equipment using proof

testing with planar location of AE sources. Under EN ISO 9712, testing must be performed by qualified and certified personnel. The instruments used must comply with the requirements of EN 13477-2 and undergo regular verification according to this standard.

Dust explosion protection news

Industrial vacuums as a safety risk

Standards are changing for dust explosion protected industrial vacuum cleaners and vacuums for flammable dusts – and, currently, those standards are somewhat unclear. What should manufacturers and users take into account in the future?

Dust explosion protection was overshadowed by gas explosion protection even into the 1990s in industrial applications, although there have always been more dust than gas explosions. This balance changed in the 1990s with the Atex directive. However, it still cannot be assumed that all employees will have a universal awareness of the dangers of dust explosions – even if personnel should be sensitised to such risks as required under Atex operator guidelines. In such cases, one useful risk-reduction measure is to extract the explosive dust directly at the site of production. In addition, the production area must be kept clean so that the dust that is stirred up does not cause an explosion.

This requires industrial vacuum cleaners with a dust explosion protected construction. These industrial vacuum cleaners must be specifically designed for this task, since they will always be collecting dust and therefore will represent a potential fire hazard.

In reality, fires and explosions with industrial vacuums and dedusters have not been uncommon. Because of this, many years ago trade associations defined industrial vacuums in type 1 (Bauart 1 – B1) that are suitable for collecting flammable dusts. The technical requirements for these vacuums were later integrated into DIN EN 60335-2-69 (“Industrial vacuums for hazardous dusts and flammable dusts”).

This standard was later adapted to the requirements of Atex directive 94/9/EG or currently 2014/34/EU.

Annex CC of EN 60335-2-69 describes the special requirements for collecting flammable dusts and for use in zone 22 explosion hazard areas. Manufacturers of dust explosion protected industrial vacuums and testing institutions have managed very well with the current standards. In particular, a greater focus on dust explosion protection was deemed correct and appropriate, and instruments such as zone classifications (dust ex zones 20, 21 and 22) and uniform explosion protection labels have proven to be practical.

Current standards

The standards are currently changing. From Annex CC of EN 60335-2-69 has come a new standard project numbered 62784, primarily developed by the German national working group DKE 511.14 and the internationally responsible working group SC61J; this replaces Annex CC. This standard has now been published with the support of the international working groups SC61J and TC31 on the IEC level as IEC and EN 62784; it has been valid since 2017 and should be harmonised under the Atex directive. The boards that developed this standard felt it was necessary to uncouple the contents of “their” standard from DIN EN 60335-2-69. The reason is the standard framework, or relationships between the individual standards. DIN EN 60335-2-69 is a product standard harmonised under the Machinery Directive. IEC/EN 62784, in contrast, does not belong under the Machinery Directive, but is instead classified under the Atex directive 2014/34/EU, even if many basic requirements were adopted



Pictures: Rohmic

Industrial vacuums that can extract flammable dusts but are not suitable for use in explosion hazard areas will be labelled in the future in accordance with the standard as “Appliances for Combustible Dust” (ACD)



The planned revision of DIN EN 60335-2-69 will also provide technical specifications on wet separators

from Annex CC to DIN EN 60335-2-69. Therefore, this standard clarifies circumstances in this area.

New standardisation project

Another standard project will also create clarity: a revision of DIN EN 60335-2-69 which explicitly applies to regulations for B1 industrial vacuums – i.e. industrial vacuums that can extract flammable dusts, but are not suitable for use in explosion hazard areas. This type of vacuum is designated as an “appliance for combustible dust” (ACD) in the revised draft standard.

The standard is also going to be expanded in this respect, so that it provides technical standards for wet/dry vacuums. This project is extremely useful, because wet separators are often used to render explosive or flammable suctioned material harmless.

Competition in standardisation

In addition, there is another current standards project applicable to industrial explosive materials vacuums. European CEN working group “CEN/TC 305 WG2” is currently developing a product standard (C standard) numbered 17348 for industrial vacuums in gas and explosion hazard areas.

It has different focal points than working group SC61J, which is developing C standard IEC/ EN 62784 as described above. This working group is developing a product standard based on the electrical explosion protection with a separate ignition type, while working group CEN/TC 305 WG2 focuses on non-electrical explosion protection.

That means: according to EN 17348, in the future industrial vacuums will be considered as an Ex-assembly. Manufacturers of industrial vacuums and dedusters will then

assess the non-electric components with respect to non-electrical explosion protection. The electrical components would need to deliver a type examination certificate in accordance with Atex directive 2014/34/EU if they belong to device category 1 or 2. In this case, no additional prototyping procedure must be carried out for the electrical components in accordance with the Atex directive in order to assess the machine as a whole, if these are used within their prescribed application and there is no new resulting source of ignition.

An ongoing process

The standardisation work described here is currently still an ongoing process consisting of the work and coordination between the respective national work groups. The result – a new or revised standard – will be reviewed thoroughly by the European Commission. Only then will the standards be harmonised under an EU directive and go into force.

Ruwac has been working on these standards for decades, and has been involved in the national and international working groups for the aforementioned standards – to integrate manufacturer expertise and be as prepared as possible for new standardised requirements.

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Online search: Ruwac



AUTHOR
GERALD SCHEFFELS
Specialised journalist



Safety is for life.™

T +49 2961 7405-0
info@rembe.de



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F +49 2961 50714
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Rembe CEO Stefan Penno



Rembe Digital Approvals Specialist Philipp Villmer

Safety and efficiency go hand in hand

Digital audits via video conference

Approvals for safety equipment directly at the manufacturer's site by the plant operator or a certified body have been common practice up to now. During a pandemic this is not so easy. cpp spoke with Rembe CEO Stefan Penno and Rembe Digital Approvals Specialist Philipp Villmer about the Rembe Digital Audit.

Mr. Penno, on-site acceptance tests are part of the daily business of industrial manufacturers and plant operators alike. How does that usually work?

Penno: According to PED, various DIN-EN standards, ASME and other international regulations, safety-relevant components such as rupture discs must be tested by the manufacturer. This is often witnessed by notified bodies such as TÜV. However, many operators additionally conduct their own tests to ensure that the delivered products comply with the required specifications and performance features. As we are an established player on the worldwide rupture disc market, our customers have also come from all over the world to Brilon in North Rhine-Westphalia for on-site acceptance tests.

Which changes are there now due to coronavirus?

Penno: Coronavirus has put a stop to this. Travel restrictions in the lockdown, such as the restrictions on entering Germany from high-

risk areas, make acceptance tests by customers in Germany and abroad significantly more complicated. Ultimately, these trips pose a health risk to everyone involved. We therefore looked for alternatives and the Rembe Digital Audit was born.

How does the Rembe Digital Audit work?

Penno: In principle, it is quite simple. The operator or the certified inspection body observes the testing of the products via video conference. However, this requires a precisely defined documentation process. For this purpose, we have to clarify in advance with the customer exactly what he wants to see, so that we can prepare ourselves accordingly and position the equipment. Of course, this procedure somewhat increases the effort involved in the acceptance test, but, in principle, it is not a problem because the operators have very clear ideas about what should be shown during the video conference.

Mr. Villmer, could you please tell us how the Rembe Digital Audit got started?

Villmer: It was actually quite straightforward. Due to the first lockdown, a customer acceptance test could not take place as planned, but the customer urgently needed the new rupture discs. So I took my mobile phone, went to production and filmed. Today we do it much more professionally, but back then it was the only way to get the goods to the customer quickly.

And what does this look like today?

Villmer: My mobile phone stays at my desk during acceptance tests now, and instead we have taken advice from professionals in the film business and invested a considerable amount of money in high-quality equipment. In addition to individual burst tests and customer acceptance tests, we now even handle the certification of our products with international testing bodies digitally. We produce a rupture disc batch in advance and a second batch in the “digital presence” of the auditor. Subsequently, both are examined, then further steps follow.

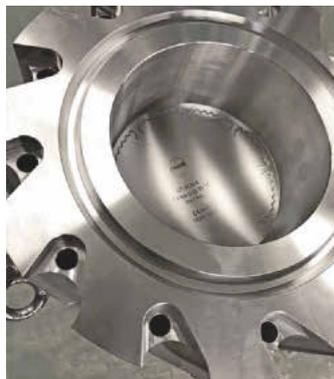
At the end of June 2020, we had an interesting acceptance test with three different high-temperature rupture discs of up to 30" in diameter, all for the same production facility. Due to their intended use, these must, of course, also be tested at correspondingly high temperatures. This means that there are long waiting times between tests, as only one rupture disc at a time can be brought up to temperature and then tested. In the case of a normal acceptance test, this would mean that the plant operator would have to assign one or more employees, who would be on site at Rembe for several days. With a digital audit, we reduce the time required from the customers side to a minimum as there is no travel time etc. and the customer is only present (digitally) when tests actually take place. It also saves Rembe customers a lot of money.

How does a normal digital audit work?

Villmer: Each digital audit is totally customer specific. There is no standard workflow in the true sense of the word, but some acceptance tests are consistent in many respects. We usually start with a general introduction, this is led by the contact person already known to the customer. This also gives the customer the opportunity to ask questions before the actual audit begins. The burst tests usually start then, but we might also start with a pre-test or a digital guided shopfloor tour. This depends on the scope of the audit and the customer requirements. In some cases, not only are the rupture discs tested, but also the associated holders. Particularly in the case of larger acceptance tests, the actual product tests are followed by further agenda items in which tag plates, operating manuals, shipping formalities and other product-related topics are discussed. This also includes the review of all documents including certificates. But those of us from the technology department are on the outside for this and leave that to our colleagues from the sales department.

Mr. Penno, how many digital acceptance tests are currently taking place in your company?

Penno: At the beginning of the pandemic, performing acceptance tests digitally was uncharted territory for us as well, but it is now part of our daily business. On average, we carry out two to three digital acceptance tests per week. For more complex acceptance tests, we provide the option to carry out a trial run of the acceptance process, thus enabling the buyers of Rembe products to gain an understanding of the likely outcome and to define any additional



With the Rembe Digital Audit, Rembe offers a customer-oriented service for digital audits for rupture discs via video conference

requirements if necessary. In the case of larger acceptance tests or certifications by notified bodies, we carry out a pre-test to guarantee that everything really is exactly as it should be.

Digital formats continue to advance. How is the Rembe Digital Audit developing?

Penno: In addition to traditional acceptance tests, Rembe Digital Audit now also offers burst tests, technical inspections such as hydrostatic tests, factory inspections and installation support. Customers can also benefit from the digital service: for example, there is no need for time-consuming travel and the costs associated with this. Colleagues and partners at other locations around the world can participate in acceptance audits and tests, even at short notice. At the same time, full digital documentation is provided, including images and sound.

What would you recommend to plant operators regarding digital acceptance tests?

Penno: In principle, these digital acceptance tests are only recommended if dealing with well-known and trustworthy manufacturers. However, this applies across the board for safety-critical components, i.e. not just for acceptance tests.

Mr. Penno, what is your conclusion regarding coronavirus and digitalisation?

Penno: Despite all the negatives, a crisis like the current coronavirus pandemic also holds opportunities for further development. We are seeing this everywhere right now with the topic of digitalisation. If international flights are not possible or only possible to a very limited extent, alternatives must be found. It is not only audits between operators and manufacturers of components that are now held digitally. Component manufacturers are also increasingly reaching agreements with official certification bodies using digital solutions. That's where the future will be.

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Online search: Rembe



THE INTERVIEW WAS CONDUCTED BY DR. BERND RADEMACHER Editor

Exhaust air cleaning with regenerative thermal oxidation

Removing VOC emissions of the chemical industry

When it comes to pollution caused by the production in chemical plants, the most efficient solution in the environmental technology market is called regenerative thermal oxidation (RTO). Some of the main pollutants emitted into the atmosphere by the chemical industry are volatile organic compounds (VOCs). For a chemical company in Spain, Tecam installed an RTO system that removes up to 99.9% of the VOCs emitted.

Regenerative thermal oxidisers (RTO) are designed to treat air volumes from 2000 to 200 000 Nm³/h as well as medium to high solvent concentrations. They count with many technology advantages such as being adaptable for small, medium and large air flows and a wide range of VOC emissions to be treated. They also have a high thermal efficiency and a low operating and maintenance cost. In addition, they do not generate any waste and they can generate heat recovery for external processes. Depending on the project's technical needs, RTOs can be accompanied by other equipment such as quenchers or scrubbers. A scrubber is re-

sponsible for eliminating acid gases, usually generated by the oxidation of VOCs with halogenated compounds, whereas a quench reduces the temperature at the RTO outlet. Tecam designs, assembles and installs equipment for VOC emissions treatment through regenerative thermal oxidisers.

VOC reduction of up to 99,9%

But how is it possible to achieve a VOC emissions reduction of up to 99,9% by RTO? The Tecam regenerative thermal oxidisers consist of towers housing a ceramic bed and a common combustion chamber where solvent oxidation takes place. The towers'

interior insulation and the combustion chamber, along with the use of more evolved ceramic materials, result in low equipment gas consumption. A conical closing valve system achieves very high purification efficiency, avoiding VOC emissions going out untreated. That valve system also allows the equipment to be closed during overnight or weekend shut-downs, hence allowing the customer to keep a high temperature inside the RTO equipment, and thus a faster start-up, with lower equipment gas consumption for VOC emissions treatment. The polluted process air is sucked in by the main fan usually located upstream of the



Pictures: Tecam

The regenerative thermal oxidisers consist of towers housing a ceramic bed and a combustion chamber for the oxidation of the pollutants



The oxidation temperature in the combustion chamber depends on the compounds to be treated

oxidiser. For processes with high concentrations of suspended particles, the fan usually is located downstream of the oxidiser. The fan forces the process air through the first ceramic tower, and the process air is heated by the ceramic. When the air has passed the ceramic bed, it reaches the combustion chamber, where the oxidation takes place. The oxidation temperature depends on the compounds to be treated. For emissions without halogenated compounds, an oxidation temperature between 800 and 900 °C is chosen. If there are halogenated compounds within the polluted air, the temperature should be at least 1100 °C to ensure complete oxidation.

Parallel to the process air inlet through the first chamber, the already oxidised air passes through the second ceramic tower to exchange the heat from the air to the tower. Thus, the gas gets cooled and the ceramic bed gets heated. After passing through the second tower, the clean air is sent to the stack. The third ceramic tower is used to recirculate the purge, since in the sequence of valves it must be ensured that all the air is oxidised. This sequence is repeated between 45 and 90 s, to ensure that each tower works the same way. The system of three ceramic towers is the most used nowadays, although there are also RTOs with two towers and even with five towers. Due to the purge circulation system in the three-tower RTO, it is ensured that all gases pass through the combustion chamber. Thanks to the special

design of the combustion chamber in Tecam's RTO plants and the valves, which have an air tightness of 99,9 %, a high degree of purification is achieved. The ceramic towers allow the recovering of the thermal energy of the combustion chamber.

Successful project in Spain

A world's leading chemical company contacted Tecam in 2018 in order to eliminate the VOC emissions from one of their production sites in Spain. The specific challenge of this project was treating emissions with a high load of halogenated compounds with high corrosion risk. The presence of acidic inorganic compounds and the explosive internal process environment in the chemical reactor required high quality inspection processes and a rigorous project audit. One of the most important challenges was to guarantee the emission limits for high-risk compounds, which according to the regional authorities had to be below 2 mg/Nm³. Some of the compounds of the total mix of VOCs were considered as of high environmental risk and had to comply with that limit. The finally installed exhaust air cleaning plant emits between 3 and 6 mg/Nm³ of total VOC. The value of 2 mg/Nm³ for each risk compound therefore is guaranteed.

The concentration of 4180 mg/Nm³ VOCs in the customer's process was very high. After analysing the customer's technical requirements, Tecam proposed a custom-

made solution consisting of a regenerative thermal oxidiser for 5000 Nm³/h with a quench and a scrubber system to eliminate the acids generated during the thermal treatment of the halogenated compounds. Due to the high VOC concentration, a dilution of 5000 Nm³/h of fresh air was carried out, which allowed to work with total safety and at the same time maintain the autothermal conditions. The equipment was designed for high temperature (>1200 °C) to fulfill the requirements of the administration regarding the halogenated compounds. After installation, the custom-made RTO technology solution managed to eliminate 99.9 % of the VOC emissions. RTO is not only suitable for the chemical sector. This exhaust air cleaning solution is as well applied in the pharmaceutical, petrochemical and oil & gas industry, and many others.

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AUTHOR
BERNAT SALA
CEO,
Tecam



LUKAS LEHMANN
Editor-in-Chief
Phone +49 711 7594-290
lukas.lehmann@konradin.de



CLAUDIA BÄR
Editor
Phone +49 711 7594-287
claudia.baer@konradin.de



URSULA FISELY-BUSTORFF
Editor
Phone +49 711 7594-373
ursula.fisely@konradin.de



DANIELA HELD
Editor
Phone +49 711 7594-284
daniela.held@konradin.de



DR. BERND RADEMACHER
Editor
Phone +49 711 7594-263
bernd.rademacher@konradin.de



ANGELIKA STOLL
Editor
Phone +49 711 7594-300
angelika.stoll@konradin.de



BARBARA DIVIGGIANO
Editorial Assistant
Phone +49 711 7594-415
barbara.diviggiano@konradin.de

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General Manager:
Peter Dilger

Publishing Director:
Peter Dilger

Editor-in-Chief:
Lukas Lehmann (le), Phone +49 711 7594-290

Editorial Staff:

Ursula Fisely-Bustorff (fi),
Phone +49 711 7594-373
Dipl.-Ing. Daniela Held (dh),
Phone +49 711 7594-284
Dr. Bernd Rademacher (br),
Phone +49 711 7594-263
Angelika Stoll (st),
Phone +49 711 7594-300

Editorial Assistant

Barbara Diviggiano,
Phone +49 711 7594-415, -1415
e-mail: barbara.diviggiano@konradin.de

Desktop Publishing:

Jennifer Martins, Phone +49 711 7594-262
Ana Turina, Phone +49 711 7594-273
Birgit Ender (freelancer)

Sales Director:

Andreas Hugel, Phone +49 711 7594-472
e-mail: andreas.hugel@konradin.de

Order Processing:

Andrea Haab, Phone +49 711 7594-320
e-mail: andrea.haab@konradin.de

Rate card No. 54, effective October 1, 2020.

Reader Service:

Ute Krämer, Phone +49 711 7594-5850
Fax +49 711 7594-15850
e-mail: ute.kraemer@konradin.de

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Inc. Detlef Fox, 5 Penn Plaza, 19th Floor, New York,
NY 10001, Phone 212 8963881, Fax 212 6293988,
e-mail: detleffox@comcast.net.

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