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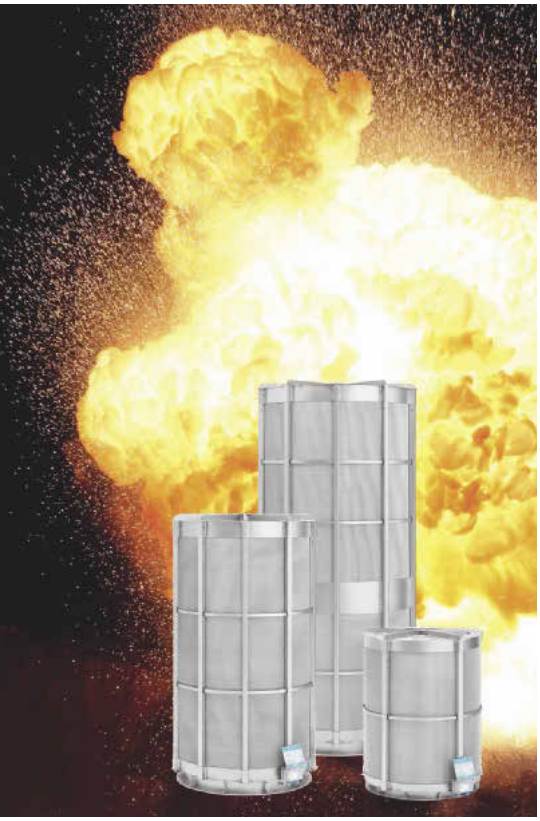
Expert Forum in Nuremberg

Only a few more days to go: for the 20th time, from September 26 to 28, the Nuremberg Exhibition Centre will be a meeting place for specialist manufacturers and processors of powder, granules and bulk solids. About 900 exhibitors will display their latest developments for mechanical processes and related technologies such as measurement, analysis, control and automation. Manufacturers and plant operators in the chemical sector will discover technical solutions for many of the burning questions affecting the industry. The chemical industry is currently undergoing a transition on many levels. Process digitalisation helps achieve the goal of ensuring consistently high product quality, 24/7. The focus is also on curbing production costs and increasing energy and resource efficiency. What's needed is maximum safety in the manufacturing process while maintaining a high level of flexibility – at multiple locations around the world. The accompanying programme of talks in the Powtech Expert Forum will likewise offer new stimuli for further thinking on this and other topics in Hall 2, Booth 507. On the afternoon of September 26 and the morning of September 27, the Forum will be moderated and organised by our relevant trade journals: cav – Prozesstechnik für die Chemieindustrie, cpp – process technology for the chemical industry, dei – die ernährungsindustrie and Pharmaproduktion. The Forum lectures on "Safe handling and processing of powders and bulk solids – solutions for chemicals, pharmaceuticals and food" are aimed at experts in the chemical and pharmaceutical industries as well as food manufacturers. For more information on the Forum contents, see www.prozesstechnik-online.de/messen/powtech. Our Powtech preview begins on page 8 with this issue's cover story.

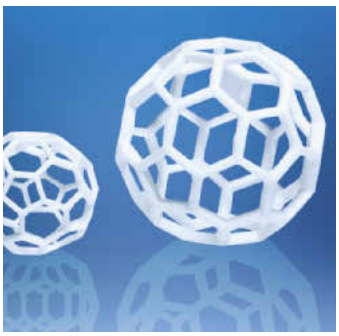
Günter Eckhardt, Editor-in-Chief



8 Cover In addition to a special stainless steel mesh filter, Rembe's Q-Rohr has an explosion vent with an integrated signalling system that alerts the process control system when the explosion vent has opened.

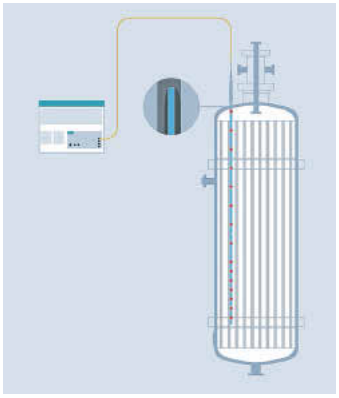
26 The dispersing machine Conti-TDS produces a very strong vacuum in its dispersing zone, thus facilitating a high powder induction rate.

34 3M has developed a technology for manufacturing PTFE parts without tools on a conventional 3D printer.



44 cpp caught up with Dr. Rita Dicke, Vice President Product Management for ion exchange resins, Lanxess, to discuss the company's current developments.

54 By installing a large number of temperature measuring points inside a single tube reactor, hot-spots can be detected at an early stage.



60 New construction or retrofit? SMB provides an example of how a safer, more up-to-date filling plant can be tailored to individual requirements.

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Investments of more than 17 million US dollars

ENDRESS+HAUSER EXPANDS US PRODUCTION

Endress+Hauser has further expanded its production facilities in the United States. The Raman analyser manufacturing plant in Ann Arbor, Michigan, was extended at a cost of 9 Mio. US dollars. The analysers manufactured by Kaiser Optical Systems, part of the Endress+Hauser Group since 2013, are designed for examining the composition and material characteristics of solids, liquids and gases. Construction of the new plant took nearly one year and more than doubles the floor space to 8100 m^2.

In Greenwood, Indiana, where the US sales center is also headquartered, Endress+Hauser manufactures temperature measurement technology and system products since 2008. The company has now invested more than 8 Mio. US dollars in a 3900 m^2 state-of-the-art production facility. The new plant will produce sensor elements, thermometers and thermowells as well as transmitters, system components and recorders.

To strengthen its position in the digital world

EVONIK ALLOCATES 100 MILLION EUROS UNTIL 2020

Picture: Evonik

Henrik Hahn coordinates digitalisation activities for Evonik in his role as chief digital officer (CDO)

Evonik is setting aside 100 million euros for the topic of digitalisation and is also entering into a strategic partnership with IBM and the University of Duisburg-Essen, aimed at forging ahead with the digital change in the chemical industry. By providing the financial means and establishing the new strategic partnerships, Evonik is aiming to further strengthen its position in the digital world. Henrik Hahn (CDO) said, "By the year 2020, we aim to see around 100 million euros going into development and testing of digital technologies. It's not just about data and technology, but especially about new business models and services for customers."
The partnership with IBM will see Evonik benefit from the latest technologies and projects IBM is spearheading, encompassing technologies such as cognitive and cloud based technologies such as IoT and Industry 4.0.

Process systems business

SANDVIK HAS SIGNED A DIVEST AGREEMENT

Picture: Sandvik

Björn Rosengren, President and CEO of Sandvik

Sandvik has signed an agreement to divest Sandvik Process Systems to FAM AB, owned by the three largest Wallenberg foundations, at a price of 5.0 billion SEK. Sandvik Process Systems delivers advanced industrial process solutions based on high-end steel belts, steel belt based equipment and process solutions within adjacent technologies. In 2016, the operations, with approximately 600 employees, had reported revenues of 1.7 billion SEK representing 2 % of Sandvik's total revenues and with a strong operating margin. "The divestment creates additional capacity for growth and expansion of the core business of Sandvik", says Björn Rosengren, President and CEO of Sandvik. Sandvik Process Systems will remain reported in other operations in the Sandvik financial statements. The closing of the transaction is expected no later than early 2018.

Picture: Schmersal

New leading manager

The Schmersal Group has appointed Uwe Seeger as Director for Asia Pacific Middle East (APME). Seeger will be responsible for the further development of markets and for expanding customer relationships in the APME region. He will be founding new subsidiaries and expanding the services offered by the tec.nicum safety services division. Seeger also takes over a leading responsibility for the Schmersal factories in India and China.

Picture: Fritsch

Fritsch opens US subsidiary

In order to meet the demands of their customers in a growing market it was time for the German company Fritsch to have a branch directly in the US. The new Fritsch Headquarters USA is located in North Carolina. The team has offices, a storage facility and applications laboratories.

Two awards for Eli Lilly

Coperion K-Tron, Sewell, NJ, USA, is proud to be a part of the supply team for Eli Lilly and Company who won this year's prestigious ISPE FOYA (Facility of the Year Awards) in two categories, Facility of the Future and Process Innovation. Coperion K-Tron provided the continuous loss-in-weight feeders and material handling equipment for each of the Lilly facilities and worked closely with the Lilly team in the integration and design of the feeder system.

Picture: Lauda

Herrmann joins Lauda

Dr. Ralf Hermann (on the right) started work on June 1, 2017 as the new General Manager Constant temperature equipment and systems at Lauda. He will be leading approximately 80 agencies and coordinating nine sales companies abroad. Constant temperature equipment is Lauda's largest business unit and holds the greatest potential for growth.

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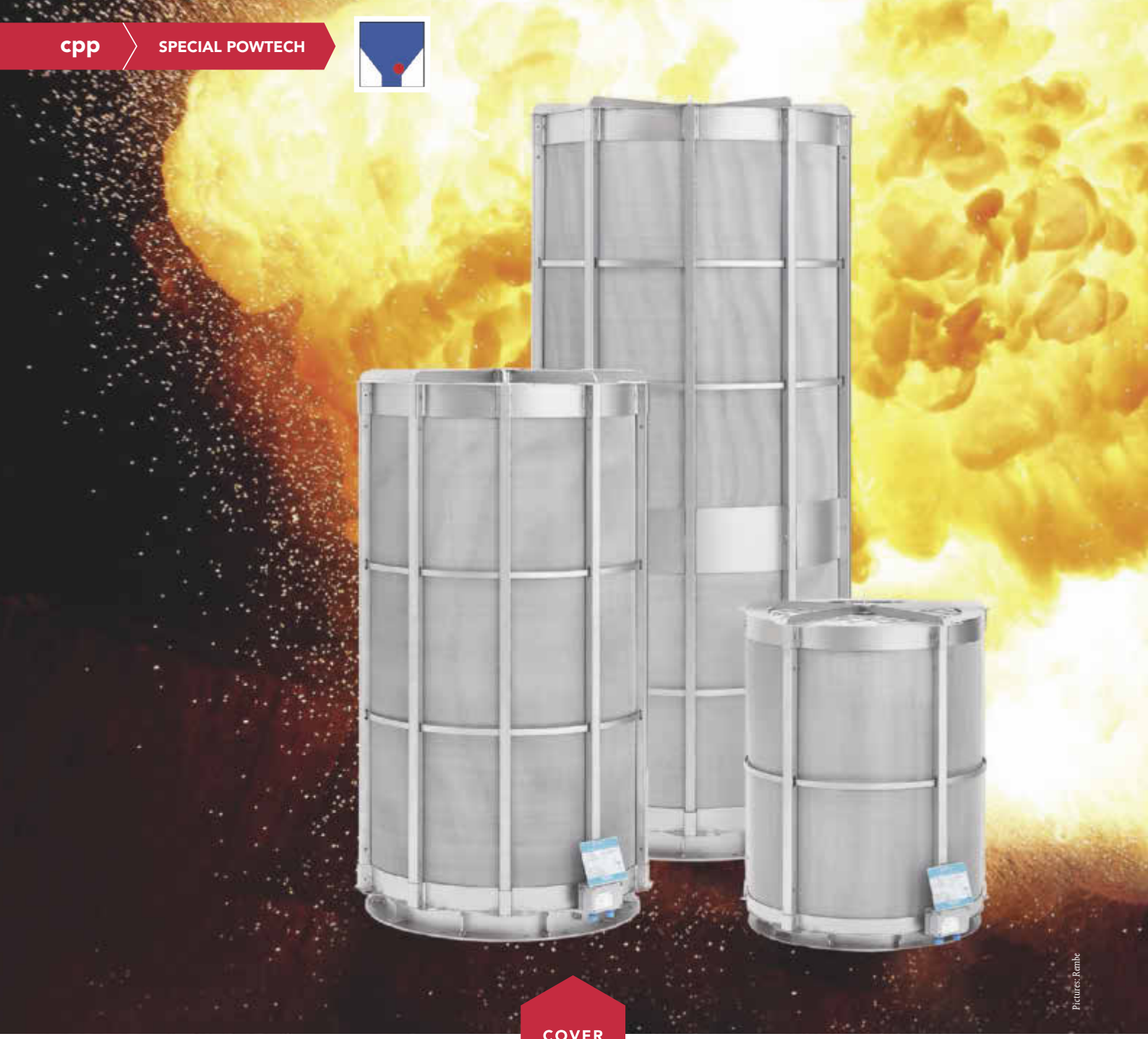

Pictures: Rembe

COVER

Everything you need to know about explosion safety

SAFETY SYSTEMS AND METHODS AT A GLANCE

Whenever a production process generates dust, the plant concerned is potentially at risk of dust explosion regardless of whether it involves screening, drying, milling or filtration. The article gives a brief but comprehensive description of the basics of explosion safety and the protective systems available for this purpose.

Probability of occurrence					
	A	6	7	9	10
	B	5	6	8	9
	C	4	5	7	8
	D	3	4	6	7
	E	2	3	5	6
	F	1	2	4	5
		IV	III	II	I
		Severity of damage			

Stage 3 of a risk assessment: a matrix showing the potential risks of individual plant components is set up based on the first two stages

Explosion vents differ from one application to another and precautions mostly involve the use of rectangular products

Explosion safety covers a broad range of applications. To decide whether and to what extent precautions are required, you must initially conduct a systematic risk assessment. The first step is to gauge the probability that an explosive atmosphere might be created and determine whether any potential sources of ignition exist. Next, the effect that an explosion might have has to be classified. Both assessments can be merged into a matrix. The resulting indicators tell you whether or not the plant or parts of it have to be protected and if so, how. A green box means that no precautions are necessary. A red box, on the other hand, signifies that precautions are urgently needed. The higher the numerical rating, the more extensive these precautions should be.

How explosions occur

An explosion requires the availability of oxygen from the air, a source of ignition and a combustible substance. In the event of a dust explosion, the distribution of dust is another factor. However, not every dust-air mixture is explosive. What matters is the mixing ratio. Specific explosion limits have been identified for every common type of dust, and within those limits an explosive mixing ratio can be expected. The lower explosion limit is the minimum concentration required to create explosive atmosphere. The upper explosion limit specifies the point at which the mixture becomes too rich, so that the atmosphere is no longer explosive. There also needs to be an effective source of ignition (TRBS 2152 Part 3, "Hazardous explosive atmospheres – avoidance of the ignition of hazardous explosive atmospheres", page 2). Among the common sources of ignition are hot surfaces, electric sparks and glowing embers arising during the process.

Explosion safety precautions

Depending on the results of the hazard and risk analysis, a number of proven precautions need to be taken. They are divided into explosion prevention and explosion protection. Preventive precautions are designed to prevent explosive atmosphere and therefore to reduce the probability of an explosion. Wherever possible, combustible substances are replaced by substances that cannot produce an explosive mix. In addition, it is possible to overlay the substance-air mix with inert gases. This has the effect of lowering the content of oxygen from the air, so that no explosion can occur.

Preventive precautions concentrate on the avoidance of effective sources of ignition. This includes, for instance, the use of suitable equipment to protect the product flow from impurities and monitor the system earthing with a view to preventing electronic discharges.

Protective precautions involve reducing the impact of a possible explosion to a more moderate level, so that the resulting damage is less severe. Conventional venting using explosion vents, flameless venting, explosion isolation and explosion suppression are just a few examples. This kind of explosion safety is a vital necessity in virtually all plants for various reasons:

- It is in the nature of the relevant processes that there can almost never be absolute or complete avoidance of effective sources of ignition.
- Inerting tends to be too expensive and/or impossible due to the characteristics of the processes involved.

Other preventive precautions may be helpful in certain respects, though they cannot normally eliminate the risk of explosion completely.

Conventional venting

If a plant is situated outside a building or if parts of it are next to an outer wall, one frequent safety precaution is to install explosion vents. Such precautions are usually applied, for instance, to stationary silos, filters and elevators located outdoors. If an explosion occurs, the explosion vent protects the system by opening. This reduces any overpressure within the vessel and the explosion is released to the outside. As virtually no two processes are the same, there are numerous types of explosion vents which differ in shape and material as well as in their resistance to temperature, pressure and vacuum. Even processes with complicated hygiene requirements can be equipped with explosion vents today. The EGV HYP explosion vent from Rembe, for example, was highly successful in passing the EHEDG cleanability test. This test determines the in-place cleanability of plant components where this is a practical requirement for manufacturing absolutely hygienic products.

A special mesh filter in the Q-Rohr cools down any flames, preventing both flames and pressure from emerging

Quench valves, open and closed: these valves are activated in response to a rise in pressure or the formation of flames

Flameless venting

If a plant is situated within a building, however, explosion vents are not suitable for pressure relief purposes, as the safety area around them is inadequate to relieve the emerging dust and flames. Such an arrangement would pose an enormous safety risk to humans and machinery. This problem is often solved through the use of vent ducts, which channel the spread of an explosion to the outside. The disadvantage, though, is that these ducts rule out process-optimised plant design and are usually very expensive: the greater the distance between an explosion and its source, the higher the pressure which the vent duct and the plant need to withstand. This results in higher (manufacturing) costs per vent duct.

Flameless venting, by contrast, is an option that is both economical and effective. Different manufacturers employ different flameless venting technologies. The special mesh filter that is used in Rembe's Q-Box or Q-Rohr cools down any flames efficiently, preventing both flames and pressure from emerging, and ensures particulate retention. The typical increase in pressure and noise that accompanies an explosion within a building is reduced to an almost imperceptible minimum, thus protecting both people and machinery. In addition to the special stainless steel mesh filter, the Q-Rohr and Q-Box each have an explosion vent with an integrated signalling system that alerts the process control system if the explosion vent opens.

Explosion isolation

In a production facility, the individual parts of the plant are always connected by pipelines. The purpose of explosion isolation is to ensure that the pressure and the flames cannot propagate, so that any adjoining parts of the plant are protected. A distinction is made between active and passive isolation systems. An active system is alerted to an explosion at an early stage when the explosion begins to develop. This is done using sensors or detectors which register the rise in pressure or the formation of flames and respond by activating the relevant isolator, e.g. a quench valve.

Passive isolation differs in that it responds purely mechanically to the spreading or loss of pressure on account of its structural characteristics. This also applies to explosion valves. During normal operation, an explosion valve in a pipeline is kept open by the flow. If an explosion occurs, the valve is closed by the spreading of the pressure front, thus effectively preventing the pressure and the flames from propagating any further.

Explosion suppression

Explosion suppression is another constructional precaution in addition to the methods mentioned so far. It means eliminating the explosion at its onset. This is made possible by detectors with sensors which register the presence of sparks or flames and immediately trigger the opening of tanks containing an extinguishing agent (also installed in the system). A highly effective extinguishing agent is released within milliseconds, nipping the explosion in the bud. If required, an explosion suppression system can also be used for explosion isolation purposes.

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Hall 3, Booth 244

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Wear protection meets fineness

Classifying wheel with exchangeable vanes

The use of the ATP-PRO classifying wheel in the production of fine and abrasive powders considerably improves not only the product quality but also the overall processing efficiency. Equipped with exchangeable vanes, this wheel can be retrofitted with ease in existing systems and moreover provides a freedom from contamination that was formerly only possible with ceramic classifying wheels.

The wear-protected ATP-PRO classifying wheel from Hosokawa Alpine combines the advantages of conventional ceramic classifying wheels with those of steel. This unique combination is expressed in the abbreviation "PRO", which in this instance stands for "protected". In addition, the uncomplicated exchange of individual vanes reduces the effort for maintenance, transport and storage and makes it possible to employ different vane materials, which in turn extends the range of applications.

The ATP-PRO classifying wheel is not only suitable for use in classifier mills; it can also be employed for classifiers in grinding circuits, e.g. in combination with ball mills, where it serves to boost the performance. In this case, finer products can be achieved and the specific energy consumption of the blowers and classifier drives reduced. The proven operational reliability and easier handling in comparison with ceramic classifying wheels are of great significance, especially with multi-wheel classifiers.

Advantages at a glance

Compared to steel or ceramic wheels of conventional design, the ATP-PRO classifying wheel offers the following advantages:

- Much finer end products
- Improved wear protection due to material diversity
- Speed reduction
- Exchangeable vanes made from different materials
- Less iron contamination
- Low pressure drop
- Reduced maintenance effort
- Lower specific energy consumption

Existing classifiers and classifier heads can be equipped with ATP-PRO classifying wheels with only a minimum of conversion effort, leading to noticeable improvements in terms of fineness, throughput, energy consumption and absence of contamination. Once the wear protection has reached the end of its service life, the classifier vanes of the most popular machine sizes 200 ATP-PRO and 315 ATP-PRO can be exchanged. Thanks to the new wear-protected classifying wheel, it is now also possible to reap the benefits afforded by the NG geometry when it comes to processing abrasive materials. Different material groups can be combined by means of design measures as well as the use of modern materials and connection techniques. The vanes can be constructed from a combination of metal and non-metal materials for handling particularly abrasive powders, for example. The wear-protection materials can be tailored to individual demands and the classifier vanes replaced as and when necessary.

Pictures: Hosokawa Alpine

Existing classifiers can be equipped with ATP-PRO classifying wheels

Tests demonstrate the added value

The potential of the ATP-PRO manifested itself some time ago in the testing centre. Tests with quartz powder not only showed processing performance on the highest level; they also revealed that the selected wear protection promises a long service life. The tests were carried out at up to 150°C to ensure suitability for use in the classifier heads of fluidised-bed opposed-jet mills or mechanical impact classifier mills operated

Different combinations of construction materials allow high flexibility

The exchangeable vanes reduce wear-induced costs and permit higher fineness values thanks to their special geometry

AFG fluidised-bed opposed-jet mill is operated with hot gas in order to process various industrial minerals. A ceramic 315 ATP classifying wheel had been used up to then. As a result of the wear-protected 315 ATP-PRO classifying wheel, the speed was practically halved without compromising the end-product fineness. At the same time, the smaller pressure drop opened the door for a substantial reduction in specific energy consumption. It was possible to manufacture much finer products in this way without any additional measures. The actual status of the machines and necessary maintenance can be identified using the Alpine VIB system. This wireless system measures machine vibration and transfers the results to a tablet computer.

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at elevated temperatures. The results achieved in the testing centre during the subsequent validation phase convinced two customers. The ATP-PRO was initially validated for grinding a rare-earth oxide with a Mohs hardness of 5 to 6 using a 400 AFG fluidised-bed opposed-jet mill. The customer concerned had previously relied on a standard steel classifying wheel in the integrated 200 ATP classifier because the traditional ceramic designs were unable to deliver the stipulated fineness values. The downside was the extremely short service life of the classifying wheel. The total contamination with iron compounds in the end product was as much as 100 ppm. During a trial period with the ATP-PRO classifying wheel lasting several months, it was possible to reduce the end particle size by approximately 15 % (d90 = 1.0 µm). Over and above this, the total contamination with iron compounds in the end product was limited to a mere 5 to 6 ppm owing to the new wear protection.

Reduced energy consumption

In a further test, the validation was carried out on a customer's premises, where a 630

VIBRATION MEASUREMENT › **COMPACT AND WIRELESS**

Whether used to measure random samples taken during regular control processes or to determine specific maintenance requirements, the Alpine VIB system always gives a clear picture of the status of machines and systems. Thanks to this innovative measuring system, vibration measurements can be carried out flexibly and necessary maintenance identified at an early stage. The complete package comprises both software and hardware. Measurements are wireless via a tablet computer. The machine status can thus be individually checked, evaluated and recorded. Damage and system failures are prevented in this way. Installation of the Alpine VIB system is simple and flexible. The battery-operated sensor can be mounted on all machines either magnetically or with a screw

The Alpine VIB system always has an eye on the status of machines and systems

connection. A WiFi is used for mobile data transmission between the sensor and tablet. The Alpine VIB software thus visualises and records the measured vibration values. The measurement curves for evaluating vibration levels are calculated from raw data and displayed directly (in accordance with DIN ISO 10816–3). Measurement reports can be generated in a few simple steps. Graphs document the minimum and maximum values as well as variations over time and much more besides.

Fire prevention concept protects milling processes at cellulose specialist Jelu

Forewarned is forearmed!

Wherever inflammable materials are processed in finely distributed form, fire and explosion incidents with serious consequences may result for various reasons. Thanks to spark detection and extinguishing solutions tailored to each customer's respective needs, it is possible to effectively prevent personal injuries and material damages as well as costly production downtime.

Pictures: Grecon

Highly sensitive Grecon 1/8 spark detectors monitor the Jelu mills in Rosenberg

Cellulose is a versatile raw material which is used in many industries such as food (for example for dairy products and pasta), technical (for example as a binding agent for mortar and plaster) or animal fodder. Numerous processing steps are necessary to manufacture this all-natural product. Purified fibre extracts, from which the cellulose is dissolved and sub-sequently milled, are utilised as raw material. Homogeneous fibres whose size is exactly matched to the application are an important quality factor. Uniform wood chips are produced in special crushing mills. The processing steps entail many fire hazards. Fine dust, oxygen and ignition sources in the form of sparks or hot particles are a combination that can easily start a fire.

If foreign bodies like stones or nails get into the high-speed crushing mills, flying sparks are inevitable. Moving system parts such as fans often ignite sparks due to wear. These sparks are transported via the suction system of the mill into downstream systems, for example a preseparator or a filter system, where they could cause a fire or dust explosion. The mill itself is also at risk. If material accumulates, overheating may result.

Extensive safety measures

This is exactly what happened to Jelu, a company in south-west Germany. Founded in 1908 as a grain mill, this family-run firm today manufactures several thousand tons of cellulose for a variety of industries. A victim of several fires in the past, it began equipping all endangered areas with Grecon spark extinguishing systems more than 35 years

ago. All mills as well as transport and suction systems are meanwhile monitored for sparks and hot particles, which are extinguished with fine water mist in case of an alarm. "We protect all areas at risk with spark extinguishing systems", says Hubert Ehrler (Head of Engineering at Jelu) when asked to explain the safety measures in place.

Tailor made protection concept

After the first spark extinguishing system was installed at Jelu back in 1982, the protection concept was continuously expanded over the years. In 2005, all older control stations were modernised with newest-generation spark alarm stations.

If a spark or a hot particle is detected, the part of the system concerned is immediately switched off and automatic extinguishing activated. "The fire hazard has been significantly reduced. Grecon spark extinguishing systems prevent 99 to 99.5% of all fires in production before they have a chance to break out", Ehrler continues.

The mill itself was likewise equipped with an automatic extinguishing system. Even when the mill is switched off, it carries on running and stirring up dust for up to a minute, presenting a considerable risk in combination with oxygen and the ignition source. Following a short check, the mill is started up again and production can be resumed after only a minimal interruption.

In addition to the highly sensitive FM 1/8 spark detectors for detecting sparks and hot particles in transport lines, Jelu also uses DLD 1/8 detectors, which are insensitive to daylight, to monitor systems with incident daylight. Furthermore, flame detectors monitor whole areas such as the mill building remotely.

"The investment in Grecon spark extinguishing systems has definitely paid off. We are very satisfied with the protection concept, which is specifically tailored to our needs, and in future we also plan to protects other areas like the transport lines to the newly built hall using similar systems", Ehrler concludes.

Hubert Ehrler is extremely satisfied: Jelu has reduced the fire hazard significantly thanks to the spark extinguishing systems

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Efficient screw blowers

Picture: Kaeser

Like its big brothers, the EBS and FBS, the Kaeser DBS screw blower delivers unparalleled efficiency. The DBS screw blowers are significantly more efficient than conventional rotary blowers and also provide substantial energy savings compared with many competing rotary and turbo blowers. These benefits are made possible in no small part by the proven Sigma rotor technology used in the rotary screw compressor sector. Another key factor is the non-slip direct drive with speed transmission integrated into the airend.

The blowers are exceptionally quiet, with sound levels in primary applications not exceeding 72 dB, which is equivalent to a modern vacuum cleaner. They are designed for use over long duty cycles, including continuous operation, require little maintenance, and can be installed side by side, or even next to a wall.

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Granulates down to 100 µm

In recent years, many manufacturers of technical fine ceramics have opted for Eirich mixers for their build-up granulation. Whereas, in the past, granulates were primarily demanded in sizes ranging from 500 µm to several mm, today customer requirements tend towards much finer ranges, down to 100 µm or even finer. For this reason, Eirich has developed rotor tools with a special geometry that can be used to manufacture granulates with even finer grain sizes. Even in this fineness range, the width of the grain spectrum or the grain size distribution can be modified with the aid of parameters like the tool speed, granulating time and granulation moisture, and adapted to the particular requirements of the relevant application.

In the size recommended for granulating, the Eirich mixer used for granulating only has one rotor tool, which can run at tool speeds of up to 30 m/s. This makes it possible to generate high shear forces and distribute liquids quickly. The new rotor tools are also available for laboratory mixers (from 1 l).

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Pneumatic actuator for sterile applications

Sisto Armaturen S.A. launches a double-acting or single-acting pneumatic actuator, which is designed for diaphragm valves used in sterile applications. A special technical feature of the MD30-MD202 actuator range is that the actuator housing and the valve bonnet are made from a single piece of material. Compared with predecessor models, this design change substantially reduces the actuator's overall height so that considerably less space is required to accommodate block-bodied multi-port valves. The actuators are also 45 % lighter than the two-piece design. In addition to the stainless steel variant, the two largest actuator sizes are also available in a weight-saving aluminium design.

The actuator can be fitted to the valve body without nuts as the threads are integrated in the body, significantly facilitating mounting. The orientation of the air connection can be adjusted in 90° steps. Accessories such as travel stop, positioner or proximity switches for actual-position feedback can be retrofitted by the operator as and when required. The actuators can be replaced with manual actuation bonnets at any time. Sisto C valves can be operated at pressures as high as 16 bar.

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Picture: Sisto Armaturen

XL cutting mill

Retsch have added a new model to their cutting mill family: the SM 400 XL is suitable for primary size reduction of very large sample pieces measuring up to 17 cm x 22 cm, but can also achieve the required final fineness in one step, depending on the application. The large surface of the bottom sieve (240 mm x 240 mm) permits processing of large sample volumes, resulting in a higher throughput than is possible with smaller cutting mills. The high torque of the 3 kW drive with flywheel mass allows for exceptionally effective primary size reduction of soft to medium-hard, tough-elastic, and fibrous samples as well as heterogeneous material mixes. The SM 400 XL even processes temperature-sensitive samples without too much heat built-up.

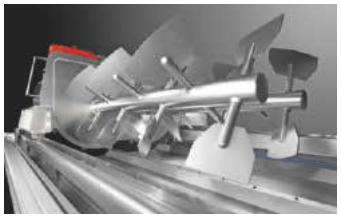
When operated with the optional cyclone-suction-combination the mill is also suitable for grinding light materials or small quantities.

www.cpp-net.com
Online search: cpp0317retsch
Hall 1, Booth 552

Picture: Retsch

CIP-cleanable paddle mixer

The Dutch company Dinnissen recently introduced the improved D-Topline, a model based on the familiar Pegasus double-axle paddle mixer. The geometry of the installation is modified in such a way that the upper sides of the mixing chamber lean towards each other, resulting in a drop shape. The negative angle of inclination in the upper side of the mixing chamber reduces the risk of product adhesion. In addition, the improved D-Top-line can be equipped with an additional hatch (front hedge) on the front. This feature makes it much easier to inspect or clean the mixer. In some cases, thanks to this hatch, a version can be offered where the paddle axle assembly can be driven entirely from the mixing chamber. Furthermore, the improved D-Topline is provided with a divisible shaft seal, allowing the installation to be CIP-cleanable.



Picture: Dinnissen

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Rotary valve in CIP design

Picture: Coperion

The ZRD 150 hygienic rotary valve is used in pneumatic conveying systems and for the discharge of powdered and pelletized materials. The EHEDG-certified valve can be used in the food, pharmaceutical and chemical industries for applications demanding even the highest degree of hygiene and cleanliness. In addition, they are distinguished by their high reliability in operation.
As these rotary valves can be readily inspected and also cleaned quickly and thoroughly, they are ideal for applications involving frequent changeovers from one product to another and/or for processing products with adhesive tendencies. Parameters such as particle size, cohesion and adhesion influence the flow properties of bulk materials and therefore also the correct design and layout of bulk material handling components.
The ZRD hygienic rotary valve offers an extra-large inlet for high throughputs and is suitable for pneumatic conveying up to 1.5 bar(g). The rotary valves are smooth-surfaced, free of dead spots, and manufactured completely in stainless steel. The fully-automatic CIP capability saves time on cleaning and therefore reduces costs.

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Thermische Trockner

Fließbettsysteme werden in vielfältigen Lebensmittelproduktionen verwendet, z.B. zur Trocknung, Kühlung, Kalzinierung, Röstung und Expansion. Weitere Einsatzgebiete sind die Texturierung, das Kochen, Sterilisieren und Pasteurisieren.

Thermal dryers

Fluidised bed systems are used in multifarious forms of food production, e.g. for drying, cooling, calcination, roasting and expansion. Further fields of application are texturising, boiling, sterilising and pasteurising.

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26.09. - 28.09.2017 Nürnberg

Halle 4.0 Stand 4 - 327

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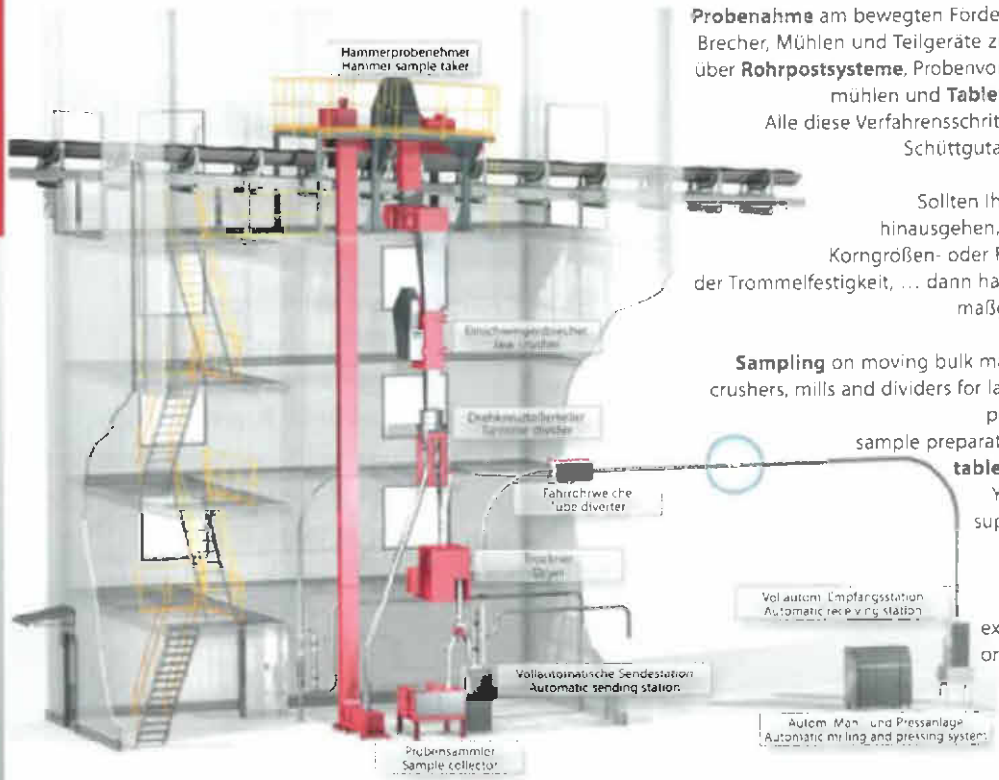

Probenahme am bewegten Fördergut, **Probenaufbereitung** über Brecher, Mühlen und Teilgeräte zur Laborprobe, Probentransport über **Rohrpostsysteme**, Probenvorbereitung mit Scheibenschwingmühlen und **Tablettenpressen** zur Analysenprobe. Alle diese Verfahrensschritte zur Erlangung repräsentativer Schüttgutanalysen können Sie uns als dem Komplettanbieter anvertrauen. Sollten Ihre Anforderungen noch darüber hinausgehen, zum Beispiel eine automatische Korngrößen- oder Feuchteanalyse, die Bestimmung der Trommelfestigkeit, ... dann haben wir auch hierfür eine für Sie maßgeschneiderte Lösung zu bieten.

Sampling on moving bulk materials, **sample preparation** via crushers, mills and dividers for laboratory samples, sample transport via **pneumatic tube system**, sample preparation with vibration disk mills and **tablet presses** for analytical samples. You can entrust us as a full-range supplier with all these process steps to obtain representative bulk material analyses. Should your requirements exceed this, for example, an automatic particle size or moisture analysis, determination of the drum strength, ...we can offer you a customised solution for this as well.

Vom Bohrkern zur analysefeinen Tablette
Analysis from Drill cores

Bohrkerne und Schüttgutproben mit Gewichten von bis zu 15 kg werden in unserer Mahl-/ Pressanlage zur **analysefertigen Tablette** für die RFA verpresst. Mit dem zur Vorzerkleinerung eingesetzten Einschwingenbrecher lassen sich beeindruckende Zerkleinerungsgrade von bis zu 1:200 realisieren, so dass hierüber bereits eine sehr gute Homogenisierung der Probe erfolgt. Mit der in den nachfolgenden Teiler integrierten Waage lässt sich die aufgegebene Probe repräsentativ auf die für die Feinvermahlung in einer Scheibenschwingmühle benötigte Menge verjüngen.

Drilling cores and bulk material samples weighing up to 15 kg are prepared in our automatic milling and pressing system for **tablets** ready for RFA analysis. With the jaw crusher implemented for primary crushing, an impressive crushing ratio of up to 1:200 can be realised, so that the sample is very well homogenised in this respect. With the weighing unit integrated in the downstream divider, the given sample can be representatively reduced to the quantity required for fine milling in a vibration disk mill.

Für die manuelle Probenaufbereitung stellen wir Ihnen **Backenbrecher, Hammermühlen, Kegelmühlen, Universalmühlen** und **Scheibenschwingmühlen** verschiedener Größen zur Verfügung.
Für **Siebanalysen** haben wir für Partikel-/Stückgrößen von **20 µm bis 200 mm** die geeigneten Analysensiebmschinen - von der Luftstrahlsiebung bis zur Großanalysensiebmaschine mit einer **Siebfläche von 1m x 1m** im Programm.

For manual sample preparation in the laboratory, we place at your disposal **jaw crushers, hammer mills, ball mills, universal mills** and **vibration disk mills** in various sizes.
For screen analyses, we have in this range suitable analysis screening machines for particle / lump sizes from **20 µm to 200 mm** - from air-jet screening right up to the large analysis screening machine with a **screening surface of 1m x 1m**.

WB253.18.01.2017
ZERKOTALATR-17DE

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SIEBTECHNIK

Flexible solutions for coarse grinding

Picture: Hosokawa Alpine

In many applications, coarse and non-uniform feed material is crushed or pelleted in a first step with a primary crusher. The distribution of particle sizes is dictated thereby by the combination of rotor speed and screen size. The multi-purpose crusher MPC 150 offers three common grinding processes in module form that can be fitted onto a basic unit:

- Conical mill for soft to medium-hard materials
- Flake crusher for brittle materials that crush easily
- Hammer mill for solid materials that are difficult to crush

These modules for all three processes can be exchanged with only one single tool and thus correspondingly quickly. In addition, the modules are very easy to dismantle and clean – there are no threads or screw heads installed in the sections in contact with the product. Dependent on the grinding process, the size of available screens ranges between 0.3 and 20 mm. Especially in the extremely fine range, these screens offer application possibilities that were barely possible before. As a function of the mill type, the peripheral speeds range between 1 and 60 m/s. Most applications are operated in the range between 1 and 20 m/s.

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Hall 4A, Booth 233

Small inverting filter centrifuge

With the HF 300.1 Heinkel is presenting the smallest inverting filter centrifuge in the HF series at Powtech 2017. With a basket diameter of 300 mm and a nominal capacity of 6.5 l, it is particularly suitable for scale-ups and small production units particularly when the products are difficult to filter. This is ensured by the gentle process which guarantees there is no heel left after filtering as well as optional thin layer filtration. The hermetically sealed design and fully automatic, uninterrupted operation offer maximum contamination protection for users, the environment and the product.

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Hall 4A, Booth 128

Picture: Heinkel

Tablet coater for the laboratory

The LC Lab laboratory coater is of modular design and can be equipped with the individual modules needed for the coating process or specific application. The engineers oriented the design of the coater fully to the requirements in the laboratory – starting with the choice of material for the housing. The latter is made of Corian. The FDA-compliant composite material with outstanding hygienic properties offers a whole series of advantages, particularly in the laboratory. It is easy to clean, resistant to solvents as well as impact-, scratch- and wear-proof and permits a joint-free finish. Seams that are problematic from a hygienic point of view were thus avoided from the outset in the LC Lab.
Simplicity of handling has been consistently pursued with the LC Lab. For instance, the utilisable volume of the entire drum can be halved with ease while retaining the drum geometry.
The nozzle arm was adapted to laboratory needs in co-operation with the experts of Düsen-Schlick. Two standard high-performance nano nozzles are used.

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Hall 1, Booth 517

Production of high performance materials

Picture: Glatt

All over the world, the requirements placed on the structures, surface characteristics and compositions of powder materials are rising. With the Advanced Pulse Powder technology APPtec, a novel spray calcination process, Glatt will present at Powtech a technology that can create and configure primary particles in almost unlimited ways in a hot gas reactor. For instance, special pigments with innovative functionalities, chemically highly homogenous catalysers and optoceramics with different application-specific dopings and complex stoichiometry can be realised. With APPtec, high performance materials can be efficiently produced, dried, calcinated and coated with functional layers in just one process step and with reproducible quality – even with mixed oxide systems and in small batches – free from lumps or hardened particles.

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Hall 3, Booth 418

Clean filling of powder into PE bags

Picture: Haver & Boecker

Adams stands for the filling of powder-type products into PE packaging made of FFS film. Here the bag is formed inside the filling machine from a premade PE tubular film. The product makes its way through the dosing and weighing systems – which are matched to the product – and is then packed into the bags as they are formed and welded shut in the packing machine. The heart of the Adams technology is its compaction system which makes it possible to pack even the finest powder with FFS technology.
Bags filled by the Adams technology always provide dust-free surroundings along the entire value-adding chain and allow a clean and attractive product presentation. The cleanliness of the filling process is striking, and as a result there is far less wear and tear to packing systems and downstream equipment. The material costs for maintenance and repairs fall, and machine downtime is reduced. The result is improved capacity utilisation and reduced operating costs.

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Hall 1, Booth 535

Packaging line on the mobile device

Under the banner of Industry 4.0 Beumer Group has developed the Beumer Overall Operation Monitoring app, an application with which the customer's employees have all relevant indices of their packaging line displayed on their mobile devices at any time. The application shows the status quo of availability, performance and quality levels as well as the energy and compressed-air consumption. This ensures efficient operation of all systems. The program can be adapted to customer-specific requirements.

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Hall 1, Booth 627

Picture: Beumer

Blower series with 104 model variants

Thanks to 104 model variants, the Alpha Blower series provides a high degree of flexibility for numerious customer applications. Aerzen large blowers are positive displacement blowers. They reach volume flows of up to 77,000 m^3/h at a maximum overpressure of 1000 mbar and a maximum negative pressure of -800 mbar. Customers can select from a range of two and three-lobe rotors, as well as horizontal and vertical conveying directions, depending on the field of application and installation site. The Alpha Blower are reducing pipe sound emissions: In case of three-lobe blowers, the proven technology of interference channels for pulsation attenuation is still used, whereby the outlet contour of the two-lobe version is designed completely new. By the use of the multi-flow principle for reducing air turbulences via an integrated soft inlet, which reduces pulsations, the pipe sound can be significantly decreased. Thanks to the Airsilence technology, even downstream silencers can be of smaller dimensions now.

www.cpp-net.com
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Hall 4, Booth 271

Picture: Aerzen

Radar sensor for bulk solids

The level transmitter Vegapuls 69 operates at a frequency of 80 GHz, which allows a considerably better focusing of the transmitted signal. New microwave components allow the sensor to detect even the smallest reflected signals. Even products, which until recently were very difficult to measure because of their poor reflective properties (such as plastic powders or wood chips), can now be measured with very high reliability. This considerably extends the application range for radar technology in the bulk solids industry and opens up new application areas as well.

With a measuring range of up to 120 m and an accuracy of ±5 mm, the sensor has sufficient performance capability even for the out of the ordinary tasks, such as level gauging in mine shafts or distance measurement on conveyor systems. Completely unaffected by dirt and build-up, the lens antenna guarantees maintenance-free operation even in harsh environments.

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Hall 4, Booth 514

Picture: Vega

Paddle dryer with eccentric agitator

Picture: Italvacuum

Planex System from Italvacuum is a horizontal paddle vacuum dryer with eccentric agitator featuring two independent movements, allowing it to simultaneously revolve around its own axis and to rotate tangentially to the drying chamber. Designed to dry wet feed from filtration and centrifuging processes Planex System is ideal for the production of active pharmaceutical ingredients, fine chemicals and intermediates. The combined rotations of the agitator and its small size compared to the drying chamber diameter, ensures the perfect mixing of the entire batch, and allows consuming at least three times less energy than conventional dryers with a concentric agitator. This means a threefold reduction in mechanical and thermal stresses on the batch being dried. As a result, even the most delicate and temperature-sensitive products are treated with maximum care.

The system is available with total volumes ranging from 150 to 3200 l. Maximum loading capacity depends on the product to be processed, and can vary from 15 to 80 % of the chamber volume.

Planex System is designed and manufactured in compliance with European Union Atex Directives and CE marking requirements, as well as with the increasingly stringent US FDA standards and cGMP Current Good Manufacturing Practice Regulations.

www.cpp-net.com
Online search:
cpp0317italvacuum

Hall 3A, Booth 510

Simultaneous calcination of zeolithes

Rotary tube furnaces are used for quick and easy production of laboratory-scale samples with excellent homogeneity for R&D and quality control. Carbolite Gero's HTR 11/75 and HTR 11/150 furnaces allow for calcinations, pyrolysis or reactive gas treatment of a great variety of powders and granulates with volumes up to 50 or 700 cm^3 respectively. The speed of the oscillating reactor can be freely selected in a range from 1 to 8 min^{-1}. The sample is constantly mixed and homogenised at a temperature of up to 1100 °C. For a chemical company a furnace was developed that accommodated 4 HTR 11/75 rotary reactor tube furnaces arranged in a very small space to simultaneously calcinate a large number of zeolithe samples. This process is an important part of quality control and can now be realised quickly and cost-effectively during production so that possible rejects are immediately detected.

Picture: Carbolite Gero

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Hall 1, Booth 552

Mixing powders into liquids

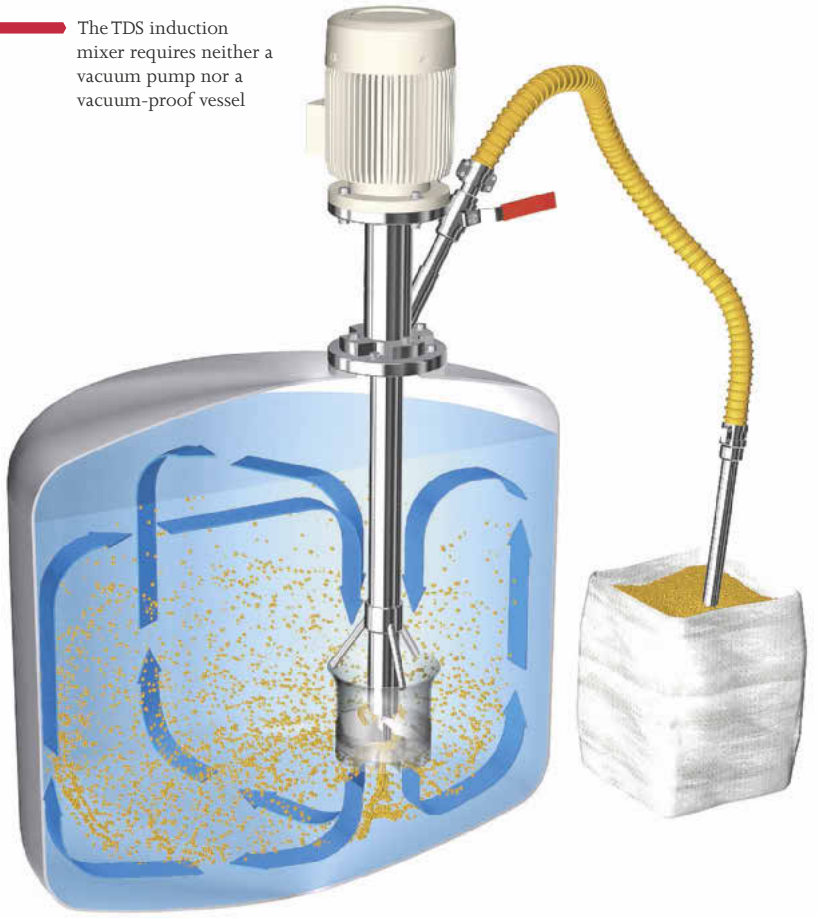
Clean, dust-free and no agglomerates

You could be forgiven for thinking that mixing powders into liquids is easy: switch on the stirrer, wait for a vortex to form and add powder. It isn't difficult but it leaves a lot to be desired all the same. Considerable amounts of dust are produced, large agglomerates develop in the liquid and there are wet powder crusts on the wall of the vessel. The Ystral Conti-TDS proves that it doesn't have to be this way.

Nearly all powders are mixed into a liquid when they are processed. Instead of dosing them onto the surface of the liquid, it is far more effective to induct them into the liquid directly. No dust is produced in this way. No dust extraction system or filter is needed. There is no product loss. The entire powder is mixed into the liquid. And because there is no dust hovering over the liquid, there are no partially wetted crusts or baking inside the vessel, which could sooner or later crumble into the product or cause powder to be carried over into the next batch.

Induction takes place under vacuum. There are basically three possible options for this process:

- Vacuum vessel
- Induction mixer installed in the vessel
- External vacuum disperser installed in a pipe



The TDS induction mixer requires neither a vacuum pump nor a vacuum-proof vessel

Pictures: Ystral

Vacuum vessels are the most complex alternative and by far the most expensive. The vessel must be completely vacuum-proof. An external vacuum pump produces the induction vacuum by exhausting air from the headspace above the liquid. The powder is added via a nozzle below the liquid level. The powder jet is thus inducted directly into the liquid underneath the surface. This method is not suitable for powders which are difficult to wet: these are inducted dry through the liquid and into the vacuum pump. Coarse, crystalline or agglomerated powders are likewise critical because their loose structure means that air is sucked in and the vacuum in the vessel is reduced. Components of the liquid which are volatile under vacuum, too, are exhausted by the vacuum pump in an uncontrolled way.

TDS induction mixers are the cheapest option by a long way. For one thing, they mix the vessel contents more effectively and more homogeneously than an ordinary stirrer because they circulate it vertically rather than rotating it horizontally. For another, the vacuum which is necessary to induct the powder is produced by the mixing head itself according to the Venturi principle. No vacuum vessel and no vacuum pump are needed for this reason; the mixers can be operated in a simple, open vessel or attached to a movable lift in drums or containers. The powder is always inducted directly in the mixing head and is mixed there intensively.

Unfortunately, though, there are also limits to what a TDS induction mixer can do. The

filling level in the vessel must be high enough to cover the mixing head properly. High-viscosity or very sticky powders impose further limitations. The powder is mixed in thoroughly but without being dispersed satisfactorily. The maximum length of the machine is restricted as well. Large vessels with a capacity exceeding about 4 m^3 and significant variations in the level cannot be realised.

The only machine that can process any powder type, viscosity, vessel geometry or filling level, and which does not simply induct the powder but disperses it thoroughly into the liquid, is the Conti-TDS – a dispersing machine which is installed outside the vessel and which produces a very strong vacuum in its dispersing zone, thus facilitating a high powder induction rate.

The Conti-TDS dispersing machine is installed outside the vessel

Flexible in use

The Conti-TDS can be installed in a loop with just a single vessel or in combination with several vessels. In the food industry the machine is often located in a totally separate powder chamber and connected via pipes and valves to numerous other process vessels of all sizes, possibly a considerable distance away. One or two machines thus suffice to meet the company's total powder induction needs.

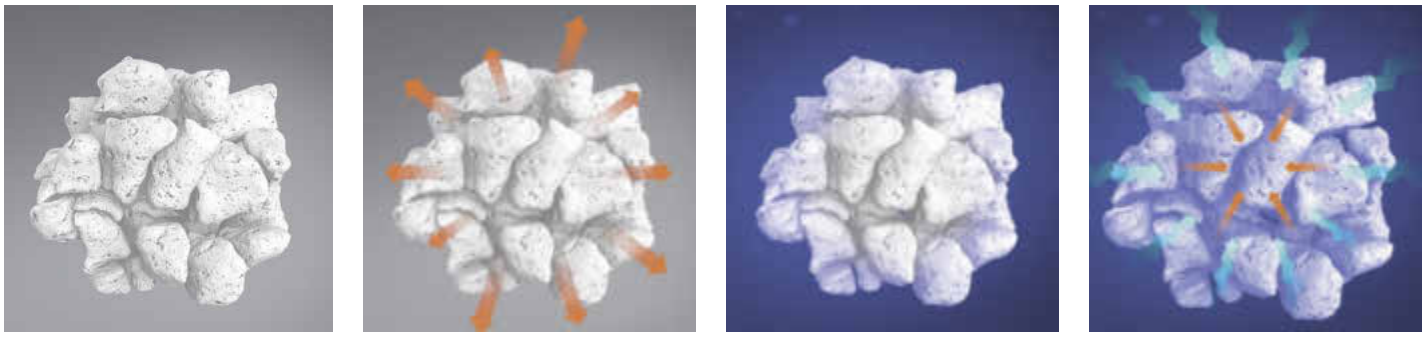
In-line powder induction while filling the process vessel is another interesting alternative. In the production of cleaning agents or cosmetics, for instance, the complete process – from powder induction through dispersion to homogenising – is over as soon as the vessel has been filled with the liquid. The powder has been fully processed. Whereas the processing time used to be several hours, it is now virtually zero.

Principle of the Conti-TDS

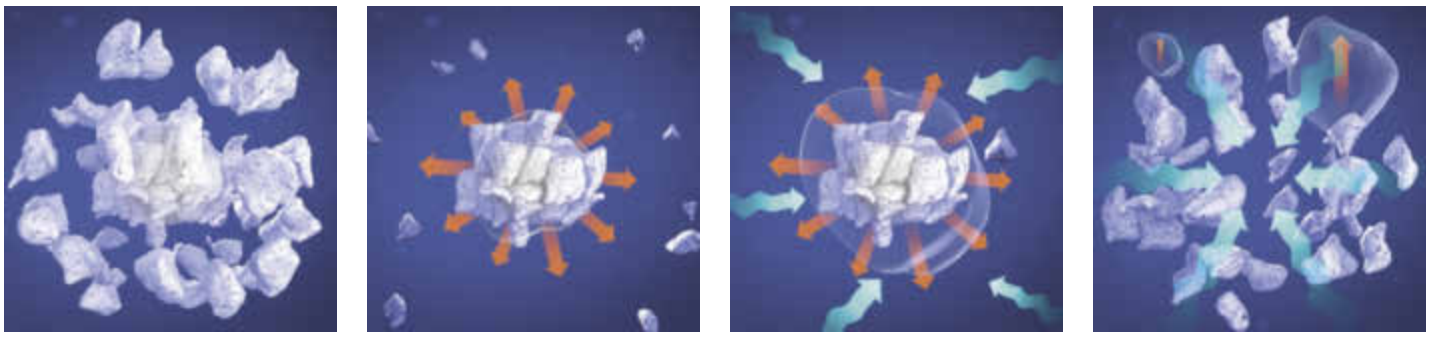
A Conti-TDS machine inducts the powder into its dispersing zone under vacuum. Vacuum has the effect of separating the powder particles. To understand this effect, it is important to know that every powder contains air. Although the particles are in contact with one another, there is always air between them. Heavy powders are composed of up to 75 % air by volume; the figure for light powders can be more than 95 %. The exact air content can be determined by calculating the ratio of bulk to solid density.

One property of air is that it is compressed under pressure but expands to a multiple of its normal volume under vacuum. The vacuum which is produced by a Conti-TDS depends on the vapour pressure of the liquid. In the case of water, the Conti-TDS achieves a maximum vacuum of 30 mbar abs, corresponding to a ratio of 1:33 in relation to atmospheric pressure. The vacuum in other liquids can be even higher.

When powder is inducted into water, in other words, the air contained in it can expand to as much as 33 times its initial volume. The distances between the individual particles increase dramatically. It is possible, for example, for every single particle to be completely wetted from the outside within



Agglomerate break-up under vacuum and simultaneous dispersion



Very large agglomerates only break up after passing through a second time

the dispersing zone, in which the liquid and the powder come into contact with one another due to turbulence and shear energy. Some powders, however, do not only consist of individual primary particles; they also form compact, solid agglomerates. The finer, wetter and more cohesive the powder, the stronger the tendency to agglomerate. There are more than twenty reasons why agglomerates may form: adhesive and cohesive forces, moisture and sinter bridges, temperatures below the dew point or simply temperature changes during storage as well as compression under conditions of vibration, to name but a few. This property is exploited with certain powders, amongst other things, in order to prevent hazardous dust.

All agglomerates have air between their primary particles. However, solid agglomerates do not break up so easily under vacuum: it takes rather more than that.

Eight steps to break up agglomerates

The break-up of agglomerates under vacuum and simultaneous high-shear mixing in a liquid is completed in between four and eight steps. In the first step, the dry, solid agglomerates are sucked towards the dispersing zone by the vacuum. In the process, the vacuum increases from atmospheric pressure at the inlet of the induction system to its maximum value on reaching the dispersing zone. The stronger the vacuum, the more the air expands – not only outside the agglomerates but also inside them. The agglomerates are so solid that they keep their shape nevertheless and do not break up. Only the air on the inside is expanded, most of which escapes.

The contact with the liquid takes place in the dispersing zone under maximum vacuum. The agglomerates are completely wetted from the outside as a result of intensive dispersion. The air which has already escaped due to expansion is separated from the agglomerates, which remain dry on the inside – after all, they are filled with air. However, the gaps between the individual particles now contain air which has increased in volume several times over.

Immediately after passing through the vacuum dispersing zone, the powder-liquid dispersion is pushed into the outer centrifugal area of the machine under maximum pressure. The abrupt change from maximum vacuum to maximum pressure inside the agglomerates causes the air which has just expanded to not simply contract but be compressed to a much smaller volume. The air which previously expanded to 33 times its normal volume inside the agglomerates now contracts to a fraction of that volume under pressure, similar to an implosion, and sucks the entire enclosing liquid into the agglomerates. This effect causes the agglomerates to break up into primary particles. The high shear energy supports de-agglomeration.

A single passage through the Conti-TDS is usually sufficient to achieve complete de-agglomeration. Occasionally, though, the agglomerates are so large or so stubborn that they only break up fully after passing through a second time. A few residual agglomerates survive. In this case, the dispersion process continues.

The residual agglomerates are inducted into the vacuum dispersing zone again in the loop, this time already completely enclosed by liquid. There is also a dry zone containing a small amount of air on the inside. The air expands again under vacuum. As a result of the high shear energy under vacuum, excess air is separated and the remaining agglomerates are completely wetted on the outside. The dispersion is immediately pushed in again under maximum pressure. The residual agglomerates then break up too, similar to an implosion. Even strongly agglomerated powders are completely dispersed in this way.

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Online search: cpp0317ystral
Hall 3A, Booth 717

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Bead mill produces nanoparticles

The future is nano

Known substances that are milled into nanoparticles take on new properties. Active ingredients increase their potency, thus allowing better drug formulation and dosage for a more targeted fight against diseases. The nanoparticles can be prepared on the Nanowitt-Lab from Frewitt.

Nanotechnology refers to the production, analysis and application of structures that are at least one dimension smaller than 100 nm. The particles are 1000 times thinner than the diameter of a human hair. The use of nanotechnology is not only increasing for surface treatment but is also delivering impressive results in the medical industry. Frewitt has tackled the nano challenge with the development of a bead mill, known as the Nanowitt. This device for drug development and formulation is further detailed in the following. The Nanowitt-Lab allows materials to be wet-milled down to a particle size of 50 nm. The milling chamber's modular design is ideal for milling quantities ranging from a few milligrams to up to 1.5 kg. The specified range depends on the solids content.

This compact lab device is easy to integrate and – thanks to its intuitive control system – can be set up and made ready to work in a very short time. The patented Nanowitt design unites short milling times with low specific energy, resulting in gentle product processing, no hot spots, only minimal product contamination and tight particle size distribution. The unique dynamic separator (DS) with no filter prevents clogging and hectic operation, which are continual problems with other technologies. In addition to providing stable processing conditions, the DS supports direct in-line sampling and integration of an in-line particle size measurement.

The Nanowitt's cGMP design furthermore offers user-friendly operation and easy bead handling combined with high product recovery.

Modifications with a flick of the wrist

Frewitt has retained its proven modular system for changing the milling head on the Fredrive-Lab platform. With just a single triclamp, the particularly lightweight nano milling head is readily interchangeable and integrates conveniently into a rigid or flexible isolator. After removal, the milling head can be cleaned quickly and easily.

The Nanowitt-Lab is designed to mill all types of powders, achieving a homogeneous product whose particle size can be measured with a real-time PAT solution if desired. Batch or semi-batch processing and simplified filling/emptying round off the technical features of this new bead mill for nanoparticles.

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Hall 1, Booth 343

Pictures: Frewitt

The Nanowitt bead mill produces nanoparticles with a size of 50 to 500 nm

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Emission-free powder transport and complete drum emptying

Stainless steel components from one source

Especially with highly active substances and chemicals, safe transport within an operation is of great importance. Moreover, cross contamination and product loss have to be avoided. Stainless steel components for powder handling from Bolz Intec ensure safety in production.

The emission-free powder transport system (EPTS) from Bolz Intec was designed for sealed transport of small quantities of solids (powders and granules) under sterile conditions. This system consists of a centrifugally optimised central container equipped with flap valves on the loading and emptying sides as well as a modular set of attachments and sealing parts (tri-clamp). The active substance volume can range from 2 to 220 l, depending on the diameter. Various adapter elements can be mounted on the loading side, such as funnels or adapter parts which can be rendered inert and sterilised. This also applies to the outlet. The high quality of the surface, with Ra < 0.25 µm on all process-side surfaces, is very important for efficient and optimal emptying. The system is thus adaptable for use with reactors, batch tanks or tablet presses, for example. The container can be filled and emptied in a protected atmosphere (glove box) or vacuum.

Pictures: Bolz-Intec

The EPTS (Emission-free Powder Transport System) is adaptable for use with reactors, batch tanks or tablet presses

Emission-free powder transport

A funnel for filling and/or a CIP chamber for cleaning the entire system can be attached to the valve on the upper part of the container, while the flap valve at the outlet of the EPTS has a connection for the reactor to be filled. When filling, the CIP chamber is completely removed in order to attach the funnel. The filling funnel is flanged onto the upper part of the EPTS and the medium (powder) is added using a vacuum/suction process. The flap valve is then closed and the CIP chamber remounted, so that the EPTS can head to the reactor, where it is docked and the powder is added to the process by creating a vacuum in the reactor. If necessary, the trolley can be raised to line up with the reactor. The EPTS clean-in-place system ensures 100 % emptying and cleaning of the entire system without emissions. Integrated spray heads and rotating nozzles can be used for CIP cleaning or to ensure optimal emptying of process fluids in a closed system. The EPTS is optionally available with Hastelloy or Halar coatings. Besides silicone, other seal materials are also available, such as EPDM or PTFE (FDA compliant).

Residue-free drum emptying

When emptying containers, there is the problem of residues which are left behind. To handle this problem, a funnel with a flap valve is usually placed on the rigging of a stainless steel drum secured with a tensioning ring and turned over so that the drum can be emptied. However, experience has

shown that residual quantities still remain on the funnel neck as well as on the rigging. This can be attributed to dead spaces in the design which trap residual powdered or viscous media during emptying, wasting valuable products and posing a high risk of both internal and external contamination. In addition to product loss, this also significantly increases the cleaning effort required to meet GMP and FDA regulations. Product residues are therefore a risk in terms of safety and can also hurt the bottom line. Bolz Intec has developed a practical, multifunctional emptying system for drums explicitly for use in hygiene-sensitive areas, which optimises the dead space between the emptying cone and the drum. The specially designed funnel with a flap in various systems is fixed simply and securely to the drum with a clamping ring and a seal. Users can then resort to their normal technology for emptying. To achieve an unobstructed product flow, the part of the funnel coming into contact with the product extends into the drum, whereas previously contact was on the funnel itself. The funnel is mounted on the drum not unlike a lid, thus allowing the drum to be completely emptied. A cap with seal is used during transport and to protect the product. The drum can be supplied with different bottoms. Tri-clamp connectors can be welded in the version with a dished bottom and foot ring. These are suitable for blasting the container with nitrogen during the emptying process (air shock) as well as for adding further product components or using measurement technologies. A CIP lance can also be easily installed either to capture the process liquid for reuse during rinsing or to reuse the drum once emptied. A stirrer is likewise possible to gently mix the product during emptying in order to prevent bridging.

Simple drum handling

The emptying system can be transported by means of a drum carriage, drum roll, drum lifter or other transport device. For safety reasons, the system has been reinforced with a footrest and a rail to protect the container when used in unprotected production processes. Correct handling can prevent damage to the drum and the tension closure. Another advantage is that since the footrest and the rail are also utilised as handles, protection and a transport aid, they facilitate the emptying process. The drum seal is tightly welded and very stable to prevent contamination. The system can be supplied in various sizes with a diameter of 315, 375, 400, 450, 500 or 560 mm. The surface is available in bright-milled, polished or electro-polished. The roughness depth is between 0.8 and 1.2 µm by default, though other roughness depths as low as 0.3 µm are possible on request. The transport and emptying system can be delivered in the following materials: 1.4301, 1.4404, 1.4435, 1.4539, or Hastelloy C22 2.4602. The silicone round-snap seals with FDA approval, USP Class 6 and BSE/TSE approval ensure a secure, airtight closure. Sealing materials such as EPDM or Viton are additionally available. The Sole Valve is used to control and steer the flow. This valve permits continuous feeding of granules and powders without material stoppage, as well as even dosage during the feeding of processing machines.

GMP-compliant lidded drums

GMP-compliant lidded drums, which are offered with volumes from 0.5 to 300 l as well as in different diameters, are well suited for storing hygiene-sensitive products in the pharmaceutical industry. They are dull WIG welded with welding filler material and without gaps. The seams are rolled flat and finely polished inside and out. They are moreover easy to clean and absolutely residue-free and exhibit high stability even at maximum load. The surfaces are polished or electro-polished for optimum product output with <0.25 µm roughness. The reusable clamping ring cover with insertable round cord seal in materials such as silicone, EPDM or Viton permits simple, airtight sealing along with the FEP-coated seals with FDA approval.
In addition to industry-standard materials such as 1.4301/AISI 304 and 1.4404/AISI 316L, drums for extreme conditions are also offered in Hastelloy C 22. Due to increasing demand for Hastelloy C 22, Bolz-Intec has now decided to put this drum into mass production. Hastelloy C 22 is very resistant to chloride ions, iodine and bromine as well as to acids like sulphuric, phosphorous or nitric.

Single-use or dedicated application

Thin-walled stainless steel such as 1.4301 is used for the best-cost stainless steel drum for single-use applications, with a diameter of 450 or 560 mm and a volume of 100 or 200 l. The drum provides very high quality, stability and breaking strength. It is priced about one-third lower than the standard stainless steel drums.
When emptying the drums, stainless steel funnels make the whole process dust-free and loss-free. The broad range of Bolz Intec funnels extends from asymmetrical and symmetrical designs to conical drums. Openings with inside diameters as small as 40 mm can be made from one piece. Both the angle and the surface are freely selectable as bright-milled/2B, polished or electro-polished. The material thickness is 1.5 mm. 60° and 90° angles are standard in conical funnels, though funnels can also be made according to specific customer requirements.

With the multi-functional emptying system for drums the part of the funnel coming into contact with the product extends into the drum

Drums in Hastelloy C 22 are offered for extreme conditions

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Hall 1, Booth 148

Filling systems for hazardous areas

Tough performers

The semi-automatic FSL-PRO S filling system from Bizerba manufactures flammable, corrosive, foaming or highly viscous liquids without any problems. This flexible all-round system ensures to-the-gramme filling and weighing accuracy as well as gentle dispensing in hazardous areas.

The filling operation at the end of a production line can be performed by a semi- or fully automatic system. The only difference between them has to do with container handling. In semiautomatic systems, containers are manually fed and positioned in the filling station, while the filling process itself is done automatically. In fully automatic facilities, on the other hand, the containers are automatically conveyed from a magazine to a separation unit and the filling station before being transported onward. The product itself can be fed to the facility either gravimetrically from elevated tanks or by pumps.

Semiautomatic systems are often the most economical solution for small batches. The container is first of all placed manually on a weighing platform. A movable filling valve then allows the filling nozzle to be lowered into the container. A more sophisticated solution is required for containers that must be filled and weighed while standing on a palet. In contrast to single-container filling stations, where the containers must be positioned underneath the filling valve, the valve must instead be positioned above the container. Apart from potential time savings, this also eliminates the hard labour required for palletising heavy containers.

Picture: Bizerba

The semiautomatic FSL-PRO S filling system ensures to-the-gramme filling and weighing accuracy as well as gentle dispensing in hazardous areas

Safe even in hazardous areas

In sensitive areas such as the chemical or paint industry, particularly tough systems are vital because flammable, poisonous and corrosive substances are quite common in this kind of environment. All components of a filling system should be designed for highly sensitive products and hazardous areas. To offer maximum protection, the entire filling process can also take place within a protective enclosure. This highly safe approach additionally lends itself to applications with high hygiene requirements, including the pharmaceutical and food sectors.

The semiautomatic FSL-PRO S filling system ensures appropriate filling and weighing even of goods with difficult processing characteristics (e. g. flammable, corrosive or foaming substances). Amongst other things, it can be used for highly sensitive liquids in the paint and varnish, chemical, petrochemical, construction material, pharmaceutical and food industries. As a flexible all-round system, it ensures to-the-gramme filling and weighing accuracy as well as gentle dispensing in hazardous areas (Ex zones 1 and 2). It is also in conformity with Atex guidelines. Products can be filled into different containers. The use of multiple valves enables fast product and container changeovers without any risk of cross-contamination, thereby providing maximum flexibility and reducing downtime.

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Hall 3, Booth 531

Dosing and shut-off valve with pneumatic sealing element

Ideal for use in Atex areas

The DKZ 103 APS and DKZ 110 APS rotary valves are based on the continuously optimised butterfly valves in the centric APS series from Warex. The shut-off function involves the sealing element being pneumatically pressed against the valve disc. This technology offers several advantages.

The APS (Air Pressure Sealing) system ensures that in the closed position, the entire circumference of the seal is uniformly inflated to adapt to the full circumference of the disc. This technique provides a number of advantages in terms of both pressure-tight shut-off and low-friction, material-friendly operation. Several different versions (diameter, speed, density of medium) are available. The customer benefits from a product that is optimally designed for the task at hand thanks to specific feature options relating to the material and drive type. Depending on the sealing material which is selected, the application temperature range extends from -40 to +200 °C. If the medium being transported is expected to reach a temperature of 130 °C or more, for example plastic granules or products and raw materials in the food sector, silicone seals are used. Rotary solutions with metallic sealing can be supplied for even higher temperatures. Although pressure tightness cannot be ensured here, most granules are unable to pass through due to the small gap size.

Wide range of applications

Wear occurs both at the rotor and in the interior of the butterfly valve seal, especially with abrasive media. Soft-sealing rotary valves are thus a reliable choice in this area because abrasion is partly compensated by the inflatable seal. In fact, material loss is fully compensated up to a certain degree of wear because the highly adaptable cuff still provides reliable sealing. The maintenance and repair intervals are significantly longer than with conventional methods, ensuring greater economy. A further advantage is that the seals are normally interchangeable. The DKZ 103/110 APS rotary valve is ideal for use in hazardous areas in accordance with the BVS 03 Atex H024 X N6 type examination. Another application for this rotary valve is in vacuum transport systems. Depending on the thickness of the material being transported, the piping is either partly or, in the case of free-flowing products, completely filled. The rotor delivers uniform portions right up to a full flow in the 22° position. The chemical and pharmaceutical industries as well as food processing are just a few of the many potential uses. The intelligent design of the rotary valve allows various relatively small, and therefore energy efficient, drives to be mounted. A distinction is made between (pneumatically operated) 180° pendulum-type drives, which always provide half the capacity of one full revolution of the rotor, and electric drives. Electric drives enable the rotor revolutions to be set precisely to match the dose rate. Thanks to the low installation height and compact design, this rotary valve can also be incorporated into existing systems in a space-saving way, so that refitting or upgrading becomes an attractive option.

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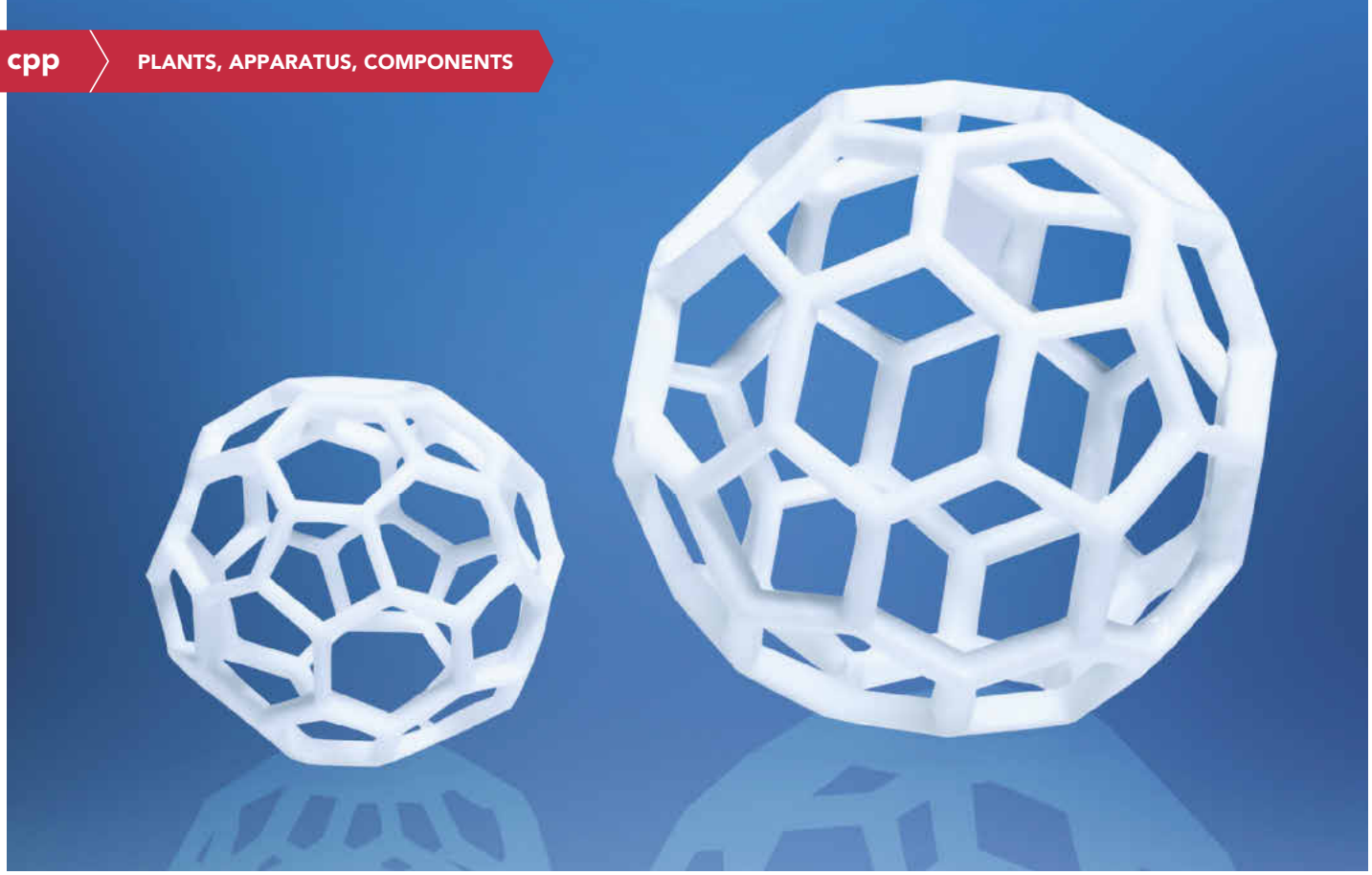
Picture: Warex Valves

Warex rotary valves with an inflatable seal are based on the APS centric butterfly valve



Pictures: Dyneon

3M has developed a technology for manufacturing PTFE parts without tools on a conventional 3D printer

Additive manufacturing with fully fluorinated polymers

PTFE parts from the 3D printer

At its Burgkirchen site Dyneon is evaluating the use of PTFE formulations on a 3D laboratory printer and the properties of the moulded parts manufactured with it. The objective of the tests is to bring the new additive manufacturing process to the production stage, i.e. making lot sizes as small as one item economically viable.

Whether for aerospace components, prototypes in automotive manufacturing or chemical engineering, conventional industrial manufacturing processes come up against their limits wherever small component lots contributing high value are concerned. In situations like this, 3D printing enables considerable cost savings as well as new design options. In future, 3M will be offering precisely that for fully fluorinated polymers such as polytetrafluorethylene (PTFE).

The industry has been striving for years to manufacture components in ever bigger lots. Optimised production processes involve very high start-up costs for tools and require complex steps to be programmed. These costs are recovered very quickly, however, owing to the scale effects which result from the manufacture of hundreds of thousands or even millions of the same component. The most common processes are thermal ones in which metals or plastics are fluidised and cast in prefabricated moulds. They are often subtractively machined afterwards. Special tools such as drills or milling heads remove material until the desired geometries are achieved.

Limits of conventional manufacturing

These conventional manufacturing processes require a lead time, for example for ordering tools and programming the machining operations. Furthermore, design engineers are obliged to ensure that components can be manufactured using conventional methods. More complex components with several functions therefore generally consist of various individual parts that must be assembled afterwards. This in turn creates sealing points.

Non-melt-processable materials necessitate subtractive machining from blanks. This

produces considerable quantities of unusable production waste – which is very uneconomical when expensive materials are a must. A further disadvantage is that moulded PTFE parts manufactured in the conventional way are almost always solid, thereby increasing the component weight. This is detrimental for aerospace or automotive engineering, where every additional gram counts.

Small lot sizes

In contrast to established large-scale manufacturing, the trend in Industry 4.0 is moving towards economical production of very small lots. Additive manufacturing is an important link in a digital engineering chain. In future, it will be possible to manufacture lightweight, ready-to-install, multifunctional moulded parts from CAD data in a single step, avoiding tool costs and long lead times.

In additive manufacturing without tools, the parts are printed in 3D. Based on digital design data, each component is built up layer by layer through the deposition of material. Unlike in the private sector, additive manufacturing processes are already widely accepted in numerous industrial applications. The first factory to use exclusively additive processes opened this year in Germany. Serial parts are already being printed for aerospace engines, while the automotive industry is shortening the development times for prototypes with the help of 3D printing technology.

PTFE for extreme requirements

In view of the above, this manufacturing process is highly attractive for the family of fully fluorinated polymers such as PTFE, which are almost universally chemically resistant. Their operating temperature range exceeds 500 °C, covering temperatures from -250 to +260 °C. PTFE is practically non-flammable. Its long-chain structure and high density lead to very good sealing properties. The electrical properties are equally good. PTFE and other fully fluorinated materials can be used when all other alternatives fail to meet the requirements. They add considerable value, for example as reliable and durable seals or linings. Fuel systems involving high temperatures as well as corrosion protection or sealing applications in processing plants utilising aggressive chemicals are just two of the typical applications.

Industrial users and drivers of additive manufacturing technologies are at the same time important purchasers of PTFE products. However, it has not been possible to process PTFE using conventional additive processes in the past. 3M has now developed a technology for manufacturing PTFE parts without tools on a conventional 3D printer. Out of the various processes investigated, it was stereolithography that proved to be most promising for processing PTFE. In the process developed by 3M the fully fluorinated polymer (in this case PTFE) is printed with the aid of a binding agent to form a so-called hydrogel. The binding agent is photosensitive, hardens under UV radiation and is thermally removed after printing. 3M currently prints moulded parts up to 35 x 30 x 55 mm in size with the 3D laboratory printer.

Moulded parts up to 35 x 30 x 55 mm in size can be produced with the 3D laboratory printer

Density of printed moulded parts

Many properties of the components manufactured on the 3D laboratory printer exhibit a comparable profile to conventional PTFE moulded parts. Some properties may even be superior. Examinations of moulded parts around 1.4 mm thick show components manufactured without tools reaching density values of 2.12 to 2.17 g/cm³. These values are comparable to those of conventionally manufactured moulded parts. Neither pores nor cavities are discernible in scanning electron microscope images of printed and conventional moulded parts. Printed moulded parts offer the same virtually universal chemical resistance as their conventional counterparts.

PTFE processing by means of additive manufacturing opens up new options for fast and inexpensive production of very small series or even one-offs. Manufacturers can thus design complex shapes, reduce weights and advance the integration of functions, to name but a few of the benefits. Above all else, manufacturers and users will in future save time because they will be able to print moulded parts directly from the CAD data, for example in order to manufacture PTFE prototypes or spare parts.

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Online search: cpp0317dyneon

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Chemical-dosing systems at two U.S. based locations

Preparing the ground

Cooling and boiler water of power plants on the premises of chemical factories must be conditioned in a similar way to the water of large-scale power plants. This is an important basis for an efficient energy supply when manufacturing substances such as fertilisers. During the water treatment, various chemicals are added by special dosing stations. Designing such dosing equipment for the U.S. market turns out to be challenging, though.

MPT of Rodgau (Germany) was commissioned by Thyssen Krupp Industrial Solutions to furnish two U.S. based chemical plants operated by CF Industries with 27 dosing systems. Four dosing stations for oxygen scavenger, amine, phosphate and caustic were erected in Donaldsonville, Louisiana. Two dosing stations for each of seven other fluids were also installed there: surfactant, dispersing agent, corrosion inhibitor, sodium bromide, sodium hypochlorite, sulphuric acid and sodium hydroxide. One dosing system for each of the following media was shipped to Port Neal, Iowa: oxygen scavenger, ammonium hydroxide, sodium hypochlorite, corrosion inhibitor, dispersing agent, sodium bromide, non-oxidising biocide, sulphuric acid and sodium hydroxide.

Each of these stations basically consists of a storage tank, which is filled by means of gravity or compressed air, as well as two or more dosing pumps. The pumps for each dosing line are embedded in a redundancy concept: if one pump fails, the other one cuts in automatically.

Project requirements

American dosing pumps were installed in this project in order to permit maintenance within the U.S.A. The entire electrical equipment – such as motors, transmitters and switches – had to be U.S.-certified either by FM Global, a mutual insurance company located in Rhode Island, or by UL, the Illinois based safety consultant. The pressure gauges and flow indicators likewise had to be appropriately designed. Since 18 dosing systems were delivered to Donaldsonville alone, the operator wanted them to have a uniform design to ensure ease of installation, operation and maintenance. Finally, they had to be sufficiently robust to last for many years. America uses Imperial rather than metric units, meaning that all tanks and flanges had to be secured with Imperial size bolts. Furthermore, the dimensions of the dosing stations in all general arrangement drawings are in feet and inches while the weights are in pounds. These dimensions and weights formed the basis for the customer's wind load calculation. The component parts were coated according to a

Pictures: MPT

Pump assemblies as part of dosing stations. At the bottom right, there is a calibration pot.

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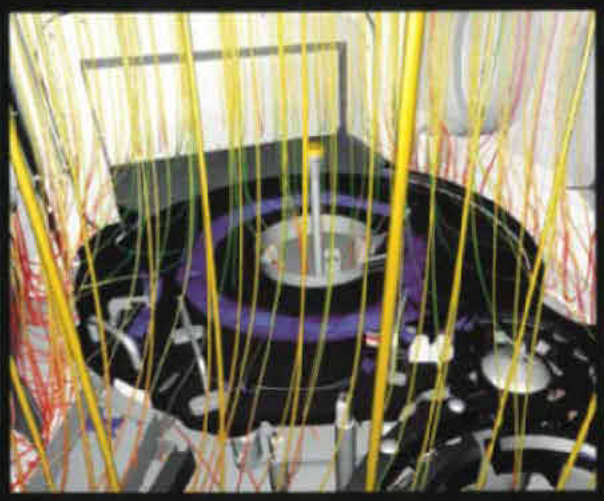

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Excellence United

Separate delivery of large tanks within the U.S.A.

specification which only applied to the pumps and motors. Although not specified in the contract, MPT coated the polyvinyl chloride and polypropylene piping for the Donaldsonville systems with a special UV protectant because they were intended for outdoor use.

Standards are of particular interest in the U.S.: thus, for example, API 675 for positive displacement pumps and the NEMA standard for motors had to be adhered to. NEMA (National Electrical Manufacturers Association) also publishes standards for product safety information such as symbols, warning messages in product manuals and warning labels attached to the product itself. In America, product safety information must fulfil strict comprehensibility requirements. Whereas ISO symbols cannot be understood without being learned, a U.S. symbol depicts a risk of injury very drastically in order to maximise the deterrent effect. In addition, the black-and-white presentation makes for a better contrast. Last but not least, U.S. symbols are larger than their ISO counterparts as they are not framed by a warning triangle or a blue circle.

Coping with problems

For MPT, the size of some of the tanks turned out to be challenging as regards packing and transport. To keep logistics costs as low as possible, extra-large tanks were ordered, delivered and installed directly in the U.S.A. solution had to be found to make this relatively simple in spite of the separate delivery. The pump group was therefore connected to the appropriate tank with flexible tubing, easily compensating the dimensional deviations which can occur during assembly.

Component parts subject to maintenance – i. e. safety valves and the above-mentioned dosing pumps – can be serviced and repaired by local businesses, making any maintenance work much easier for the operating company.

The thoroughly prepared, comprehensive and detailed sets of documentation – including piping and instrumentation diagrams, general arrangement drawings and assembly and operating instructions – smoothed the transition to these complex process facilities.

Throughout the project, MPT's great flexibility as system manufacturer proved to be particularly helpful for the client: a company-wide flat hierarchy and quick decisions paved the way for comprehensive customer support, enabling prompt answers to the questions that always arise when installing and commissioning such systems.

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Online search: cpp0317mpt

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Advantages of special centrifugal pumps consistently exploited

Pump selection without the burden of choice

The selection of a pump involves significant risks, particularly for applications with media which are difficult to pump, which can be quite a challenge for standard pumps to master. Furthermore, the chemical industry is continuously developing new substances whose behaviour can create problems in the pumping process. Many of these problems can be solved ahead of time using special centrifugal pumps, which are individually manufactured for the respective application.

The assembly of the pumps takes place based on the design plans, which are developed for the individual application of the pumps

When it comes to pump selection, alongside technical issues and regulations relating to safety and environmental protection, for instance, the financial aspect is regarded as the most important factor. If we only considered the procurement costs, however, it would be like comparing apples with oranges. Special centrifugal pumps from Bungartz are used for unconventional solutions to complex pumping tasks, of which the chemical industry boasts an abundance. They are designed for those situations where conventional pumps fail, being developed and built on site exclusively for a particular application. Such situations typically include the replacement of an old pump, retrofits due to frequent failures within a process chain or initial installation in a new construction project.

Engineers love solving problems

"The more difficult the operating conditions, the more important it is to have excellent teamwork between everyone involved", explains Sadko Meusel, Head of Sales at pump manufacturer Bungartz. Our common goal is to find the technically and economically optimal solution. Over the course of decades, the company has developed its own philosophy with which to achieve this, based on its special pump technology backed up by corresponding special methods. In contrast to manufacturers that sell standardised pumps, Bungartz relies on custom-built centrifugal pumps. Furthermore, competent and dedicated staff in the sales offices are available to advise clients in Germany and worldwide. They are

Pictures: Bungartz

The special centrifugal pumps from Bungartz are designed on a requirement-specific basis, and manufactured in the Eifel region of Germany

solution-oriented and familiar with a wide range of requirements thanks to several decades of experience. Since they are committed to achieving the best possible solution, just like the manufacturer's engineers and designers, they know that efficient communication between all stakeholders in the planning process is essential. Consultants, planners, plant and operations engineers and technicians in the customer's relevant departments each contribute their respective expertise, as do the specialists at Bungartz' production facility in Euskirchen. This can get interesting where special challenges arise, such as sensitive media that must be pumped in explosive atmosphere, temporary pumping tasks or fluids with a tendency to crystallise or polymerise. However unusual the application, a technically and economically optimal solution is always developed. "There's a real sense of achievement, working together with process and project engineers to develop our self-regulating pumps for use in different plants. Customers are always amazed that they don't need any additional control system technology. If it's also possible to economise on construction work that had previously been considered or planned, they're delighted", says Meusel.

Discovering alternatives

"You can't use something that you haven't heard of", says the current CEO, Frank Bungartz. He describes the principle as follows: "Our three-pillar model allows us to develop the most suitable pump for even the most difficult application."

Pillar one: the sealing technology. Almost all pumps combine the hydrodynamic shaft seal as a primary seal with a downstream secondary seal capable of dry running. The permanent dry-running safety results in an extremely long service life. "In practice, what that means is this: in very aggressive applications, which are challenging for seals, the pumped medium is kept well away from the actual seal during operation and even in the idle state. Very often, the traditional (secondary) seal never even comes into contact with the medium and is therefore not subject to much wear. This alone leads to a far longer service life", Bungartz adds.

Effective self-regulating behaviour

Pillar two: the special physics. This is what we call the effective self-regulating behaviour of the V-AN pump series. These pumps automatically adapt to changing feed rates. Their NPSH value is almost 0, meaning that they are cavitation-free, even if the vapour pressure is reached in the pump reservoir. This occurs without any mechanical or electrical regulation equipment, making these pumps intrinsically safe. The high level of intrinsic safety allows plant and maintenance costs to be kept continuously low. Pillar three: the choice of material. The range of materials comprises all castable and weldable stainless steel grades, special alloys (titanium, zirconium), grey cast iron and even components made from SiC. "Selecting the correct material makes the pumps very robust. In some highly complex cases, changing the pump can increase the service life from just six weeks previously to more than six months", says the CEO, describing the experience of the Bungartz team. What's more, the selection and use of these special pumps eliminate virtually all known causes of faults in advance, as one real-life example illustrates. At the Gendorf chemical plant, a process change required different chemical waste water flows (acidic, solids) to be pumped from production processes into another operational area. Josef Lehner, Head of the "Pumps" specialist unit, chose to go with Bungartz pumps (see cav 5/2015 "Ohne Netz und doppelte Pumpe" (Without a safety net or double pumps)). Lehner is a renowned expert on the Pump Engineering distance-learning course (www.pump-engineer.org). Bungartz was known to the pump specialist as a supplier, as were the advantages of the V-AN pumps, which get by without additional control systems. As an experienced practitioner, he also knows that two of the fundamental requirements when considering a manufacturer's quotation are how reliable their statements about pump characteristics are and how smooth their teamwork is during commissioning.

Functional models

"We are always looking for new methods to illustrate our technology", says Sadko Meusel. When words are not enough, explanatory models are needed. At trade fairs, conventions and industry exhibitions, Bungartz has for some time been offering functional models to try out. "Our local Technology Days event uses our mobile demonstration stand and has proven very effective", Meusel comments. The pumps can be operated either in normal suction mode or, as Bungartz calls it, in abnormal mode. This highlights the advantages of the special physics and makes the differences clearly visible.

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Mobile worker concept: Industry 4.0 for hazardous areas

Redefining maintenance

Thanks to smartphones, tablets, sensors and smart HMI systems, maintenance activities are no longer a reaction to a problem but provide an opportunity to prepare in advance and avoid unplanned shutdowns, gain competitive advantages and realise cost savings. The decisive factor for corporate success is not a single component or solution but an interconnected ecosystem of compatible hardware components combined with a software solution stack for mobile workers.

Industrial enterprises can benefit enormously in terms of productivity and data quality from digital, mobile solutions. However, experience shows that – due to a lack of budget, compatibility or the necessary certificate of compliance – many tasks are still performed with a clipboard and paper. Mobile computers are only used in offline mode and essential devices or peripherals turn out to be incompatible. These archaic methods bring increased risk and inflexibility to the business, being error-prone and inefficient while creating potential safety issues and affecting the well-being of the workforce.

One person who was dissatisfied with the traditional maintenance process is Oliver Wichmann, Head of Mobile Solutions at Bilfinger Maintenance GmbH. "I was displeased that the mechanics had to document their maintenance work in writing and then again in the SAP system", he says. "We were therefore considering how to avoid this unnecessary duplication of effort, reduce paper consumption and simultaneously improve the quality of the documentation." "Predictive maintenance" was the answer: particularly in industries with extensive terrain or hazardous areas, consistent, preventive maintenance activities call for new forms of communication and data exchange. "Ecom is the ideal partner to help us improve the quality of documentation processes in potentially dangerous working environments using mobile solutions – making them more efficient while saving time and money", Wichmann explains. Thanks to digital mobile solutions, maintenance workers, technicians, experts, teams and project groups can work together faster, more flexibly and in real time, whether in manufacturing, maintenance, plant configuration and control or machine, tools and inventory management, supply chain management, inspection rounds, repairs or plant security checks.

Pictures: Ecom

Important data is visualised on the mobile device of a service technician, who is permanently connected to the central IT system and can communicate job-related information directly

Maintenance now more targeted

Daily inspections in chemical plants, refineries and other hazardous areas are vital but time-consuming for businesses seeking to ensure the smooth running and reliability of their facilities. Maintenance technicians typically carry out such inspections throughout the day and afterwards enter the results into the company's maintenance management system. The reaction time between damage detection and repair is needlessly slow – with risks for personnel, assets and production. For almost a decade, Bilfinger Maintenance has developed practice-oriented mobile solutions for maintenance purposes. Ecom's smartphones, tablets and peripherals, which are Ex-certified up to Zone 1/21 and Division 1, are the technology underlying these interconnected applications.

Modern mobile devices and apps let mobile workers pursue a more targeted maintenance strategy. Specific procedures and measures can be individually assigned to each technician or mechanic. In other words, each mobile worker only actually

Oliver Wichmann, Head of Mobile Solutions at Bilfinger Maintenance GmbH

Occupational safety is crucial to prevent injury to persons and is naturally also integrated in the workflow. Risk assessments and near misses can be documented with only minimal effort and reported directly to the HSEQ managers.

sees the jobs for which they are personally responsible on their smartphone or tablet display. Historical maintenance records can be consulted on their mobile devices, showing how often a particular defect has occurred in the past and how it was rectified. Wiring diagrams or manufacturer information can also be visualised, providing an additional technical resource. Once a job is done, the mobile worker can document the procedure on the mobile device and log the completed process steps or tasks, the amount of time needed and the materials used. Modern apps automatically sync this information wirelessly with an ERP system, and even without device data connectivity it can also be read offline, updated and then uploaded the next time the company network is accessed.

New maintenance technologies

Bluetooth beacon technology, well-known from the retail and consumer markets, has the potential to fundamentally improve maintenance activities as well as the way businesses operate, secure and manage their assets or plants in hazardous areas. Loc-Ex 01 BLE beacons from Ecom combine digital and physical data into a single, unified business intelligence unit. For example, if a technician approaches a particular asset, information specifically tailored to the relevant task, person and access authorisation can be visualised on the screen of the tablet or smartphone with an app, without having to manually navigate to the right content. The device promptly initiates the appropriate workflow and enables data reception. At the same time, these beacons provide a cost-effective, largely maintenance-free option (even at maximum transmission power, the battery only needs to be replaced after four years) for collecting asset data and connecting it to back-end systems. They require only a single access point to deliver information back to the company, quickly identify potential threats or downtime or help improve workflows, with the result that engineers can cut down on the time they spend on administrative tasks at the end of every day and significantly increase wrench time. In addition, BLE beacons allow in-depth insights into operational procedures and asset information such as plant drawings, login data, the number of deployments and the average dwell time – even temperature measurements and other metrics can be implemented.

Predictive maintenance

When used together with the right apps, beacons, smartphones, tablets and sensors offer fast access and a compact overview of data, knowledge and information. The system warns of potential downtime or risks. Employees in charge of production and plant operations can evaluate the data live. Based on this, they can detect deviations or anomalies, act proactively rather than reactively, identify trends and make data-driven predictions. In short, they prevent possible causes of lost production before they have a chance to occur.

"Maintenance 4.0" is essentially all about one thing: networking. Flexible and secure communication over long distances is therefore a must. A powerful mobile enterprise concept, taking both hardware and software into account, is key to greater efficiency, productivity and flexibility. Businesses realise competitive advantages such as more effective workflows, predictive maintenance and streamlined decision-making processes which deliver higher margins.

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Mobile solutions like the Tab-Ex 01 tablet allow maintenance technicians access to the latest information anywhere and at any time

AUTHOR
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Picture: Held

Dr. Rita Dicke, Vice President Global Marketing/Product Management Liquid Purification Technologies, Lanxess, presented ion exchange resins and their use

Lanxess invests in water treatment technology

Ion exchange resins and membranes in demand

Water treatment plants continue to be in demand. In line with this trend, Lanxess has in recent years invested in plants that produce ion exchange resins and reverse osmosis membranes. cpp caught up with Dr. Rita Dicke, Vice President Global Marketing/Product Management for ion exchange resins in the Liquid Purification Technologies business unit, to discuss current developments.

Dr. Dicke, what is the current trend in the market for ion exchange resins and RO membranes?
Dr. Dicke: External sources, such as the Global Water Market 2017 study carried out by GWI, indicate annual growth rates of around 10 % for reverse osmosis membrane technology and still around 4 % for ion exchange resins. That represents solid growth for a technology that has already been established for several decades.

How large is the annual demand for ion exchange resins worldwide?
Dr. Dicke: In 2016, global sales amounted to around 1.7 billion euros. Lanxess is one of the market leaders in this segment. Our strength is that our portfolio boasts membrane technology and iron oxide adsorbers in addition to ion exchange resins.

How is the ion exchange resin and membrane technology business embedded in the Lanxess group structure?
Dr. Dicke: The Liquid Purification Technologies (LPT) business unit, which is part of the Performance Chemicals segment at Lanxess, has subsumed the business with products used to treat water and liquid media. We represent the ion exchange resins from the Lewatit product line and the Lewabrane reverse osmosis membranes. Customers can design their water treatment plants using the Lewaplus engineering software.
In 2016, Lanxess also reorganised the marketing structure for its iron oxide adsorbers. LPT incorporated marketing of Bayoxide iron oxide adsorbers for water treatment – manufactured by Lanxess' Inorganic Pigments (IPG) business unit – in its comprehensive portfolio. In order to harness synergy effects, LPT is now responsible for all water treatment products business. Unlike Lewatit ion exchange resins, Bayoxide cannot be regenerated but must be disposed of after use. Lewatit, Lewabrane and Bayoxide applications can be broadly split into four segments: industrial water treatment, drinking water, the chemical industry and food processing. Industrial water treatment accounts for around a third of the total annual sales.

How well is the business unit performing?
Dr. Dicke: Sales in the Performance Chemicals segment rose by 2.7 % in 2016 to about 2.14 billion euros. The development of sales in the LPT business unit contributed positively to this performance. Business is generally good: it's a development which is being driven by a number of recent projects such as the expansion of our production plant at the Leverkusen site, the opening of a new facility in India and investments in reverse osmosis technology in Bitterfeld.

At which sites does Lanxess produce ion exchange resins and membranes?
Dr. Dicke: Ion exchange resins have been produced on an industrial scale in Leverkusen since 1956. We have consistently refined our products ever since. Styrene and divinylbenzene based polymers began to replace condensation resins as early as the 1950s. The first monodisperse polymers were developed at the start of the 1980s. Ion exchange resins have been manufactured at the Bitterfeld site since 1938. Reverse osmosis membrane elements were added in 2011. We have also had an ion exchange resin plant at our Jhagadia site in India since 2010.

What resin grades are produced at the various sites?
Dr. Dicke: Certain grades can be produced at more than one plant while others are mainly manufactured at a single facility. The same level of quality is maintained across all sites. If one plant is unavailable, another can take over, thus safeguarding our ability to deliver and ensuring flexibility for us and our customers. Phthalimide, which is required to make anion resins in Leverkusen, is an example of a site-specific technology. These resins have particularly high-quality properties and can potentially be used in the chlor-alkali industry, for example. They are utilised to treat the brines for chlorine production. Ion exchange resins employed as catalysts in the chemical industry are likewise manufactured at the Leverkusen site. These can be used to produce important plastics precursors. Other products from Leverkusen are the weak acid cation exchange resins (WAC resins) which are used in cartridge systems and improve the taste and quality of water.

"Overall, we have invested around 10 million euros in the Leverkusen site to expand the production plant."

Lanxess expanded the production plant in 2014 to include these cation exchange resins. What was the reason for this investment?
Dr. Dicke: One reason was the positive market development of these WAC resin grades. The demand for special cation exchange resins is growing by between 3 and 5 % each year. We added a fourth plant to the three lines that we already had for this product type. Overall, we have invested around 10 million euros in the site. This figure also includes the construction of a food-grade packaging unit for the resins which can serve all four lines.

Did the plant expansion result in any changes to the production process?
Dr. Dicke: The technology of the fourth WAC resin line is based on our existing plants. Of course, we are continuously improving the production process across all plants. The batch process begins with the production of polymer beads by emulsion polymerisation. A monomer and cross-linker mixture is placed in an inert solvent in a beading tank to form a finely distributed emulsion. Strict compliance with the reaction parameters is crucial to ensure that the polymer beads are of a high quality. The process steps for this purpose are mostly automated. Three-dimensional polymerisation and cross-linking take place in the tank. The non-functionalised polystyrene or polyacrylonitrile beads are separated from the liquid reaction medium via Nutsche filters and functionalised in the next phase. In the case of weak acid cation exchange resins, carboxyl groups are used. Due to their negative charge, the functional groups are capable of binding cations.

Picture: Lanxess

Lewatit ion exchange resins help to protect the environment and water – a valuable resource

Why did Lanxess specifically decide to expand the Leverkusen site?
Dr. Dicke: We chose Leverkusen because the infrastructure of the relevant production plants was already excellent at that site and there was space for a fourth line. Another reason was the fact that the European market for resins used to treat drinking water is relatively large for us. However, there is also the option of manufacturing these products in India, so as to supply the Asian market from there. The resins produced in Leverkusen will primarily be utilised to make cartridges for treating drinking water. It was therefore also important to us that the food-grade packaging unit could serve all lines. This unit is vital for these types of WAC resin because no other industrial-scale methods are used by customers to purify the resins.

What structural measures needed to be implemented for the food-compatible filling unit?
Dr. Dicke: Packaging takes place in a separate building that is divided into black and white zones, the white zone being maintained under cleanroom conditions. Pipes are used to feed the resins directly from the tank into the packaging unit. Access to the white zone is closely regulated and the personnel employed there wear protective clothing. The white zone is supplied with filtered air and kept under positive pressure to prevent the ingress of impurities from the surrounding environment. Inside this 300 m^2 hall, products are fed from several silos into big bags and drums on stainless steel pallets, so that they can immediately be weighed, labelled and transported. A rail conveyor system is employed instead of conventional forklifts. Before being transported to the adjoining storage

and dispatch building, the containers are transferred fully automatically to wooden pallets and sealed in weatherproof film.

Are there already plans to further increase capacity, including at other sites?
Dr. Dicke: We are currently looking into potential areas for investment, but it is too early to confirm anything as yet.

What differentiates Lanxess' ion exchange resins from the products of other manufacturers?
Dr. Dicke: An ion exchange resin is a product that inherently requires explanation, since it has a wide variety of applications. Unlike other manufacturers, we offer both monodisperse and heterodisperse resins. The performance characteristics of our products are what differentiates them from those of our competitors. What's more, our service includes not only the sale of the product concerned but also the design of the water treatment plant using the Lewaplus software as well as technical advice.

What plants can be planned using the Lewaplus software?
Dr. Dicke: We started off designing ion exchange resin plants for water applications, but the range of products we can plan using Lewaplus software is regularly expanded. Following the introduction of reverse osmosis membrane technology, we incorporated it into the software as well. This is an advantage because the two technologies are often combined, especially in water treatment. The ion exchange resins are sometimes applied before the membrane elements in order to remove substances from the water that are harmful to the membrane. Ion exchange resins are also required following reverse osmosis to enable fine purification of water for applications requiring very high purity.

How do I know when I need to regenerate the ion exchange resin or even replace it entirely?
Dr. Dicke: Ion exchange resins are regenerated using a regeneration fluid such as 4% sodium hydroxide solution or sodium chloride solution that is passed through in the reverse direction. We are able to calculate the volume required for regeneration and design the cycles with a high degree of accuracy using our LewaPlus software. This allows a customer to plan the times between regeneration cycles and the anticipated costs of the regeneration process. The customer should also monitor the process continuously, for example by measuring concentrations in the purified stream. The length of time before regeneration becomes necessary depends to a large extent on the application. Resins can continue to be used for years in some applications. In others, however, they are subject to very high wear and regeneration is neither possible nor economically viable. As a result, their service life is much shorter. To check whether a particular resin is working correctly, customers can send us samples and we will then judge whether that resin can still be used or whether it needs to be replaced.

Does your portfolio currently include any new products?
Dr. Dicke: We have several new products for each segment, e.g. an acrylic resin for removing sulphates from citric acid, a new product for separating glucose and fructose and a mixed-bed resin for purifying water in heating systems. We have introduced Lewatit MDS TP resins for the chemical industry. MDS stands for "MonoDisperse Small", which means that the average size of the ion exchange resin beads is very small. This resin delivers particularly good results, for example in chlorine electrolysis. The small beads make it possible to achieve enhanced properties for the selective removal of certain ions. The product is particularly attractive for new plants, which can be built specifically to facilitate its use.

Picture: Lanxess

Lanxess has invested a total of some 10 million euros in expanding the production of Lewatit weak acid cation exchange resins in Leverkusen

Are you also developing customised Lewatit resins?
Dr. Dicke: In many instances, we are able to recommend a special ion exchange resin from our extensive product range to solve a customer's problem. If we are unable to find an adequate solution, and if a corresponding order volume will result, then we will develop a resin to meet that customer's needs. This is a simple business calculation.

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THE INTERVIEW WAS CONDUCTED BY DANIELA HELD
Editor

We know what makes a good powder

Meeting the highest standards for drying and powder quality

To make superior powders, look for a GEA drying system. We specialize in supplying industrial drying systems designed to match your exact product and plant specifications. With more than 10,000 references worldwide our expertise is unsurpassed. Our comprehensive product range includes spray dryers, fluid bed systems, flash dryers, ring dryers, rotary dryers, spray congealers and spray dryer reactors.

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Defies even strong acids

Plate heat exchanger made from silicon carbide

Plate heat exchangers constitute a highly efficient solution for heat transfer. Especially for use in corrosive applications, they combine design advantages with the almost universal chemical and abrasion resistance of the ceramic silicon carbide material.

There are many criteria such as size/footprint, weight, heat transfer area, volume, fouling factors or cleaning effort where plate heat exchangers are superior to classic shell-and-tube apparatus. For example, the average space requirement is 40 to 50 % less and sometimes even more, depending on the application. The plates have usually a wall thickness of 1 to 2 mm, allowing efficient manufacturing by forming. The range of materials in this production process is limited to stainless steels, special alloys, copper, titanium and other ductile metals. However, these materials have only limited chemical resistance, especially in extremely corrosive applications. It therefore makes sense to combine the design advantages with the almost universal chemical and abrasion resistance of the ceramic silicon carbide material. The corrosion rate is mostly well under 10 mg/cm^{2}a, even when exposed to severe chemical stress. It is the modification that is decisive, though: this excellent, practically universal chemical resistance is only offered by directly sintered alpha silicon carbide, otherwise known as SSiC.

Meandering channel structure

Yet the use of ceramic materials requires a rethink in terms of manufacturing technology. The silicon carbide plates are moulded by machining the so called green body, i. e. the isostatically pressed but not yet sintered plates. Depending on their size and design, these plates have a total thickness of approximately 6 to 10 mm, from which the channel cavity for the media is machined on the inside. The channel surface has profiles for guiding the flow, producing turbulence and supporting the channel against the next plate. The meandering channel structure ensures efficient utilisation of the heat transfer area without short circuits or dead spaces. Other design elements can be implemented depending on the plate size and the requirements of the application. The basic concept for plate heat exchangers made from SSiC was developed to market maturity by 3M Technical Ceramics, formerly ESK Kempten. The material-specific manufacturing challenges were a key priority. When the series was taken over by GAB Neumann, the latter's long-standing application expertise and experience in classic chemical apparatus came into play. This heat exchanger type complements the Corresic product family with shell-and-tube and block-type SSiC heat exchangers. As part of the transfer, the product was optimised and its overall structure adapted to the application requirements.

Pictures: 3M Technical Ceramics

Plate heat exchangers with SiC plates combine design advantages with the almost universal chemical and abrasion resistance of the ceramic material

Universal corrosion resistance

The 3M SiC Type C plate material is a pressureless sintered SSiC with universal corrosion resistance. The maximum dimensions of ceramic plates are limited compared to metal apparatus. There are two reasons for this: firstly, the green body must be sintered at approximately 2000 °C, so that larger plates are ruled out by the complex sinter-

The meandering channel structure ensures efficient utilisation of the heat transfer area without short circuits or dead spaces

ing equipment, and secondly, the effectiveness of the plate principle, namely between two and four times more heat transfer than with other classical heat exchanger types. High transfer rates can thus be achieved with small heat transfer capacities. Three series (plate sizes 260 x 120, 500 x 200 and 585 mm x 250 mm) currently exist. The apparatus meets even the highest hygienic standards, e. g. the German KTW, and can optionally be supplied with an FDA compliant design.

Potential applications

Silicon carbide material is primarily used in highly corrosive and/or abrasive process conditions for economic reasons. Providing it is appropriately prepared, it is also suitable for high-purity processes (up to ppt) due to the fact that there is no risk of contamination or emissions. The Corresic portfolio of silicon carbide heat exchangers now includes SR shell-and-tube type exchangers, SE block heat exchangers and SP plate apparatus. The SP plate type is ideal for high-performance applications with low-to-medium mass flow rates. The dilution of highly concentrated sulphuric acid, for example, goes hand in hand with a relatively high mixing temperature. Although the acid rates are often low (a few m^3/h), so that a small cross-section is called for, the large target temperature differences (about 100 to 140 °C) result in a high capacity and comparatively large transfer area. In such situations, both tube bundle and block apparatus usually require multiple passes that enlarge the transfer area still further because the mean temperature difference is reduced. In many cases, multiple devices must be connected in series to provide the required cooling capacity or heat transfer area. A whole set of applications, particularly if there are temperature overlaps, are problematic if not impossible with shell-and-tube or block apparatus.

Compact plate apparatus

SiC plate heat exchangers allow a high degree of variability as well as easy implementation of multi-channel functionality in the apparatus. This is impressively demonstrated by the example of 70% sulphuric acid cooling, where a temperature difference of 140 °C/45 °C must be realised with cooling water at 25 °C/38 °C. Two very long, slender shell-and-tube units (DN 125, each 4.5 m long), can be replaced with a very compact plate apparatus just 0.6 x 0.6 x 0.35 m in size. The plate apparatus has a heat transfer area equivalent to just under 30 % of entire transfer area of both shell-and-tube units. The heat transfer coefficient, too, is inversely proportional. A total of 34 SiC tubes 14 x 1.5 mm/4.0 m long were compared with 30 SiC plates measuring 500 x 200 x 7 mm. The same applies to applications with higher or high-viscosity media, where the advantages of plate heat exchangers are similarly clear. In a SiC plate heat exchanger installation, consisting of four apparatus for preheating and cooling a specific sulphuric acid product, huge graphite shell-and-tube units were successfully replaced with SiC plate exchangers with heat transfer areas of between 1.5 and 2.5 m^2 and operating temperatures from 15 to 150 °C.

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Reduce alarm rates efficiently

The alarm statistics report in B&R's Aprol process control system provides a clear, intuitive overview and makes it easy to reduce the frequency of nuisance alarms. A sustainable approach to alarm management can relieve plant personnel and improve safety. The alarm statistics report provides an overview of alarms that is clearly organised and intuitive. It provides key performance indicators (KPIs) for efficient alarm management per the requirements of EEMUA 191, ANSI/ISA 18.2 and IEC 62682. The consequential alarm report effectively identifies cause-and-effect relationships between alarms to help minimize the occurrence of consequential alarms. Aprol alarm reports are available via the intuitive web-based user interface that requires no additional software other than a web browser.

Picture: B&R

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Vertical dryer offers reduced handling

The Guedu vertical dryers from De Dietrich Process System adds an important benefit for drying of powders in process industries, cosmetics and food. The vertical dryer is unlike hot air dryers and tray dryers. The powder is stirred under vacuum, that allows an improvement of the drying time by a factor 2 to 10 compared to tray dryers, and a total cycle time reduction by a similar ratio (by reducing the necessary handling).
In fact, the vacuum drying technology allows savings due to the total cycle time reduction (a single pan dryer can replace several tray dryers) and also savings from the improved heat transfer during drying (reducing utilities costs). The mechanical mixing during drying improves product homogeneity. Therefore, at the end of the cycle, the product comes out perfect evenly dried, with residual moistures below 0.1% where required.

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Safe lockout for large gate valves

Brady's collapsible gate valve lockout can block gate valves up to 18 inch to neutralise or secure the flow of energy or materials to machines. Every worker servicing a machine can apply a padlock to the lockout device to lock a gate valve in the off-position while maintenance is ongoing. This prevents other workers from inadvertently re-energising machinery. Collapsible gate valve lockouts can also be used to secure the flow of water to firefighting systems for example.
The device can easily be rotated around a valve to lock it in the off- or on-position. Its tri-folding system makes it practical to store or carry, while still being able to cover and lock large, 18 inch valves. With just three size variations to lock a range of valves from 3 to 18 inch, this lockout solution is also a very flexible and practical tool to reduce accidents in the workplace. The collapsibleg gate valve lockout is a rugged, injection molded styrene construction. It can be coupled with any of Brady's range of padlocks, available in several materials.

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Bringing real-time plant data to personnel

Emerson's DeltaV Mobile enables on-site teams to quickly and securely connect with off-site experts, extending organisation-wide expertise and collaboration beyond the plant. Intuitive mobile views and customisable filtering ensure that users see clear and relevant data and alerts about the safety and performance of facilities. It easily provides alarms, trends and data available on DeltaV operator workstations to iOS and Android mobile devices, as well as alarm alerts via push, SMS, or email notification.
DeltaV Mobile is a core platform solution in Emerson's Always Mobile portfolio, which also includes Asset View for the AMS Ares asset management platform and Guardian Mobile. Always Mobile technologies deliver operational mobility solutions that improve productivity and collaboration. With instant access to operational information in intuitive views, personnel at all levels of organisations can make effective, business-critical decisions.

Picture: Emerson

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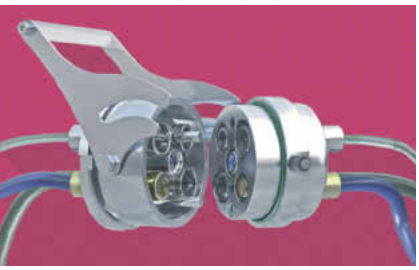
More diversity and service

The multiple couplings and multiple media connectors of the Eisele Multiline E series offer an innovative modular kit system for combining compressed air, vacuum, gases, coolant, liquids, electronics and electrical wiring in one connector body. The German manufacturer continues to develop the Multiline E and presents now the M12 power plug for power electronics.



Picture: Eisele

It is approved for voltages up to 630 V. The M12 power plug is designed for cables with diameters up to 2.5 mm^2. The adaptive insert with up to five power contacts provides up to 16 A per pin and is reverse polarity protected, shockproof and vibration-proof.
The Multiline series will also include an optimised housing version with a practical locking lever soon. The lever enables connection and disconnection within seconds. This quick-change system also requires less manual force, making it very convenient to operate a Multilinre E multiple connector that is completely equipped with drip-free adaptive inserts.
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Compact and flexible Profinet switches

Siemens offers the Scalance XF-200BA line of compact switches. The flexible use of various bus adapters allows users to set up electrical and optical line, star and ring structures. Bus adapters are available with RJ45, SCRJ and LC connection systems. Two types of switches are available: Scalance XF204-2BA, a standard switch for universal, cross-industry use, and the Scalance XF204-2BA DNA Y-switch for special tasks in process automation. An extended temperature range from -40 to +70 °C together with approval for use in hazardous areas (Atex Zone 2, IECEx) allow reliable use, even in harsh environments.
Both versions support up to four ports and various firmware-functionalities. For example, virtual LANs divide the physical network into several virtual sections to minimise the number of broadcasts in the network. Redundancy protocols permit a high availability of machines and plants.
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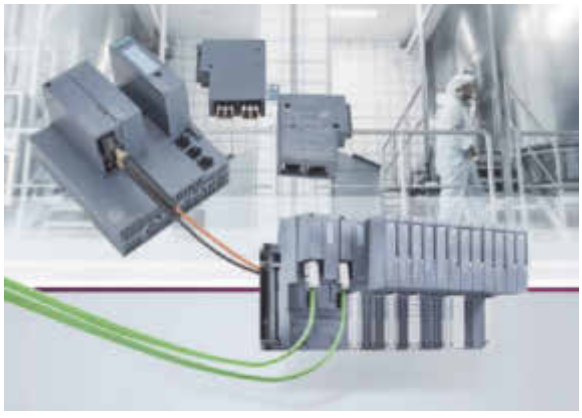

Picture: Siemens

Operating software for rotary drive

The Tensor drive series offers a variety of setting options and evaluable data already in the basic version, due to its internal electronic control and monitoring system. The setting takes place via the standard on-board operation. Since summer 2016, Aris Stellantriebe has been offering a tensor with an expanded range of functions and, in the context of this, an operating software with which the Aris customers can more easily operate and adjust the Tensor via a notebook or tablet. This user interface can then be used to change speeds, to set up individual control characteristics, to adjust the adjustment curves of the control valve or to program different speeds for individual control ranges (travel distances).

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Picture: Aris

Ultrasonic flow sensor with hygienic design

The non-contact Dosic ultrasonic flow sensor is used to detect the flow volume of conductive and non-conductive liquids. With its measurement channel and stainless-steel housing, the ultrasonic flowmeter is suitable for measuring tasks in hygienic and highly demanding environments. Two configurable digital inputs and outputs and up to two analog outputs, as well as an IO-Link interface to a superordinate control unit, ensure that you get just the right start position. The IO-Link reduces cabling and also enables complete control and monitoring of the sensor in Industry 4.0 machine environments.
The absence of moving parts in the sensor eliminates potential contamination risks. In addition, the sensor has a straight, seal-free, and self-emptying measuring tube made of stainless steel (316L with Ra ≤0.8). The stainless-steel housing also provides the necessary ruggedness and resistance. The sensor has EHEDG certification and demonstrates FDA conformity.

Picture: Sick

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Safe handling of high quality drugs

Tyvek Isoclean single-use coveralls are designed for use in cleanrooms and controlled environments demanding high levels of microbiological protection. Additionally, with a bacterial filtration efficiency of >98 %, these coveralls offer the ability to filter out bacteria. Protective suits made of Tyvek are also suitable for activities involved in the production of cytostatics and offer different levels of protection depending on hazard type.

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Digital pressure gauge for high pressures

Picture: Wika

Wika introduces the CPG1500 precision digital pressure gauge in extreme ranges – the instrument can even measure pressures up to 10,000 bar.
The high-pressure version of the digital pressure gauge works with an accuracy of 0.5 % FS. The measured value registration has been adapted in a rupture-proof way for this version – the thin-film cell is not welded, but rather it is inserted solidly into a conical pressure channel.
Via the new smartphone app, the CPG1500, which is already intuitive to operate, can be used even more flexibly. Versions for iOS and Android operating systems are available for free-of-charge download from the respective stores. The app enables a mobile parameterisation of the instrument and also the reading and evaluation of the information from the data logger, which can record up to 50 measured values per second.
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Outlet valve with a 60° outlet nozzle

To allow an easy interchangeability and compatibility to its customers in pharmaceutical and fine chemical field, De Dietrich Process Systems (DDPS) has extended its range of disc bottom outlet valves by adding a 60° outlet nozzle version. As an alternative to the approved 45° valve, Cleanvalve with all its special properties is now available, with a 60° outlet nozzle according to DIN 28140-1. This DIN Norm defines the angle (60°) as well as the exact position of the outlet nozzle flange. This allows easy retrofitting on existing reactors and tanks made of glass-lined steel, stainless steel or nickel alloy. All features of Cleanvalve 45° are preserved with the following advantages:

- Patented flat seat to avoid collection or build-up of materials in the annular area between the valve seat and nozzle wall
- Self draining design of the internal components and body
- Cleanvalve is able to accommodate temperature measurement sensors, measurement electrodes at the lowest point in the vessel
- All DDPS glass-lined valves are made of cast steel coated with the standard DD3009 enamel identical to the reactors on which they are installed. Wetted parts feature the same characteristics of all other glass-lined equipment.

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Picture: DDPS

Fibre-optic temperature measurement in a tight space

Timely detection of hotspots

A fibre-optic temperature measuring system developed by Siemens enables temperature profiles to be determined in tight spaces, for example in tube or tube bundle reactors. By installing a large number of temperature measuring points inside a single tube reactor, areas with excessive temperatures (hotspots) can be detected at an early stage and action taken to control the flow of heat. Following successful trials at Evonik Resource Efficiency GmbH, this measuring system is now available.

In-line measurements of temperature profiles in applications where space is restricted represent a daunting challenge for the measuring equipment. This is particularly true when it comes to determining the temperature profiles in tube or tube bundle reactors. A large number of temperature measuring points are needed in order to optimise and maintain the catalyst activity; these were difficult to achieve using conventional measurement technology owing to the small diameter of the reactor tubes, the required number of measuring points and the necessary measurement speed. The fibre-optic temperature measuring system developed by Siemens in response to this problem is based on the fibre Bragg principle. Fibre Bragg gratings are created by inscribing optical periodic structures into the core of an optical fibre. Since only a defined wavelength of the incident light is reflected while all others are transmitted, each grating acts like a filter with a narrow bandwidth.

Wavelengths determine temperature

Sitrans TO500 temperature transmitters use fibre Bragg gratings (FBGs), which are arranged at individually defined points on the sensor probe. The transmitter sends light waves to the fibre-optic sensors and evaluates the reflected portions. In the transmitter, light is generated in the wavelengths from 1500 to 1600 nm and output to the sensor probe by means of a continuously tunable laser. Each fibre Bragg grating reflects light of a defined wavelength, which varies depending on the temperature at the measuring point.

Since the measured value transfer (reflection of the light) takes place in the same fibre, no additional cables are necessary, so that a much smaller cross section of the protective tube is possible for this measurement set-up. This firstly means that more reaction space is available in the reactor, with a positive impact on the throughput. Secondly, the sensors have faster response times because the damping effect of the air gap between the fibre in which the gratings are inscribed and the tube walls can be reduced to a minimum.

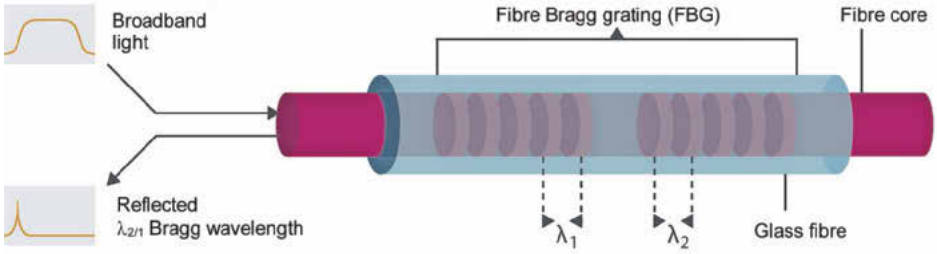
Pictures: Siemens

The Sitrans TO500 temperature transmitter based on the fibre Bragg principle enables temperature measurements in tight spaces

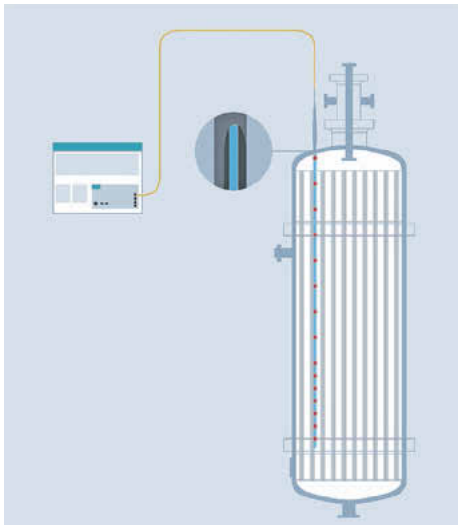
Synchronous measurements

The system consists of a transmitter to which up to four fibre-optic probes with up to 48 FBGs each can be connected. 192 temperature measuring points can therefore be processed synchronously by a single measuring system. Siemens tailors the measuring probes – the length, number of sensors and sensor positioning – individually to each specific application.

Each probe with a diameter of less than



Structure of a fibre Bragg sensor: the transmitter sends light waves to the fibre-optic sensors and evaluates the reflected portions



Fibre Bragg gratings are arranged at individually defined points on the sensor probe, which can be inserted into a tube or tube bundle reactor, for example

"The fibre-optic temperature measuring system helps us prevent the catalyst from being destroyed or ageing prematurely due to overheating", explains Matthias Hüning (left), who works in the electrical measurement and control systems section at Evonik Resource Efficiency GmbH

2 mm measures temperatures in the range from 0 to 400 °C with an accuracy of <0.5 K. The response time is equally impressive, namely less than 4 s for T90.
A gas cell with a fixed absorption line serves as a reference in the Sitrans TO500 and the wavelength determination is continuously adjusted by it. The transmitter provides the values which are determined in this way for analysis in control systems via a Profibus DP interface, so that they can be made available for management of the assets and optimisation of the process. The parameters of the Sitrans TO500 are set via the integrated Ethernet interface.

Pilot project in Marl

A pilot study with the Sitrans TO500 transmitter was conducted at a manufacturing plant for laurinlactam, a starting product for Vestamid L, belonging to Evonik Performance Materials GmbH of Marl. "Thanks to the fibre-optic measuring system, we can install a sufficient number of temperature measuring points in a single tube reactor to enable us to detect excessive local temperatures at an early stage and initiate suitable corrective action", explains Matthias Hüning, who works in the electrical measurement and control systems section of Evonik Resource Efficiency GmbH's High Performance Polymers Business Line in Marl. "Our operators are now aware of any hotspots which occur, or any change in the catalyst activity, in good time. In the former case, we use this information to take steps to reduce the temperature, for example. In the latter instance, we can carry out maintenance procedures such as replacing the catalyst at precisely the right moment in the ageing process. Both applications extend the lifetime of the catalyst in the reactor. Predictive maintenance on demand is now a reality."

Catalyst loading reduced

Applications for non-contact measurement methods with fibre-glass sensors are increasingly widespread in the chemical industry. These sensors are insensitive to electromagnetic interference and resistant to the majority of chemicals. The ability to couple the optical signals is a further advantage. In the Evonik installation, Siemens uses a fibre-optic coupler to connect the measurement fibre in the reactor and the transmission line to the transmitter. This coupler can simply be disconnected for maintenance, for example in order to open the reactor cover. Prior to inspecting the reactor or replacing the catalyst, the measuring probe can be removed easily and rolled up on a spindle for safe and problem-free transport. The speed and accuracy of the temperature profile measurements, for instance during gas-phase reactions in a fixed-bed reactor, helps determine the thermal load within the catalyst filling and initiate suitable countermeasures to keep it active. The optical measurement system implemented by Siemens provides an elegant way to simultaneously determine and process a large number of temperatures for monitoring and optimisation purposes. Disturbances can be detected efficiently and the reaction courses optimised, leading to a higher product throughput in the plant. Following an intensive trial phase, the application described here is now being introduced into production at Evonik.

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Online search: cpp0317siemens

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Thanks to the Excell230 NIR sensor, optical density can now be monitored continuously, both on a small laboratory scale and in complex production processes

Measuring optical density by means of NIR technology

Monitoring cell growth

In the pharmaceutical and food industries cell growth is mostly measured optically. As part of the PAT initiative, the FDA is calling for online measurements of all process parameters relevant for quality. With the help of the Excell230 NIR sensor, optical density can now be monitored continuously, both on a small laboratory scale and in complex production processes.

During the product development and process optimisation stages in development laboratories, optical density has so far mostly been determined offline in order to obtain information on the progress of the process, the cell number or the biomass. The PAT (Process Analytical Technology) initiative launched by the FDA in 2002, however, requires online measurements of critical and quality-relevant process parameters to guarantee the quality of the final product. It is therefore reasonable and necessary to have critical parameters such as optical density, from which important conclusions can be drawn on the course of process, available throughout the product development stage. If these parameters are recorded continuously when a product is developed and optimised, implementation in a large-scale process is much easier.

One sensor for all applications

The Excell230 NIR sensor developed by Exner specifically for such applications fulfils all the requirements for measurements in both small laboratories and complex production processes. Thanks to its tiny diameter of just 12 mm, it fits into almost any development fermenter. Attached to a 12 mm port in the cover plate, it monitors and controls the process in the same way as with pH or oxygen measurements. The same sensor can also be used in large-scale production processes owing to its standard fittings and the values it delivers are consistently identical to the underlying laboratory

measurements. The days when time-consuming correlations had to be determined between the measuring methods employed in the laboratory and those installed in the process are gone.

By measuring in the near-infrared spectrum (NIR), colour effects are eliminated and optimal absorption is achieved for most cells. The sensor meets all the specifications for a PAT device and the measurement takes place online. Robust and easy to handle, it has traceable calibration filters for direct, uncomplicated sensor checking and calibration. The integrated measurement amplifier connects the sensor with the process control system via a Modbus, USB or 4…20 mA communication interface in order to start the measuring process. The calibration data and all necessary settings are saved in the system. A functional test can be carried out before and after the application using various calibration filters. This ensures that all recorded measurements remain correct and traceable throughout the process. It goes without saying that the sensor can be sterilised directly in the process as well as autoclaved. A positive EHEDG report about in-process sterilisability is available.

Fields of application

The optical sensor provides an easy way to determine cell growth and cell density in numerous processes, for example mammalian cells for the production of monocular antibodies or bacteria cells for manufacturing toxins, vaccines, enzymes, therapeutic agents or food products. Yeast and fungal cells or microalgae are likewise monitored and optimised with the help of optical density. The optical density parameter enables reproducible conclusions to be drawn about the total number of cells in the measured medium. The actual growth curve recorded during the product development stage in the laboratory serves as a basis for optimal further development and safe process control.

Since the same sensor is utilised both in the laboratory and in the subsequent production stage, the process parameters determined when the product is developed are easily transferable, leading to enhanced process control, reproducibility and output quantity and quality.

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This robust sensor can be sterilised directly in the process as well as autoclaved

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Tablet press containment

Certificate of retention performance

As a complete solution for the safe and efficient production of tablets under containment conditions, Fette Compacting has introduced the Containment Guard: a quality certificate that characterises the retention performance of containment tablet systems even before the final risk assessment.

Anyone involved in pharmaceutical production who wants to exploit the opportunities for growth associated with new, highly active substances, has to have safe and efficient containment solutions. But that's not all. Protective measures are increasingly also required for a large number of medicaments that in the past have been manufactured without taking special precautions. Low-dust production systems are the new minimum standard. In practice, however, precise specifications for the individual process steps have not been available until now – in spite of comprehensive guidelines and stricter enforcement by regulators.
Fette Compacting is therefore taking the first step in the area of tablet production. The Containment Guard is the first quality certificate to determine and document the retention performance of containment tablet systems even before the operator's final risk assessment. It is both a test procedure and the foundation for the technical development of containment solutions in tablet production. The Containment Guard additionally offers comprehensive service, training and consultation, precisely matched to the needs of production under containment conditions.

Based on toxicological limits

The toxicological assessment of the active ingredients to be processed by the manufacturer of the medication forms the basis for the containment system design. Manufacturers determine the maximum permitted limits from this assessment. This process involves the use of models such as the occupational exposure limit (OEL), the permitted or acceptable daily exposure (PDE, ADE) or the maximum workplace concentration (MAK). The limits specified in this way serve as a reference for the subsequent risk assessment when the overall system is put into operation based on the standardised measurement of equipment particulate airborne concentration (SMEPAC). This provides a suitable framework for general assessments of a system's containment quality. To enable a reproducible assessment specifically for containment tablet systems, the Containment Guard supplements the SMEPAC guideline with further, practically relevant aspects:

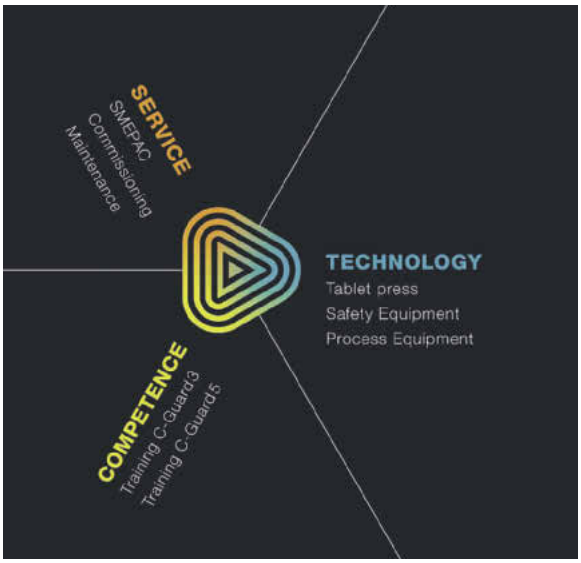
- Positioning of the measuring probes
- Whereabouts of the operators
- Number of samples taken
- Operating states of the machine
- Behaviour of the system in the presence of faults or malfunctions
- Calculation of the system's overall performance, including process equipment

Precise measurement, low expense

The measuring criteria used by the Containment Guard correspond to those of the SMEPAC guideline. However, this method always covers the complete system, including the process and safety equipment.
The structure and sequence of the test procedure are likewise standardised. Fette Com-

Pictures: Fette

High-containment plant with an isolator from Fette Compacting in use at Dr. Kade



An overview of the modular Containment Guard range

Example of a total solution meeting Containment Guard 3: FE75 tablet press with containment package and process equipment

pacting performs the test in a specially equipped room at its Customer Centre in Schwarzenbek. After passing the test, the equipment receives the Containment Guard certificate. Fette Compacting hands over the documentation together with the system. This forms the basis for the operator's risk assessment and reduces ongoing expenditure after the plant has been put into operation.

Multi-stage model

As a complete solution, the Containment Guard takes in all tabletting system components. This particularly refers to third-party process and safety equipment as well as Fette Compacting's patented air management system. The individual stages of the Containment Guard are oriented towards the pharmacological and toxicological classification of the active ingredient (occupational exposure band, OEB). The OEB levels are clearly illustrated in the containment pyramid of the International Society for Pharmaceutical Engineering (ISPE). Containment solutions for tableting at OEB Level 3 or higher – i. e. substances with a low pharmacological effect – are relevant in practice.

Level 3: Low-dust standard

In the light of the increase in potentially hazardous substances, it can be assumed that products incorporating substances with low pharmacological activity and with relatively low dust exposure will become the minimum standard for tablet production. Efficiency is the central key to lower manufacturing costs. Fette Compacting's FE55 and FE75 tablet presses are the ideal technological solution here. When fitted with an optional containment package and associated process equipment, they form the basis for Containment Guard 3 upward.

In the FE series, the tabletting process is fully automatic. From the filling of the machine to tablet discharge, containment is unbroken. The machines are accessible from every side through glove ports. The containment package for the FE55 and FE75 includes a flap valve for secure product feeding, hermetically sealed and automatically lockable window flaps, rapid transfer ports (RTP), a low-dust tablet outlet, H13 HEPA filters, a hand vacuum hose for initial manual cleaning, an interface for the process and safety equipment and a special software safety concept utilising the human-machine interface (HMI).

Level 4: Optimised cleaning

When processing highly active and toxic pharmaceutical ingredients, the use of wash-in-place (WiP) systems significantly reduces the exposure of machine operators during cleaning. The effort required for product changes is also reduced, so that there is far less machine downtime. The containment tablet presses in Fette Compacting's i-series are supplied with a manually operated washing gun and a vacuum cleaner nozzle that easily remove product residues from the compression chamber. An RTP access is likewise integrated for inserting and exchanging tools.

Level 5: Maximum safety

Encapsulating tabletting solutions that meet Containment Guard 5 offer maximum safety in production as well as optimum protection for operators. They are based on Fette Compacting's isolator technology. The isolators can be fitted with a range of options such as an upward de-duster, a metal detector and an IPC Checkmaster for in-process monitoring. All transfer interfaces and flaps of the plant are sealed absolutely tightly. The operator can carry out all the work required on the machine or in the isolator with the help of the integrated glove ports and RTP accesses. Individual compression and in-process monitoring steps can be supervised via the HMI. The same applies to air cleaning, which the operator can monitor using the software-controlled air management system, including a vacuum emergency system. In combination with a WiP Centre the plant can be cleaned automatically in a very short time.

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Future-proof filling plant custom-made

New construction or retrofit?

In mechanical and plant engineering, the term retrofit refers to the modernisation or conversion of existing plants. Users wishing to preserve the tried-and-tested have their equipment updated to the latest state of the art. However, the complexity, scope and downtime should be carefully considered in advance. SMB provides an example of how a safer, more up-to-date filling plant can be tailored to individual requirements.

Pictures: SMB International

About 50 % of the components were replaced, expanded and equipped with new safety technology

Higher speeds and changing requirements often pose specific challenges for the operators of filling systems. Drums, canisters, containers or other receptacles are used depending on the liquid or bulk material. In addition, the properties of the material to be filled are triggers for many more decisions: what form of explosion protection is now needed and will a cleanroom be necessary in the future? In particular, complex plants for high-risk materials call for a sophisticated and future-oriented strategy to ensure consistently reliable operation. Users seeking to adapt their filling systems to current safety standards must regularly examine whether retrofitting the existing system makes eco-nomic sense or whether it might be better to invest in a new one.

Decision on a case-by-case basis

The decision-making process can be illustrated taking the example of an SMB customer in the chemical industry. The company wanted to convert its semiautomated system to support smaller containers – in this case, steel drums – in response to new customer requirements. "Our expert team took a look at the initial situation and immediately noticed that, in addition to the containers themselves, other aspects likewise play an important role in plant conversion", reports Andreas Heckel, Managing Director of SMB International. "If a system has already been in operation for some time, it may no longer meet current standards and regulations. It might not be ap-

proved in this form today. That's why adapting to current safety stand-ards is also a key task."

The SMB engineers initially assessed the possibilities for extending the plant's lifespan. Old assets can often be preserved with the help of new and more advanced technologies. The costs are moderate compared to purchasing a completely new system. "We decide and calculate on a case-by-case basis which variant we recommend to our customers. If the majority of the system components are so obsolete that spare parts are difficult to obtain or have ceased to be available, a retrofit measure is no longer worthwhile in the long run", Heckel explains.

It is theoretically possible to convert up to 70 %, but with most projects less will also do the job. With 50 % of the components having to be removed, replaced, expanded and equipped with new safety technology, SMB classified the chemical plant as suitable for retrofitting. In close consultation with the customer, Andreas Heckel and his team developed an individual concept to meet future requirements. The goal was to realise an easy-to-use, future-proof filling line that conformed to all the latest safety standards and provided all the functions necessary to increase the company's productivity.

Safety

Numerous measures were implemented to update the obsolete safety technology to current standards. Light barriers and additional sensors greatly improve occupational safety. The system can even distinguish between containers and people – and stops immediately if the safety limits are exceeded. The new inerting station, too, ensures the highest level of protection. The oxygen from the air is displaced by adding nitrogen, an inert gas, thus preventing the build-up of explosive atmosphere. Ex Zones 1 and 2 were also installed throughout the plant, of course, according to the level of risk and equipped with certified technology.

Automation

Filling plant and system technologies are constantly optimised. For example, SMB has developed its own system for exchanging filling lances automatically, in which the quick-release fastener is pneumatically controlled. A crane system collects the lances via a chain hoist and transports them to the filling station. The extended functions of the filling lances with integrated filling hoses and camera recognition enabled the customer's process to additionally be optimised in the filling plant. SMB also integrated a new clinch unit, where the drums are automatically provided with lids that are fixed with clamps. Moreover, a calibrated scale ensures that the product quantity always meets the specifications exactly and that the goods leave the production plant ready for sale. The semiautomated system even became fully automated as a result of installing these components.

The complete conveyor system supplied by SMB is precisely matched to the container for a process which is both safe and fast. A user-friendly portal rounds off the improved system. The entire filling process can now be controlled with very little effort, in other words without any restrictions or the previously unavoidable manual intervention, such as opening the drums.

The plant was recommissioned by the chemical company following a three-week conversion phase and a successful FAT (factory acceptance test). Customer-specific documentation, including spare and wear parts lists as well as mechanical drawings of individual assemblies, was provided as part of the final inspection. "Even after commissioning, we attach great importance to customer satisfaction. This is why we compile the documentation according to each client's specific standards and are always available to answer questions – as well as for training and maintenance contracts if required", says Heckel. "To enable us to develop customised plants in a short time at our in-house facility, we have opted for a high level of vertical integration." The engineers in Quickborn also manufacture smaller components such as filling lances in their own production shops. Spare parts can be supplied at very short notice. This is another factor that companies should consider when choosing between "new or retrofit".

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Future-proof filling plant due to modernisation of safety standards

The conveyor technology allows a process which is both safe and fast

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