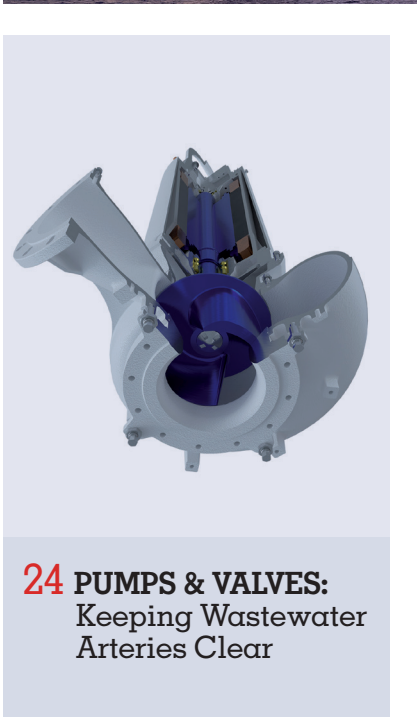


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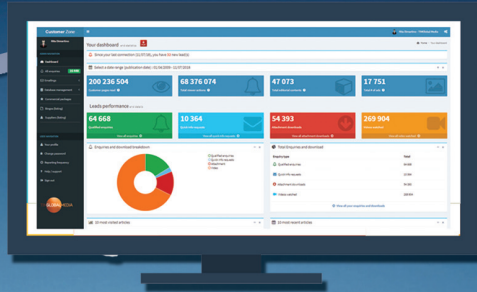
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Dear Reader,

Slowly a year comes to end that most of us will not really miss, once it is over. A year that went by without visiting any major shows and not many companies to learn what is going on directly in the field. So it was a strange year, different in many ways from all the others since I entered the industry in 2006 and most of them were much more enjoyable than the year 2020, that I would only rate as "interesting".



But even in a year like this you can see, people are still going on to be inventive and innovative, some of them even more than before. This helps me keeping positive that we can cope with this challenge and other ones present and future. In this issue we want to show you some of the innovative solutions and ideas that can be a smaller or bigger part of solving problems in different parts of the industry. This are for example an ultrasonic sensor that can monitor levels and communicate from very remote locations (page 8), dryers that help in the production of high-quality, plant-based proteins for a modern life style (page 10) or pump impeller designs that help fighting blockages in municipal wastewater treatment (page 26).

Enjoy your read and please don't hesitate to contact us, if you have interesting news or innovations from your daily work you want to share with us and the PCN Europe readers.

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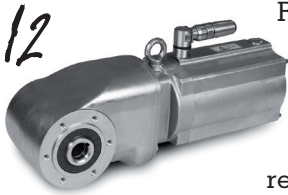
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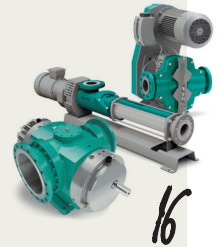
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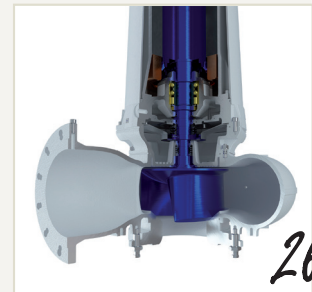
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From the Wooden Winch to the Pneumatic Hoist

For J.D. Neuhaus GmbH Co. KG in Witten-Heven, the year 2020 is something special. In September the company celebrated its 275-year anniversary. What started with a wooden winch is now a hoist manufacturer with worldwide reputation and still family managed, today by Wilfried Neuhaus-Galladé, who took over in 1995 as the seventh generation. With his managerial knowledge and a dedicated team, it was possible to acquire new markets and open up new user industries domestically and abroad when mining, one of the most important markets at that time declined. The establishment of a worldwide distribution network, with subsidiaries in the USA, France, Great Britain and Singapore, has increased the export share of JDN products to more than 80 percent today. Companies from 70 industries in 90 countries from around the world are listed in the customer books. Up to 8000 hoists leave the factory halls in Witten-Heven each year. Innovative product developments certainly played a significant part in this success. This included, among other things, pneumatic hoists in the Pro series with explosion protection, which cover the load capacity segment from 250 kg to 100 tons for use under the toughest industrial conditions.



60 Year of Internationalization

With the founding of its first foreign sales center in 1960, Endress+Hauser laid the foundation for the global presence. Today the company operates its own sales centers in 50 countries. Select representatives ensure sales and support in more than 70 other countries. "While the first step is always difficult, pioneer work pays off," says Managing Director Rob Hommersen with confidence. Mr Hommersen began his career at Endress+Hauser Netherlands in 1978 as a sales engineer and has headed up the sales center since 2006. Endress+Hauser Netherlands began as a sales office with four employees and rapidly captured a leading market position.



Today a workforce of 169 serves the customer base, which includes many international companies. The key industries are water/wastewater, food, oil & gas

and chemical. The creation of the first foreign subsidiary 60 years ago marked the beginning of the internationalization of Endress+Hauser, a development made clear by a series of other anniversaries being celebrated this year. Endress+Hauser has been active in the US for 50 years, in Canada and Spain for 30 years, Poland 25 years and Chile for 20 years. Although the Group is headquartered in Switzerland, Endress+Hauser first established a sales center there in 1960, seven years after the Group was founded in Germany.

Developing Smart Solutions for Energy-Adaptive Production Facilities

The volatile output of electricity from wind farms and photovoltaic plants can pose a real headache for energy companies. Part of the solution to this problem is to adapt the power consumption of production plants to the fluctuating output from wind and solar generation. Researchers from the Fraunhofer Institute for Casting, Composite and Processing Technology IGCV have now piloted this innovative concept in the Augsburg region. The results have been encouraging so far: the team has been able to show that energy-adaptive production – adapting industry's consumption of power to the actual generating capacity – not only works in practice but also reduces CO₂ emissions. In the first instance, therefore, SynErgie is attractive for energy-intensive companies. In the future, however, small and medium-sized enterprises might also benefit from this new system, since it could enable them to avoid expensive periods of peak load, for example, or to market their own aggregate capacity to adapt their production operations to supply levels. If industry succeeds in adapting its consumption of electricity to the actual level of generation, then power companies will require fewer conventional power plants with which to offset fluctuations in generating capacity, and the need to rapidly expand the power grid will also become less urgent. At the same time, an intelligent technology mix will ensure that better use is made of regional generating capacity. and help to establish Germany as a leading market for energy technology.



Emerson Expands Industrial Automation Control and Software Footprint

Emerson announced the completion of acquisition of the Progea Group, an industry-leading provider of industrial internet of things (IIoT), plant analytics, human machine interface (HMI) and supervisory control and data acquisition (SCADA) technologies. The addition of Progea's capabilities in analytics, industrial visualisation and IIoT will build upon Emerson's embedded



software and control portfolio for manufacturing, infrastructure and building automation applications and enable customers to streamline comprehensive machine and plant control systems to a single partner. This acquisition will help bridge a critical customer technology gap by lowering total cost of ownership and reducing the barriers that come with working across multiple vendors to drive more successful digital transformation and integration. "The acquisition of Progea strengthens our ability to provide customers with an integrated package of control, visualisation and IIoT to help our customers improve overall equipment efficiency and accelerate their digital transformation journey," said Lal Karsanbhai, executive president of Emerson's Automation Solutions business. Progea Group is headquartered in Modena, Italy, with approximately 55 employees.



ACCURATE HERMETIC PRESSURE SENSORS

For medium and high pressure ranges and up to IP69K



Sensata announced the availability of the new PTE7100 and PTE7300 hermetic pressure sensors for industrial applications with medium or high pressure ranges. Building on Sensata's leading Microfused Strain Gauge (MSG) with best-in-class accuracy, this new series of pressure sensors provides high burst strength

and high shock and vibration performance, making it a reliable and robust solution for customers with challenging measurement requirements. The stainless-steel design features a hermetic port without using internal o-ring seals, which enables sensor compatibility with most media and use in harsh environments. A snubber option is available to dampen pressure spikes from hammer and cavitation. The PTE7100 series hermetic analog pressure sensor has a measuring range from 0-50 bar to 0-600 bar (0-725 to 0-8700 psi). The sensor's high mechanical shock rating of up to 500g, vibration up to 30g (10...2000Hz) and a burst pressure of $\geq 10X$ make it a reliable solution with an extended product life. A wide variety of highly customizable ports, connectors and analog electrical outputs allows for easy integration with existing system electronics in many industrial applications.

►► 59593 at www.pcne.eu

80 GHZ COMPACT RADAR TRANSMITTERS

Level measurement for a wide range of liquids and solids



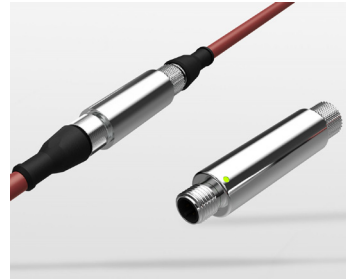
Siemens presents two new additions to the Sitrans LR100 series of 80 GHz radar transmitters. These high-frequency, compact transmitters deliver robust, reliable measurements even in the most challenging environments. Both deliver fast and easy setup and configuration

via Bluetooth wireless technology and the Sitrans mobile IQ App. Sitrans LR140 features 4-20 mA simplicity, Sitrans LR150 offers a four-button user interface on an optional HMI for configuration or monitoring. The easy-to-use Quick Start Wizard will have the transmitter operational in minutes. Custom microchip technology delivers fast response and extremely high sensitivity to detect even the weakest of signals. Reliable readings mean reduced operator exposure to hazardous situations: no need to climb tanks, lean out over sumps, or crawl into confined spaces to maintain instruments. Zero blanking distance allows measurement right up to the sensor, thereby avoiding costly overfilling. And two-millimetre accuracy enhances operational safety through precise measurement through the full range of the application. Users can monitor level measurements or diagnostic and maintenance information from the comfort of the control room or connect to Siemens MindSphere or any other IoT solution of your choice.

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CABLE TRANSMITTER FOR TEMPERATURE

Robust and reliable retrofit solution



The **JUMO** dTRANS T09 temperature transmitter is ideal for simple retrofitting of plants. High vibration and shock resistance make the device particularly reliable. The cable transmitter with 4-wire connection for RTD temperature probes is avail-

able with an analog output (4 to 20 mA) or an IO-Link interface. Pt100 or Pt1000 sensors can be used in the JUMO dTRANS T09. The high-quality stainless steel case is available in protection types IP65, IP67, and IP69. Connection takes place on both sides using Plug and Play with M12 connectors. Pre-assembled cables for M12 connections on both sides, which are also available, can prevent wiring errors and thereby reduce mounting and maintenance costs. Due to its design the JUMO dTRANS T09 is largely insulated from process influences so that it is particularly robust and durable. The version with IO-Link interface optimizes production processes through communication down to the lowest field level and offers maximum transparency of the measured values and sensor states. This interface also contains a switching output. As a result, temperature measurement and monitoring is possible with only 1 device. This variant can also be used, for example, to digitize plants during a short standstill.

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OXYGEN MEASUREMENT WITH EX APPROVAL

Measurement in industrial combustion processes



The user-friendly, extremely rugged and precise zirconium dioxide analyzers from **SICK** are not only available for gas explosion-hazardous areas (ZIRKOR 200 Ex-G), but for use in dust explosive atmospheres (ZIRKOR

Ex-D) as well. The ZIRKOR200 now also features SIL2 certification for integration into safety-related process controls. Both explosion-proof variants are approved in accordance with ATEX and IECEx. The target markets for the ZIRKOR200 Ex-G for Zone 1 are primarily the chemicals, petrochemicals, and refineries sectors as well as the oil and gas industries. With the ZIRKOR200 Ex-D for Zone 21, the focus is on applications in the cement industry, the power plant industry, and in the fields of waste and recycling. In the majority of these industries, the ZIRKOR200 with SIL2 option also enables safety-relevant measurements with only one system (1oo1; One out of One). This means other devices are not needed to achieve SIL2 classification, which makes the implementation of safety systems in process automation cost-effective. The high-tech analyzers of the ZIRKOR200 series for process gas temperatures up to 1,600 °C impress with their simple operation. They adjust automatically and feature an integrated cell diagnostic function. The operator can also access the analyzers conveniently without a cable using the ZIRKOR remote app.

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TEMPERATURE MONITORING LABELS

RFID labels for wireless reading and monitoring



The new **Brady** RFID Temperature Labels are a low-cost solution for temperature monitoring. Applications include environmental monitoring, material and equipment monitoring, cold chain monitoring maintenance

and safety data collection. The thin and flexible, RFID enabled smart labels do not need energy or maintenance. They are energised wirelessly in the event of a temperature reading with a UHF compliant RFID reader. Temperature readings can be automated and are picked up by scanners on an ISO 18000-63/64 and ETSI compliant bandwidth. The identification specialist has made temperature sensing RFID technology available in its wide range of researched industrial grade label materials. These labels are tested to stay attached and remain legible in heat, cold, dirt, in- or outdoors and to resist chemicals, cleaning agents, grease, oil and fuels. Equipable with a variety of adhesives, they can stay attached to smooth, rough, or powdered surfaces, and to flat or curved surfaces. Brady can supply a complete solution to enable reading and monitoring temperatures from a wide range of surfaces. The complete solution includes blank or preprinted RFID labels, one or more professional label printers, label design software, and an RFID reader. Hard- and software support for every component of the solution is available.

►► 59551 at www.pcne.eu

VERSATILE GAS DETECTION CAMERA

Finding more gases with one device and different lenses



The new **FLIR GF77™** Gas Find IR Series provides professionals with the flexibility to use a uncooled gas detection camera for gas detection and thermal inspections across chemical and industrial manufacturing, electric power utilities, natural gas supply chain, food and agricultural, and public safety. The most notable feature updates include visualizing a

completely new category of gases in sulfur hexafluoride, ammonia, and ethylene. The versatile GF77 does more than visualize gases; this ergonomic, easy to use camera is calibrated for IR temperature measurement, so it can be used as part of predictive maintenance programs, such as verifying tank levels and searching for electrical or mechanical issues without the need to change a lens. The GF77 offers two types of lenses—low-range (LR) and high-range (HR)—in a standard 25° field of view or as a 6° telephoto lens. The LR lens has a built-in 7-8.5 μm wavelength filter for visualizing methane, nitrous oxide, sulfur dioxide, R-134a, and R-152a. The HR lens filters the 9.5-12 μm wavelength for sulfur hexafluoride, ammonia, and ethylene. The GF77 Gas Find IR Series now includes a broader temperature detection range, from -20 °C to 500 °C, with improved accuracy of +/- 3 °C, down from +/- 5 °C, within the full range.

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CLAMP-ON ULTRASONIC FLOW METER

Easy installation on metal and plastic pipes



AW-Lake introduces a new series of Clamp-On Ultrasonic Flow Meters that fasten on the outside of vertical or horizontal pipes ranging in size from 1/2" through 48". Housed in a water- and dust-tight NEMA 4X poly-

carbonate enclosure, the flow meters are compatible with a range of metal and plastic pipe materials and "difficult liquids" such as chemicals, viscous liquids, and abrasives that would damage standard flow meters. As a result, the non-intrusive, clamp-on ultrasonic sensors feature enhanced flow measurement with no pressure drop in a range of applications such as food or chemical processing plants, oil refineries, and more. Operating from 100 - 240VAC, they offer an isolated 4-20mA output that can transmit flow readings to remote displays, recorders, or controllers. The programmable relays are useable for flow control, pump protection or flow proportional pulse. A built-in keypad and simple menu system simplify calibration and programming of pipe diameter, pipe material, liquid types and measurement units. Designed to operate at temperatures of -40°C to 150°C, the devices offer a measurement accuracy of $\pm 1.0\%$ of reading from 0.5 to 12.0 m/sec and ± 0.0046 m/sec for velocity below 0.46 m/sec.

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NEAR-INFRARED SPECTROMETER

Fast, simple and robust routine analysis of liquid samples



The main advantages of near-infrared spectroscopy compared with other techniques are that there is no need for sample preparation and results for different parameters are available very fast. The new NIRS DS 2500 from **Metrohm** provides superior sensitivity for analysis down to concentra-

tions in the lower ppm-range. It covers both the near-infrared range and the visible range, which means that, unlike FT systems, the NIRS DS2500 Liquid Analyzer can also detect color changes of the sample, e.g., caused by aging. The DS2500 with its IP65 certified housing and only one rotating optical element is a highly robust solution providing excellent protection against environmental influences even in high vibration environments. The rotating high-precision grating used to disperse light guarantees fast data acquisition so that results are obtained within 30 seconds. With the DS2500 Liquid Analyzer, users can choose from a variety of cuvettes, flow cells and disposable vials, giving them the flexibility to adapt to the respective sample. Intelligent sample holders in combination with SOPs help prevent errors in routine operation that could otherwise result from accidentally selecting the wrong sample containers.

►► 59499 at www.pcne.eu

Autonomous Sensor for Network Connections from Any Location

How can a feed silo or a glass recycling container be transformed into a smart asset? With the battery-operated WILSEN.sonic.level IoT sensor from Pepperl+Fuchs. The autonomous device is connected to the internet via LoRaWAN. The IoT sensor has an extremely long battery life, provides the highest level of data security, and can be used to intelligently automate logistics processes.

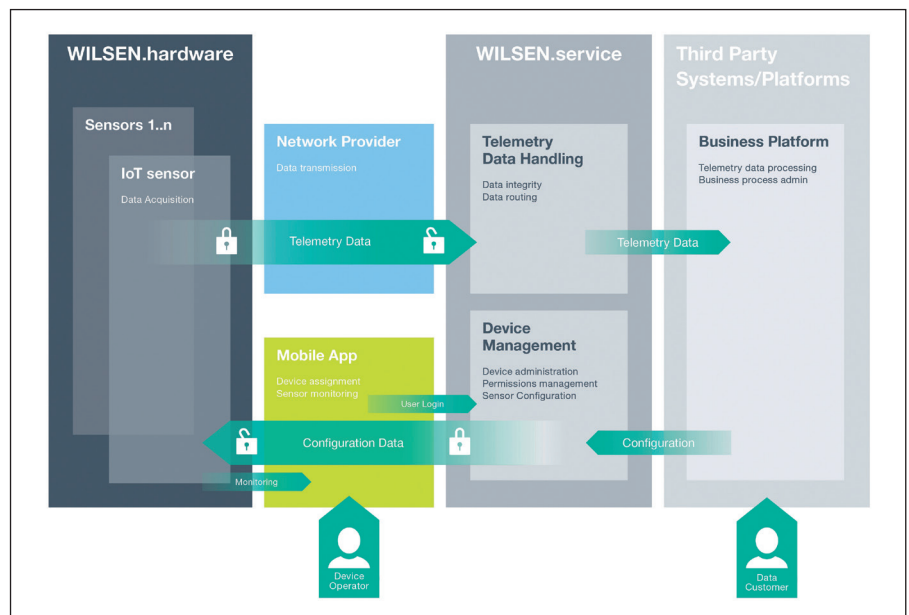
The acronym WILSEN is derived from the phrase “wireless sensor”. The core element of the product is a highly rugged ultrasonic level measuring device from Pepperl+Fuchs’ extensive portfolio of industrially proven sensors. The WILSEN.sonic.level also features a number of other components and functions that make it an autonomous IoT device. A GPS receiver determines its exact position and enables geotracking. Additionally, the sensor monitors the ambient temperature and its battery status. The latter is an important feature since the battery usually needs replacing after several years. Battery life can vary greatly, and depends on the applications in which the sensor is used.

ENERGY-SAVING WIRELESS TECHNOLOGY WITH GUARANTEED SECURITY

Low-power wide area networks (LPWAN) are therefore the right alternative for autonomous, battery-operated devices in industry.



WILSEN.sonic.level IoT sensor is connected to the internet via LoRaWAN.



Transferring status data to the internet does not require high data rates, so the radio signals use very little energy. Since the messages are also cyclical—often with long pauses between the radio pulses—the battery lasts for many years in most applications.

The long-range wide-area network (LoRaWAN) uses the sub-GHz ISM band, which can be used without a license free of charge. Radio waves in this frequency band can penetrate building walls and basement ceilings. The detection range is about 2 kilometers in built-up areas and over 15 kilometers in open areas. The LoRaWAN protocol provides end-to-end data encryption implemented in a two-step process. The technology is suitable for public networks and private, protected campus networks on-site. Where no network is avail-

able, a connection with a gateway—usually solar-powered—can be easily established. A single gateway is sufficient for hundreds of sensors, and even for up to 2500 sensors under ideal circumstances. Therefore, only a small number of gateways are needed for the radio coverage of very large areas. The wireless network can be easily expanded without expensive radio plans since additional units can be connected via plug-and-play. Roaming between different networks is also possible. When assets equipped with the WILSEN.sonic.level are transported, users are able to automatically log in to the network at the destination.

AUTONOMOUS SENSORS IN THE FIELD

The WILSEN.sonic.level IoT level sensor can monitor liquid levels and solid levels. The



measuring range of the ultrasonic transducer is either 2.5 or 4 meters. Users can physically or remotely customize the transducer parameters to suit the conditions of the respective application. The wide coverage of the sound beam allows even very irregular surfaces to be reliably detected; the sound waves detect virtually all materials without being impacted by contamination, dust, mist, or the material's visual properties. Furthermore, the sensor can electronically compensate for immanent disturbance variables such as installations in containers. This compensation process ensures realistic fill-level value readings. The use of autonomous wireless technology allows the sensor to communicate with the relevant control system from any location.

The signals supplied by the sensor eliminate the necessity of visual inspections and value interpretation. The process of emptying and replenishing container contents can be time-optimized and triggered automatically. The GPS data from the monitored tank or container can be used not only for reliable geolocation but also for optimized route planning when transporting containers to different locations. The values from the supplementary temperature sensor can be incorporated into the quality assurance process when handling temperature-sensitive substances. Temperature plays a key role in applications such as the processing of sealants and adhesives.

FROM SMART CITY TO IBC MANAGEMENT

Disposal management in a smart city environment is a good example of how WILSEN level sensor functionality can provide considerable additional benefits. Since the LoRaWAN radio waves are able to penetrate walls, road surfaces, and layers of earth, the sensor can also be used in containers that are located fully or partially underground. Reliable data on the fill level of glass or clothes recycling containers can be used to automate planning processes for routine emptying and determining optimal



The Internet of Things in the process industry

routes for specialized vehicles. The collection request is triggered when a defined limit value is reached. Instead of regularly following set routes, the vehicles collect the containers only when it is necessary. This arrangement prevents unnecessary trips while also ensuring that the containers do not overflow. In turn, this reduces noise pollution and exhaust emissions, while still saving considerable (consequential) costs. The data history can be used for detailed analysis and strategic planning.

The WILSEN.sonic.level can be used for monitoring individual silos in the agricultural sector and animal feed industry. Automated and systematic replenishment logistics and optimized route planning are also extremely beneficial in these sectors. The same applies to intermediate bulk containers (IBC) used to transport and store various liquids. Although these containers are used throughout the food, chemical, and pharmaceutical sectors, they are usually not integrated into the automated workflows of process engineering. To aid environmental research, the WILSEN concept can be used for continuous monitor-

ing of water levels in rivers and lakes, as well as in floodplains and overflow areas. The automatically accumulated historical data enables in-depth analysis and predictive planning. Defined limit values can be used to trigger alarm routines, making the device an ideal solution for active flood protection and system management in wastewater plants. Using the autonomous sensor for the first time is very simple, and even a single device can provide valuable information for system control. The WILSEN.sonic.level makes it easier for users to access IoT by enabling initial, hands-on IoT experience in their own process environment. Since using the data supplied by the sensor is so straightforward, users can quickly gain a full understanding of how to use the technology and recognize its potential for themselves. Users can typically see the clear benefits of IoT connectivity over other solutions after only a short period of time. This experience can serve as a starting point for developing comprehensive IoT strategies.

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N° 11 - NOVEMBER 2020

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Dryers for High-Purity Plant Proteins

Plant proteins often form an essential part of a vegetarian or vegan diet, which is why this product is in high demand. However, several process steps are required to obtain high-purity plant proteins suitable for human consumption from almonds, sunflowers or quinoa, for example. One of the challenges is the final drying process. AVA is supplying a special dryer for this purpose to a German plant protein producer.

Plant proteins from sunflowers, for example, have many properties that make them ideally suited for use in vegan products. Thanks to their good emulsifying properties, they are binders and stabilizers and also optimize the consistency. There is a wide range of applications, from ice cream to spreads. One challenge in the manufacturing process is the low heat tolerance of the proteins. All process steps must therefore be carried out in a way that is gentle on the product.



AVA supplied a special dryer suitable for handling the heat-sensitive plant proteins.

DYNAMIC DRYING FOR SENSITIVE PRODUCTS

A producer of plant proteins required a machine for the final process step – the drying of the protein meal. The machine needed to meet the high requirements of food production while at the same time enabling optimum drying even in the low temperature range. In addition, the system had to be able to recover the solvents. Ulrich Vielhaber, Sales Manager at AVA, reports: “We decided on a vacuum dryer with a dynamic drying process to implement the evaporation of the solvents at the end of the process. This means that the product is kept in constant motion.

As a result, no nests with higher residual moisture or temperature form, so the proteins dry thoroughly and in a uniform manner.” A fully automatic control system permanently measures and regulates the temperature. Once the desired degree of dryness is reached, the machine shuts down automatically. This means that the sensitive product is not moved any longer than necessary. The evaporated solvents are collected and can be returned to the process, thus saving resources and money.

THE RIGHT DRYER FOR EVERY APPLICATION

Before deciding on a particular procedure, AVA carries out an extensive consulting and testing phase. In this particular case, the product’s sensitivity to high temperatures represented a particular challenge. Thanks to the in-house, state-of-the-art test center, AVA’s experts for drying processes can precisely simulate the final process with the respective feed material.

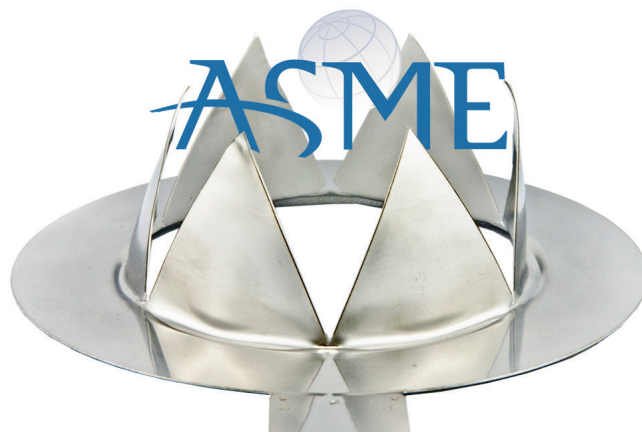
These tests make it possible to correctly adjust parameters in advance, to design the machine for best performance and to analyze the economic efficiency of the process. This proven approach of AVA applies to both individual machines and entire process chains. The dryer is scheduled to start operation at the food manufacturer in late 2020.

PROMOTING SUSTAINABILITY IN THE FOOD INDUSTRY

Volker Spies, Managing Director at AVA, is particularly enthusiastic about the project’s sustainability on several levels: “Thanks to the novel process for extracting plant proteins, a high-quality product fit for human consumption can now also be obtained from plant parts that were previously not suitable for food production. Our dynamic



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The high-purity product is discharged from the dryer. Several process steps are required to obtain high-purity plant proteins. Consulting and testing helps to find the best design for the performance and economic efficiency of a machine or an entire process chain.

drying process makes a decisive contribution to this.” Thanks to the closed process in the vacuum dryer, the energy consumed during this production step is minimal. The efficient drying process also facilitates maximum recovery of solvents and delivers a high-purity, directly marketable product. “AVA and the BHS-Sontheofen Group are true innovators. Nowadays, this must always include energy efficiency and the conservation of resources,” emphasizes Spies. “In this project, we combined both aspects with the benefit of gaining a high-quality food product.”

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Reduction of Risk Factors in Food Production and Processing

How specifying geared motors in stainless steel design or specialised finishes can help reduce HACCP risk factors.

Geared motors are found throughout food and beverage production sites, used to drive conveyor belts, stirrers & agitators, packaging machinery and other equipment along the production line. The geared motor design lends itself to energy efficiency and reliability, a must for any modern production facility. However, the food & beverage industry also requires strict hygiene compliance, meaning that specialised geared motors are a wise choice for such facilities.

The Hazard Analysis and Critical Control Points (HACCP) system is an internationally recognised method for reducing risk factors in the production or processing of food. It works on the principle of on-going improvements, encouraging manufacturers to continuously re-evaluate each of the pro-

cesses in its production line to identify possible hazards and minimise risk. The primary purpose of the system is to protect people from food-borne illness, though it is also recognised as a 'best practice' approach to improve quality and consistency in the final product. Understanding the importance of the processes surrounding the analysis of risk in the production line helps to explain the evolution of geared motor technology used within the industry.

Specifically, it explains why the industry requires that geared motor manufacturers invest in R&D for aseptic solutions – developing specialist coatings and even stainless



Aseptic drives deliver all the benefits of a standard geared motor, while also protecting the drive during harsh washdown cycles and preventing the build-up of microorganisms.

steel variants of their latest products. Aseptic drives are designed to deliver all the performance benefits of a standard geared motor, while also protecting the drive from harsh washdown cycles and preventing the build-up of microorganisms. Drives are typically painted using acid- and alkali-resistant coatings that can withstand chemicals with a pH range of 2 – 12. These drives will also usually offer high levels of ingress protection and be designed with a smooth exterior to prevent dirt build-up.

The HiflexDRIVE range from Bauer Gear Motor is an example of geared motors with design evolutions specifically aimed at improving performance in hygiene-critical applications. The range is carefully designed so that fans and cooling ribs are not required, thereby allowing for completely smooth outer casings with non-drive ends that are sealed. This allows the IE4 super-premium-efficiency motor to be offered with up to IP69K rating – which protects against high-

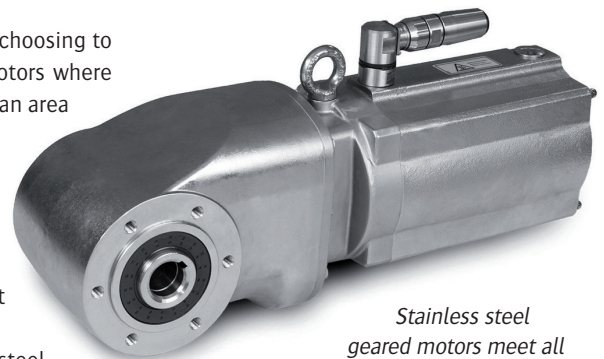


Specifying stainless steel geared motors reduces risk factors in your HACCP concept.



pressure washers and steam cleaning. The elimination of venting elements creates a smooth outer surface, which provides a higher cleanability of the motor casing and prevents re-infection of the local environment caused by air movement from a cooling fan. While specialist coatings perform exceptionally well when correctly applied and maintained, there is always a risk that the coating could become damaged while the motor is in operation. Should this happen, then the contamination resistance of the geared motor would be reduced. Adopting the principles of

HACCP, many manufacturers are choosing to specify stainless steel geared motors where they are likely to be operating in an area with risk of mechanical damage. Stainless steel geared motors – as found within the HiflexDRIVE range – meet all the regulations set out by organisations such as the FDA and NSF without the need for specialist coatings. As a base material, stainless steel is inherently resistant to corrosion and chemicals, even if it has been scratched or



Stainless steel geared motors meet all of the regulations set out by organisations such as the FDA and NSF without the need for specialist coatings.



Many manufacturers are choosing to specify stainless steel geared motors in areas where increased mechanical resilience is required.

dedented after suffering an impact. For manufacturers or packaging specialists looking to minimise HACCP risk factors when specifying geared motors, there is no question that it pays to choose a specialist solution.

The HiflexDRIVE range is available in three sizes ranging from 80 Nm to 330 Nm in standard, aseptic and stainless steel designs; with power ratings up to 6.3 kW depending on the size selected. A two-stage gearbox design allows ratios of up to 109:1, depending on gear type, and allows a wide range of applications to be covered.

Whether the application would benefit most from a stainless steel design or an aseptic coating depends on the sort of working life it will be exposed to. Our engineers help customers to assess their environments and provide expert guidance on the most appropriate choice with consideration to efficiency, reliability, risk and long-term cost saving.

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On the Edge is Where It Happens - Bringing Digitisation to Oil and Gas

The offshore energy industry, whether it is oil and gas or offshore wind, is one underpinned by remote and distributed assets, critical operations and harsh environments. As such, it's one of the prime sectors to benefit from digitisation and embedded technologies to support improved maintenance and monitoring.

PCN Europe is speaking with Martin Frederiksen, managing director of offshore embedded computing expert Recab UK, and Diethard Fent, manager sales partner EMEA at global computer-on-module technology leader con-gatec, about how the offshore industry is embracing digitisation.

PCN Europe: Where are the main application areas for embedded systems in the offshore industry?

Martin Frederiksen (MF): "The nature of all offshore operations lends itself well to the potential benefits of embedded computing and digitisation. Interestingly, one of the areas where

we at Recab UK have seen a lot of projects recently is in offshore wind generation. Wind farms are high-tech and are an ideal Internet of Things (IoT) use case.

"Only last year, a report commissioned by the UK's Offshore Renewable Energy (ORE) Catalyst highlighted the offshore wind sector as lagging behind in adoption and understanding of digital technologies. We're certainly seeing evidence that operators are now addressing that and investing in edge servers for remote monitoring and predictive maintenance.

"We also see projects for mapping the seabed using lidar scanners and/or cameras, often involving unmanned aerial vehicles (UAVs).

When using UAVs, the ability to process the data as effectively as possible is very important. We also have more traditional projects for ships, either for navigation or for transmitting data. The value of embedded systems and digitisation truly spans all offshore operations.

"The key with each of these projects is to consider the environmental conditions, which is arguably the biggest challenge for the development of embedded computing in offshore environments. These systems need to be IEC 60945 compliant, IP67 rated to protect against salt mist and water ingress and able to operate in a wide range of temperatures and pressures. Subsea projects in the North Sea, for example, will need to function effectively in the very low temperatures, as well as subsea pressure changes."

PCN Europe: Why are more businesses in this space turning to embedded solutions?

Diethard Fent (DF): "The International Energy Agency estimates that digitisation can reduce production costs in the oil and gas sector by up to 20 percent. According to auditing and consulting firm PWC, there is great potential for savings through more efficient maintenance and better operation of assets.

"Both the upstream and midstream oil and gas sectors, for example, are characterised by distributed assets and infrastructures in harsh environments. They therefore require ultra-robust embedded platforms for the digital transformation challenge that offers a huge potential for cost savings.

"There is also further potential for savings in the supply chain, through the use of artificial intelligence and integrated platforms that connect organisations with external partners."





MF: “By digitising these processes, companies in the upstream and midstream sector can potentially save up to \$1 trillion in capital and operating costs. Realising this potential requires extremely robust embedded edge server technologies, such as those offered by congatec. Recab UK’s IoT and solution-ready system platforms for solution providers, system integrators and end users are based on these technologies.”

PCN Europe: How do you support offshore and oil and gas companies?

DF: “In late 2019, congatec introduced a new rugged class of embedded edge server technologies designed for the digitisation of the upstream and midstream oil and gas industry. The new embedded edge computing platforms

are designed for extended temperature ranges, with optional conformal coating to protect against the effects of salt water or condensation caused by large temperature fluctuations. “In addition, they offer comprehensive server class RAS (reliability, availability, serviceability) features that enable OEMs to dependably manage thousands of devices remotely. As multicore designs with currently up to 6 cores and a particularly low 25W TDP, they are suitable for completely fanless and therefore maintenance-free 24/7 operation in hermetically sealed housings with the highest IP protection classes.”

MF: “For us, we support with our expertise and experience in embedded edge technologies for harsh environments. We have been able

to assist in several maritime projects where there is a need for an IEC 60945 compliant computer that is IP67 rated and resistant to salt mist. The sea is not the best environment for a computer and therefore a lot of precautions are necessary for a computer to keep functioning for many years.

“We are mainly supporting the offshore business with our baseboard solutions for our COMexpress modules. These projects can be in a variety of applications, like remote operated vehicles (ROVs) for transmitting data from cameras or lidars to process the data before it is sent to the main server. It can also be controlling the sensors in an offshore wind turbine. “In recent years, the oil and gas industry has reduced its staff and therefore some companies either do not have the in-house competence or do not have the time to do the development themselves and therefore they turn to us for a helping hand.

“The number of units needed in the offshore business is usually small- to mid-size volumes, which is where it makes sense to work with a company like Recab UK. It is also a sector that is heavily regulated and that appreciates close contact and cooperation with the developing party.”

The potential benefits of digitisation in the offshore industry are clear: reduced production costs, improved maintenance efficiency and lower capital expenditure. As more offshore companies move to digitise their processes and operations, choosing the right technologies and system partners will prove essential to success.

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Reliable Pumping on a Floating Production Storage and Offloading Unit

A rotary lobe, a multi screw and a progressing cavity pump – on a floating production and storage unit on the high seas, optimally solve a range of pumping tasks with displacement pumps from a single source. The Floating Production Storage and Offloading Unit (FPSO) is used in the North Sea, where it will be pumping crude oil soon.

Is the fossil age coming to an end or is mankind in the middle of a renaissance in oil and gas exploration? There is no consensus among politicians or society in general, but economically, however, the situation is very clear: for the time being, industry is still reliant on fossil fuels. The demand for heat and electricity, mobility, plastics and chemicals is increasing worldwide. In times of trade wars and protectionism, it is therefore not surprising that there is renewed investment in the development of new oil fields outside the Arab world as well, especially in Europe and America.

Immense effort is required to access new deposits, as boreholes have to be prepared and created. It can take years of preparation before a new oil field comes online. For offshore wells, oil producers now frequently are opting for a Floating Production, Storage and Offloading Unit (FPSO). The FPSO is flexible and can be used to store, process and load the extracted crude oil or natural gas, as well as for pumping. Particularly for offshore operations, using FPSOs means that expensive

pipelines at the point of production are no longer necessary. That means even fields with a short life span or far from the coast can be developed cost-effectively.

INTO THE FUTURE EFFICIENTLY

In January 2018, one of the world's largest oil companies decided to deploy just such a flexible production unit off the coast of Great Britain. Once the planned eight boreholes have been drilled, the FPSO will be one of the largest investments the group has made in the British North Sea for decades. Efficient operation is important to the company, especially in view of volatile oil prices, so the company

wanted the system to be profitable even at world market prices of less than 40 US dollars per barrel. Up to 45,000 barrels per day will be produced at the new site in the future.

Efficiency is therefore also a priority for the technology used on the platform, both for the primary tasks associated with oil production and for secondary processes such as crude oil processing. The oil company's partner in charge of engineering and construction therefore turned to

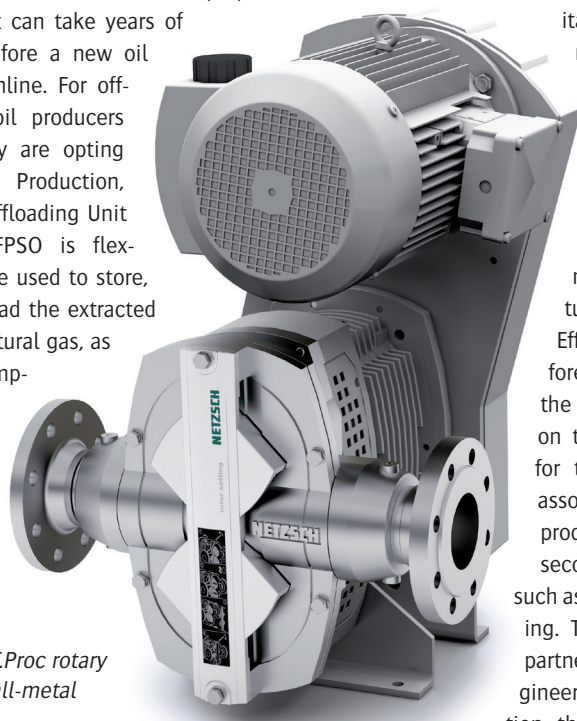
NETZSCH Pumps & Systems for the pumping technology. NETZSCH not only has a comprehensive portfolio of technology for pumping liquid media, it also has the required expertise in the oil and gas industry.

HIGH SEAS = HIGH DEMANDS

"We do especially well in the offshore sector – not least because NETZSCH concentrates its combined knowledge of the industry and its applications in a specialised business field with a global presence," says Ulrich Eibl, Head of the Oil & Gas Mid-/Downstream global business field at NETZSCH Pumps & Systems in Germany. Ulrich also knows that, on the high seas especially where every repair job comes with enormous costs, customers need very low-maintenance technology that functions simply, is reliable and has long life cycles. "After all, downtime on an FPSO quickly adds up to several million US dollars in losses per day," the pump expert explains.

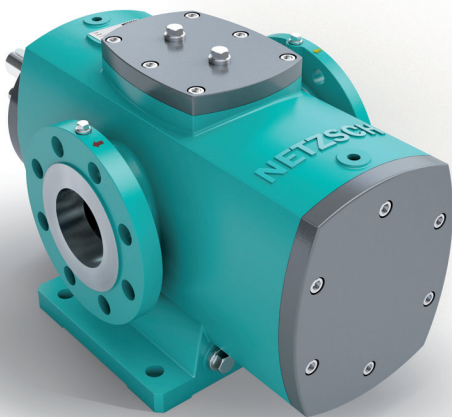
CLEAN FUEL SUPPLY

Three different types of pumps will operate off the English coast: a rotary lobe, a multi screw and a progressing cavity pump. Each model has been developed perfectly for its specific application. The TORNADO T2 T.Proc rotary lobe pump is used to clean the marine diesel oil. "Since maintaining and cleaning all the components at a remote site such as an FPSO is expensive and time-consuming, the fuel used for the power supply is cleaned in a separator," Ulrich explains. This keeps engines and tanks clean and makes sure that the fuel is of a consistently high quality – an approach that has proven to be valuable and that also ensures a longer service life for the engines. The T.Proc



TORNADO T2 T.Proc rotary lobe pump in all-metal design.





NOTOS multi screw pumps, here the 3 NS, are used around the FPSO ship's storage tanks.

SAFETY FOR STORAGE TANKS

NOTOS multi screw pumps are used around the FPSO ship's storage tanks. "Safety is of course the top priority for our customers," says Ulrich. "To prevent even the possibility of an explosive atmosphere developing in the storage tanks for crude oil from the outset, an inert gas is produced from some of the ship's diesel fuel, which is put on top of the oil in the tanks". The 3 NS 3-screw pumps, which convey the diesel used to produce the inert gas, therefore have an essential task, Ulrich explains. "It was particularly important to the customer that the unit requires as little maintenance as possible and has as long a service life as possible". The NOTOS also stands out for its small footprint. Its continuous, almost wear-free pumping technology with almost no pulsation meets the high safety requirements for pumping marine diesel oil – even at high pressures. On the FPSO, the NOTOS units pump 0.9 m³ per hour at 25 bar pressure.

PROTECTION AGAINST ABRASION, CORROSION AND H₂S

Finally, several NEMO progressing cavity pumps are used in a completely different part

of the floating platform. As it is the American Petroleum Institute (API) design, the pump is an extremely robust all-rounder that can be used universally. On the FPSO, the pumps take care of the produced water. "This is not waste water in the traditional sense," Ulrich explains. "This is in fact reservoir water at a temperature of 50 – 60 °C that comes to the surface together with the crude oil". The NEMO units pump about 2 m³ per hour against 15 bar pressure at 240 revolutions per minute. Besides oil droplets, the water contains minute rock particles from the formation deep in the seabed, as well as hydrogen sulphide (H₂S) and chlorides. For the pump, that means a risk of abrasion and corrosion and, in the event of a leak, it can even mean toxic H₂S could be released. The NEMO comes out top again with its unique wear-resistant design, which ensures a long service life even when media is loaded with rock particles.

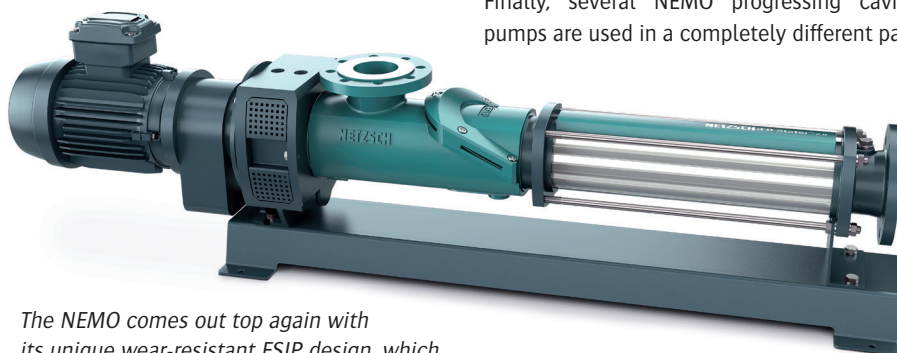
The double mechanical seal is pressurised to reliably prevent H₂S from escaping. "Ultimately, however, what spoke in favour of the NEMO was the fact that its low-shear pumping technology makes it easier to separate the oil and also the sediment," Ulrich adds. The components are separated in later process steps so that the water can be injected back into the formation without negative environmental impact – which is necessary to maintain the pumping pressure.

"When a pump is operated more than 200 kilometres from the mainland, you just cannot have anything going wrong," Ulrich emphasises. He is particularly pleased that three types of pumps from his company are being used on the FPSO. "This is us showing what our entire portfolio can achieve under extreme conditions," says the pump expert.

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rotary lobe pumps in all-metal design deliver 6m³ per hour at 285 revolutions per minute against a pressure of 2.3 bar. The pumped diesel oil has a temperature of about 15°C.

This TORNADO version was not only chosen for its space-saving design. Its low-shear pumping technology prevents emulsification of the water droplets, so they can be separated easily, delivering better results at lower cost and therefore providing greater efficiency for separation. Cartridge seals contribute to ease of maintenance, as does the "Full Service in Place" (FSIP) concept, where all parts in contact with the medium are immediately accessible without dismantling any pipework or the drive.



The NEMO comes out top again with its unique wear-resistant FSIP design, which ensures a long service life even when media is loaded with rock particles.



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How Good Marshalling Design Delivers Better TCO

Smart universal marshalling can minimise costly downtime, simplify operations and deliver better TCO, says Roger Highton, MTL Product Line Manager, Eaton.

Traditional marshalling aims to provide reliable interconnections between field instruments and a central control system. It may include provision for intrinsic safety, signal conditioning, relay interfaces, surge protection and loop disconnect.

While the task seems simple in principle, in reality it is complicated and time-consuming. A typical cabinet will have 20 different marshalling components and may require up to eight interconnections on each loop. That means eight opportunities for a wiring error. A single change will affect design drawings, the Bill of Materials (BOM) and cabinet layout.

Once a system is live, marshalling changes become even more complicated. Failure in a wiring connection has the potential to cause immediate and severe incidents, potentially triggering a plant shutdown costing millions of dollars. Smart Universal Marshalling (SUM) systems – such as Eaton's MTL SUM5 - offer both practical and financial benefits over traditional marshalling while reducing risks – all of which contributes to an improved Total Cost of Ownership (TCO).

SUM APPROACH

1. Standardisation

Smart universal marshalling solves the problem of complexity by reducing the number of components. Traditional marshalling considers each function as a separate entity, whereas SUM allows for the integration of these functions. For example, one MTL SUM5 universal ADIO isolator module can replace 20 different MTL4500 single-channel modules. Standardised modules reduce the number of items on a BOM, so ordering parts and keeping track of design changes becomes



Smart Universal Marshalling offers practical and financial benefits while reducing risks for industrial facilities – all of which contributes to an improved TCO.

easier for purchasing teams. Standardisation comes into its own when design changes occur during detailed engineering. Replacing modules or adding functionality after the conceptual phase adds uncertainty to a project. This can result in overruns and loss of credibility. Using standardised modules allows engineers to make design changes without changing module specifications.

2. Simplicity and compactness

SUM eliminates the need for separate cabinets for each function. A single cabinet design caters for them all. It also eliminates the need for a separate loop disconnect terminal. Each terminal base includes this functionality.

Standardised and modular structures make design changes much easier to handle: for

example, swapping an ADIO isolator for a temperature isolator without any other changes to the loop. Configuration changes can be done at the cabinet via a push-button or a PC. Surge protection modules can also be moved to a different channel or added once surge studies are completed, which often happens later in the design phases. These features greatly reduce installation and configuration time.

SUM solutions are compact and cater for maximum packing density. Two or three columns fit into each side of an 800 mm wide double-sided cabinet providing all marshalling functionality for 512 or 768 channels. More modules per cabinet mean fewer cabinets in total. Eaton calculates that a reduction of 30% to 50% is possible using smart universal marshalling.





3. Flexibility

Modern production facilities must be able to respond quickly to changes in market demand or supply chain disturbances. Flexibility is crucial for sustained business success. Marshalling systems must, therefore, allow changes to configuration without extensive rewiring and delays. An ideal marshalling solution would have connectivity to 5G and Artificial Intelligence (AI) technology and integrates seamlessly with automation systems. Traditional marshalling solutions cannot meet these requirements, but smart marshalling solutions can.

The MTL SUM5 allows for changes to module configuration in the cabinet. There are fewer hardware changes required when new designs or operational changes are needed. The modular infrastructure also makes it easy to add to the system without rewiring. Another way SUM adds value is in the usability of spare capacity. Most marshalling solutions are designed with 20% extra capacity, but industrial plants seldom use the spare capacity loops because of the risks of moving wiring from a ground terminal to a Field Termination Assembly. With SUM, the grounding is accomplished via a plug-in module rather than hard wiring. As a result, removing the ground module and inserting an isolator module makes the extra capacity available without the risk.

REDUCING CAPEX AND OPEX

Eaton has worked with partners to quantify savings in initial costs for SUM, particularly in relation to the reduced cabinet count. An 82% reduction compared to traditional marshalling solutions is possible. SUM makes a substantial contribution to lowering ongoing operational costs,



MTL SUM5's modular design delivers operational cost savings of up to 65% through reduction in spares holding, lower air-conditioning needs and simpler maintenance processes.

too. A 65% reduction in spare component types means a lower stock holding and more efficient procurement process. Maintenance technicians benefit from reduced complexity of standardised cabinet designs, which lowers the risk of human error. Troubleshooting is also simpler. The MTL SUM5 has LEDs to indicate power, function and status so maintenance technicians save time by having the right information available for diagnosing problems. The terminal holds its own configuration information making it easy to swap out modules seamlessly.

Comparisons of operational costs using smart marshalling versus traditional methods indicate a 65% saving is possible.

SPACE SAVINGS

Space is at a premium in centralised control rooms, which are generally built to exceptionally high blast-proof specifications – making them an expensive investment. Reducing the number and size of marshalling cabinets reduces the requirement for space and, therefore, the cost of the building. It also reduc-

es the amount of cabling and air-conditioning required. Even when marshalling cabinets are eliminated by remotely mounting I/O in field enclosures the MTL SUM5 compact standard footprint reduces the size and cost of the enclosure required.

Eaton calculations show a saving of 69% in terms of end-user costs for a smart marshalling project versus the traditional approach. Most of these derive from the reduction in cabinet space.

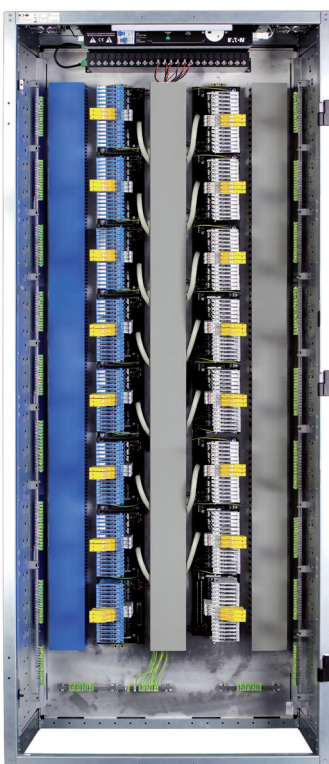
LOWERING RISK

Connection failures and human error are the most common cause of incident for traditional marshalling solutions. SUM lowers the risk of an incident by simplifying the system. All marshalling functions reside in a standard cabinet design, and the quantity and complexity of hard wiring are greatly reduced. These factors reduce the risk of human error, which could result in a major plant incident.

MTL SUM5 meets ATEX, IECEx and North American certification requirements, making it suitable for international use. It is designed for location in Zone 2 hazardous areas and has a wide ambient temperature operating range. SUM is, therefore, a viable solution for even the harshest operating conditions.

CONCLUSION

Smart universal marshalling offers substantial benefits over traditional marshalling. It simplifies the design process as well as system installation and lowers operational and maintenance costs. Eaton's MTL SUM5 offers TCO benefits while enabling the kind of flexibility and connectivity industrial plants need.



The compact design of Eaton's MTL SUM5 means that typically 50% fewer marshalling cabinets are required, lowering initial investment cost by up to 82%.

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Delivering 10 Million Euros of Production Improvements per Year is the Goal

MOL Group and ABB embark on a three-year collaborative project to transform Asset Integrity Management (AIM) across four key chemical and refinery sites in Europe.

ABB has been awarded the contract to improve asset integrity across MOL's downstream assets, through changing mindset, standardizing processes and software and ensuring integrity management is focused on the right equipment. The project spanning MOL DS Production plants in Hungary, Slovakia, and Croatia, will implement standardized asset integrity procedures in a move to drive production efficiency, improve safety and reduce risk.

IMPROVED SAFETY AND RELIABILITY IS THE GOAL

Leveraging technology and process data, ABB together with Metegrity Visions, will integrate a common digital platform at the Danube, Slovnaft, MOL Petrochemicals plants and INA chemical unit. The new solution, with the adoption of improved integrity management processes being rolled out by ABB will pro-

vide advanced risk analysis of assets with a key aim of reducing unplanned outages and lowering maintenance costs. It is estimated that by controlling all its static equipment through the Asset Integrity Management (AIM) procedures, processes and systems, MOL will increase availability and reduce turnaround duration (TAR) leading to savings and production improvements of approximately 10 million euros a year across MOL's downstream assets.

"Asset safety and reliability have the highest priority in MOL Downstream production. To ensure continuous value creation and focusing on the safety of our colleagues and communities around us, we are fully committed to executing and supporting group-level programs such as AIM. We have full trust in the professionalism and expertise of ABB's technical delivery team, as well as on our own

ABOUT MOL GROUP

MOL Group is an integrated, international oil and gas company, headquartered in Budapest, Hungary. It is active in over 40 countries with a dynamic international workforce of 25,000 people and a track record of more than 100 years in the industry. MOL's exploration and production activities are supported by more than 75 years' experience in the hydrocarbon field. At the moment, there are production activities in 9 countries and exploration assets in 14 countries.



Implementing standardized asset integrity procedures can not only drive production efficiency, but improve safety and reduce risk as well.

colleagues' commitment to the successful delivery of the project," said Zsolt Huff, SVP Downstream, Production, MOL Group.

Zied Ouertani, Global Technology Manager for Chemicals & Refining, ABB Energy Industries said: "The adoption of AIM will increase efficiency and transparency, identifying the critical assets and focusing inspection and remediation of risk with respect to safety and production. This will enable MOL to base asset integrity investment decisions on the equipment's current condition, and to make the switch from reactive to proactive maintenance."

The new project builds on a longstanding collaboration between MOL Group and ABB. The ABB team has worked closely with the MOL team over the past two years to develop a business case and ensure it could deliver the right solution.

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Leak-Proof Gaskets



Metal gaskets with 10-year guarantee for gas-tightness

"For any industrial operation where liquids or gases are transported through pipe infrastructure, fugitive emissions are an acute problem. They can lead to serious environmental, personal and economic harm, damaging reputations and severely impacting on productivity and profitability. At Pipeotech we view any leak as unacceptable... and we believe facility owners and operators should have the opportunity to do the same. With DeltaV-Seal we have the technology to deliver complete, long-term pipeline integrity," explains Pipeotech CEO Henrik Sollie.

DeltaV-Seal launched in 2015 and has gone on to prove its efficacy in sectors ranging from oil and gas, to chemical processing, maritime, pharmaceuticals, and food and drink production. The secret of its success lies in its design as a CNC-manufactured one-piece metal gasket featuring sharp sealing 'rings' that deform upon installation to form a perfect fit with flanges. Its construction from the same metal as the flanges it mates with ensures a permanent seal that is gas tight, fire and blow out safe, capable of withstanding any temperature (both high and cryo-

genic), and one that will not disintegrate over the long-term. Furthermore, it never needs re-tightening, ensuring less pipeline maintenance and complete peace of mind. The DeltaV-Seal is type approved by DNV GL and trusted by a range of market leading industrial players, including VARD, Avista Oil, GE Healthcare, Quantafuel and Primagas. Pipeotech's 10-year guarantee covers all gaskets made in the materials, size and pressure classes covered by DNV GL certification.

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ANALYZER FOR NATURAL GAS QUALITY

Portable tester for hydrocarbon and water dew-point



The **Michell Instruments** CDP301 hydrocarbon and water dew-point tester is a fully portable, manual-visual dew-point instrument that uses chilled mirror technique for highly accurate and reliable measurements of both hydrocarbon and water dew point. It is ATEX, IECEx and cQPSus compliant for use in a Zone 1 or 2 Hazardous Area and Class I, Div 1 Hazardous Locations, allowing it to be positioned close to the process sample test point. It is fully portable, simple to set up and, as it is fully self-contained, there is no need to use a separate coolant gas. Unlike older visual-manual dew-point testers, which rely on the operator making observations through a microscope, the CDP301 includes a full-colour interface which shows a magnified view of the mirror surface. It is this optimised display - together with specific illumination techniques - that makes it possible to measure either water or hydrocarbon dew point and log the results. Visible red-spectrum laser light clearly illuminates fine water droplets and ice crystals when targeting water dew point. Broader spectrum white light enables the iridescent film synonymous with HC condensate to be detected with a high sensitivity of up to 5mg/Nm³.

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'FOUR-IN-ONE' COMPACT FLOW METER

Cost-effective installation with built-in redundancy



Emerson has introduced the Rosemount™ 8800 Quad Vortex flow meter specifically designed to meet stringent safety standards in environments and applications that require safety instrumented systems (SIS). The flow meter is the industry's first with quadruple sensors and transmitters to meet safety integrity level (SIL) requirements. Comprised of multiple independent sensors in an all-weld-

ed meter body, the meter provides a compact flow solution with built-in redundancies for added safety without introducing intentional leak points. The meter reduces piping needs threefold compared with the usual settings. It has the ability to meet measurement challenges in industries such as chemical, power, refining, and offshore oil and gas applications. The 8800 Quad Vortex accomplishes the same task as four separate meters, without needing impulse lines that might clog. The design and configuration allows for a SIL 3-capable solution and protects against spurious trips using a two out of three (2oo3) voting method. The 2oo3 voting method ensures that at least two of the sensors must read 'good' for a process to continue, which means one poor reading does not trip a complete process shutdown.

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Restoring Power at the Height of the Pandemic

When vandals damaged the CHP control panels at EDL's Wellingborough landfill site, rendering the engines unusable, the timing could not have been worse. One week before Easter 2020, the coronavirus pandemic was sweeping the UK and the country had just been placed into an unprecedented nationwide lockdown. Site managers anticipated a significant period of downtime but thanks to a swift response from gas engine support specialist Gen-C, the upgraded engines were back up and running within just two weeks.

Based in Wellingborough, Northamptonshire, the EDL landfill gas site generates 1.5 MW of power per hour, enough for 1,500 homes. It is a crucial power distribution site for the local area, so site engineers were dismayed to discover that vandals had broken in over the weekend before Easter and smashed the CHP control panels, placing the engines out of action.

PANDEMIC PRESSURE

"At the time, the country was in a state of national emergency, with the coronavirus lockdown having only just come into force," says Paul Newman of Newman Electrical Services, main mechanical contractor for EDL Midlands.

Even in normal times, getting the two Jenbacher 320 1 MW engines back up and run-

ning would have been a challenge as the damaged control systems were no longer available on the market, so fixing or replacing them was not possible. However, the added factor of a global pandemic affecting the supply chain and resulting in millions of workers being furloughed made the situation even trickier.

Despite these concerns, Lee Heath, EDL's Operations Manager, called Gen-C's Managing Director James Thompson at 10am on the day the damage was discovered to see whether there was anything he could do. "I had dealt with Gen-C for a number of years and had always been impressed by their level of customer service," states Lee. "However, the speed of their response on this occasion was astounding. Sean Kennedy, Gen-C's Head of Sales, was on site by 1pm to assess



EDL's Wellingborough site



"Vandalised control panel and new Motortech panel after replacement."



the damage and had quoted to replace the panels by the end of the working day."

James explains: "We could see the predicament that EDL were facing and knew how important it was to get their engines back up and running as quickly as possible. As power supply specialists, we are classed as key workers, so we were able to get on site within hours to assess the situation. We recommended upgrading their vandalised panels to the far superior Motortech open access control panels, which are based on the popular ComAp technology, along with Motortech ignition and knocking control systems. However, as this was an unplanned upgrade, it was especially important to keep costs down, so we made sure the new equipment could interface with the engines' ex-





isting Jenbacher parts, including the mixer, throttle and auxiliary components.”

ESTABLISHING SOCIAL DISTANCE

Happy with Gen-C’s quote, and the speed of response, EDL instructed them to begin work as soon as possible. But with lockdown measures and social distancing guidelines now imposed, this was to be an installation unlike any other. “In a week when most of our competitors were closing premises and furloughing staff, we were figuring out how to complete the project while minimising the chance of our employees, and EDL’s, catching COVID-19,” says James. “Firstly, with hotels being closed, I rented an oversized house in the local area for our engineers to stay in. It was big enough to zone off separate bedroom, living and bathroom areas for each person in order to minimise social interaction. I then assessed the site and identified clear working zones for each staff member, to reduce the risk of exposure.”

With the health and safety of personnel now assured, it was also important to ensure that the supply chain had not been affected by the pandemic. “Fortunately, we have the capacity to store a lot of parts at our Sheffield headquarters and every item required for the EDL project was in stock. This meant we could begin work asap – in fact, we started the project just three days after I received the initial call from Lee.”

SUPERIOR ENGINE PERFORMANCE

The installation took place without a hitch – the first engine upgrade was completed within two weeks, despite the Easter bank holiday weekend and restrictive COVID-19 working conditions, while the second took just eight



The vandalised control screen and the Motortech replacement with touchscreen.

days. Gen-C’s engineers removed the vandalised control panels and replaced them with Motortech’s advanced gas engine technology. Not only does this ensure improved reliability for the engines, it also enables site managers to dial in remotely at any time via phone or tablet to see instantly how the engines are performing, receive an alert whenever there is a fault, diagnose the fault, rectify it and even remotely restart the engines. Gen-C also upgraded the engines’ ignition and knocking control systems with the latest Motortech technology.

“The difference in performance is like night and day,” confirms Paul Newman. “The engines run much more smoothly and reliably, and the fact that we can monitor and restart them remotely has proved invaluable; espe-

cially as fewer personnel have been able to be on site in recent months.”

With both engines running well, Paul and Lee are full of praise for Gen-C’s support during a difficult and unprecedented time: “Gen-C’s speed of response was fantastic, but more than that, their professionalism and knowledge ensured a difficult situation had a positive outcome for us. Their ability to keep costs down was also impressive. Gen-C quoted us a figure on the day we contacted them and stuck to that price throughout the project; even when unexpected parts needed to be fitted. There were no surprises for us in either cost, performance or service. Gen-C delivered exactly what they promised, on time and on budget.”

►► 59605 at www.pcne.eu



Maximising Energy Savings

Introduction of systems approach helps optimising operation of pumps

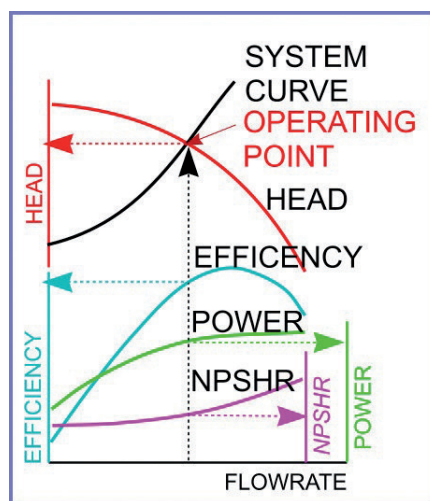
Various countries around the world have taken different approaches towards energy usage and possible energy reduction. Across Europe, the Commission has concentrated on components within the Energy Related Products Directive (ErP).

The ErP focuses heavily on the efficiency of the products and the Commission has already implemented legislation to ensure that products with low efficiency are gradually phased-out across Europe. A significant step in the right direction for sure, although new 'energy efficient' components may still be required to operate within an inefficient system, impacting hugely on any possible efficiency gains.

To evaluate the energy efficiency of a pumping system takes time, knowledge, and the will by both the pump system energy auditor and the pump's operator (customer) to make a determined change. But the rewards are most definitely worth the effort. The potential energy savings throughout Europe are estimated at being between 40-50 TWh if the necessary changes to inefficient pumping systems are made.

THE SYSTEMS APPROACH

First let us define what we mean by a system. A pumping system is defined as one or more pumps and those interacting or interrelating elements that together accomplish the desired task of moving a liquid. A pumping system generally includes pump(s), driver, drives, distribution piping, valves, controls, instrumentation, and end use equipment such as heat exchangers. Using the 'systems approach' involves comparing the need or demand to the supply. It is important to understand how the different components in a system interact and influence each other. A change to one com-



Pump system interaction curve

ponent might improve or negatively impact other components.

An example of this is replacing an old inefficient motor that is employed to drive a pump, with a modern high efficiency motor. The newer high efficiency motor will have less slip and will run faster than the old motor. When the pump is running faster, it will consume more energy and this increase in energy usage can be larger than the savings produced by the more efficient motor.

To reap optimum savings from the change, the pump impeller might have to be trimmed.

A system approach starts with defining the 'ultimate goal' of the system. This includes determining the flow rates that the system must be able to deliver, whether there are flow variations and what kind of control is necessary. These requirements will influence the choice of piping size, control methods, pump size, motor size and so on.

Figure 1 uses the pump and system performance curves to determine pump operating conditions and to evaluate methods of flow control.

To determine the efficiency of a system, the minimum energy to fulfill the process demand is compared to the actual energy used. Figure 2 illustrates the difference between looking at components and looking at systems. The diagram shows a remarkably simple system pumping a liquid from one tank to another.

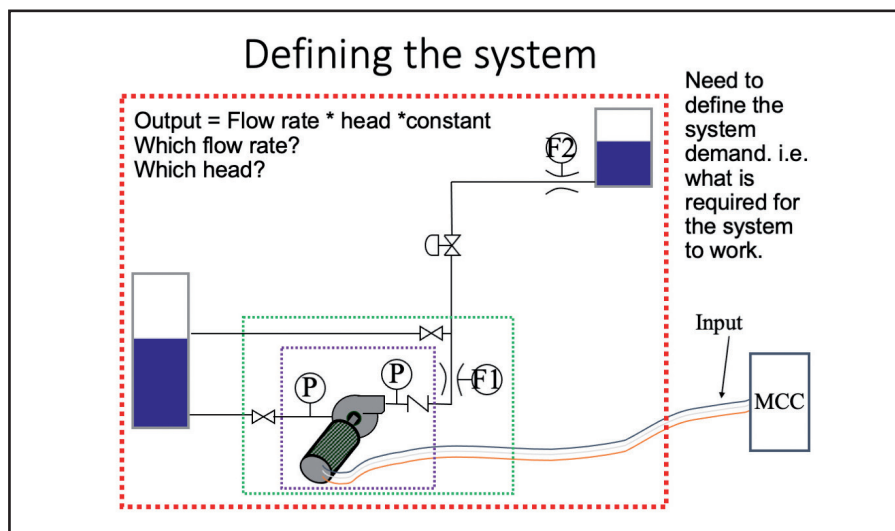
When looking on a component perspective we compare the input power to the motor from the MCC to the liquid output from the purple square around the motor and the pump. This analysis could indeed yield an excellent result. If we broaden the view a bit, we can see a re-circulating line going back to the first tank. The flow rate coming out of the purple square in is hence smaller than in green square.

ABOUT EUROPUMP

Europump is the European Association of Pump Manufacturers and was established in 1960. It represents 17 National Associations in 14 EU Member States, Turkey, Russia & Switzerland. Europump members represent more than 450 companies with a collective production value of more than €10 Billion and an employee base of some 100,000 people across Europe.



Defining the system



Efficiency of a pump measured on a component basis (purple box) based the ratio between input and output indicated by the purple box. The system view includes a recirculation line as shown by the green box. Looking at the complete pumping system using a total system approach is illustrated by the red box

national standard ISO 14414 – Pump System Energy Assessment.

CONCLUSION

There are many exciting energy use improvement programs being developed around the world, but in Europe we have the Energy Efficiency Directive which mandates energy audits in Systems. For the electrical energy savings identified in pumping systems to be fully achieved, there needs to be a far stronger emphasis on the 'systems approach' and a commitment to make this happen from both the pump industry and its final end users – those that will ultimately benefit from lower energy bills.

►► 59211 at www.pcne.eu

The power input is however the same. Finally, we take a complete system view and include the losses in the recirculation line as well as the losses in the regulating valve on the line to the second tank. What might have looked as a reasonably good system on the components in the purple square can be viewed as an extremely low efficiency system

when looked at using the systems approach illustrated by the red outline.

To do this we need to define the system demand, i.e. the minimum pressure, flow rate and subsequent energy for the pumping system to work. To understand the knowledge and tools required to assess the system, industry spent many years developing the inter-

IOT MONITORING SENSOR

Robust IoT system to monitor pump and sealing systems



Chesterton introduces the Chesterton Connect™. It is an easy-to-install Acquisition System associated with an Application which allows the user to increase the reliability of rotating equipment. Chesterton Connect records data 24/7 with a rolling history of 30 days. Four sensors allow the user to safely monitor his equipment, both directly in the process, thanks to the pressure/temperature sensors installed on the mechanical seal, and at the

equipment, thanks to the vibrations/temperature sensors integrated into its housing. It combines 4 sensors in a unique device which transmits via Bluetooth to a mobile application (installed on a tablet or mobile phone). All data collected by the application can be easily exported for analysis, to help the user understanding the operation of the equipment, and thus take preventive measures to extend the MTBR (mean time between repairs). Thanks to the application (downloadable for free from the Apple Store or Google Play Store) the user can set the thresholds for the different measurements. A large in-unit's multicolored LED display system alerts the user in case of measures exceeding limits.

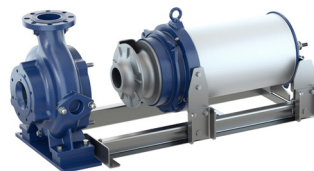
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FREE DIGITAL SUBSCRIPTION

EASY-TO-MAINTAIN WASTE WATER PUMPS

For high ambient temperatures up to 55 °C



The new pump sets from **KSB** are available with drive ratings of 10-30 kW and are suitable for vertical or horizontal dry installation. Since the pump motors remain fully operational

when not submerged, the pump sets can also be used in pump sumps when water levels have dropped. Thanks to IP 68 enclosures, the pumps also offer trouble-free continuous operation when flooded. The pump sets meet all explosion protection requirements set out in the ATEX, FM and CSA standards. The motor is cooled via a closed circuit which avoids contact between the circulating water-glycol mixture and the fluid handled. This also rules out any risk of contaminants in the fluid handled impairing the cooling of the motor. The cooling liquid is circulated by a special impeller which the pump's design engineers have integrated into the cartridge seal. The pumps are able to transport fluids with a temperature of up to 40 °C and operate in environments with a temperature of up to 55 °C. This enables the pumps to be used in hot countries where they are often dry-installed in air-conditioned rooms. The sensor package installed as standard includes monitoring of the motor temperature via a PTC chain, a leakage sensor inside the motor and monitoring of the mechanical seal leakage via a float switch.

►► 59628 at www.pcne.eu

Keeping Wastewater Arteries Clear

Evolving pump impeller technology helps wastewater companies in the ongoing battle against blockages.

Pump blockage is a growing and costly issue for wastewater companies. Choosing a pump designed specifically to meet the challenges of frontline operation in sewage networks can dramatically cut downtime and minimize asset lifetime costs.

Water rates affect everyone and they are largely dictated by the costs of extracting, treating and cleaning water as it travels through the water cycle. Therefore, any savings that can be made in efficiency and operating costs can have a beneficial effect on the bottom line for utilities, which should be reflected in customers' bills.

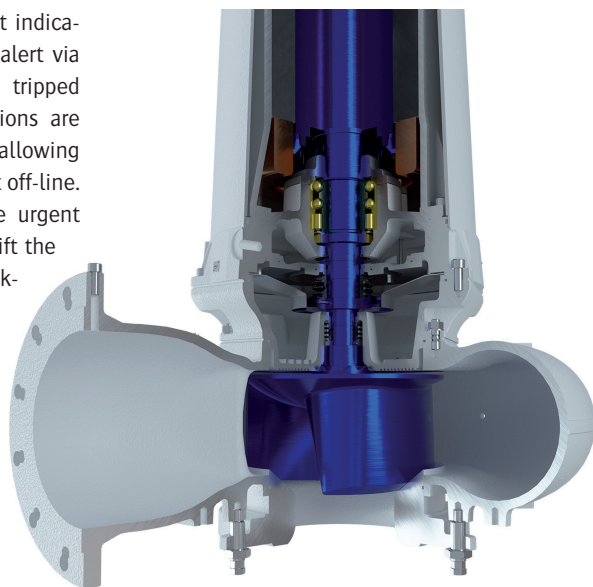
Solids removal is the first process at any municipal wastewater treatment facility. The screens installed at the inlet of the treatment works capture large quantities of material, mainly composed of wipes, sanitary items and – in combined sewage and stormwater management systems – litter from the streets. One terminal pumping station in Spain, for example, collects around 1.6 m³ of fibrous materials, equivalent to approximately 200.000 wet wipes, from the 28.000 m³ of wastewater it pumps every week.

MEETING THE CHALLENGE FOR PUMPING STATIONS

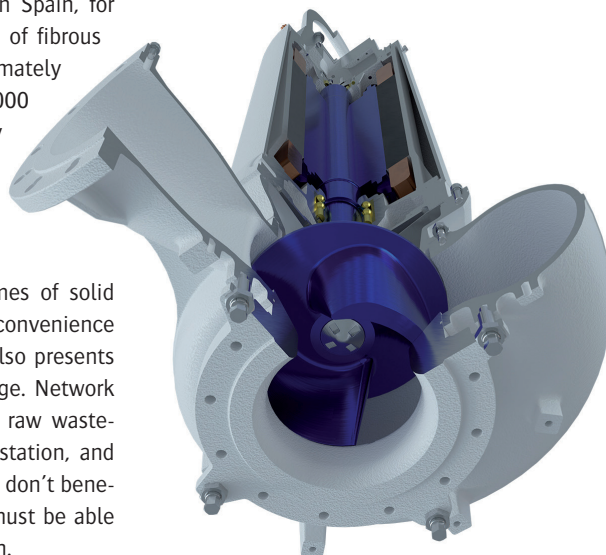
The need to process high volumes of solid material is not only a costly inconvenience for wastewater companies, but also presents a significant operational challenge. Network pumping stations, which deliver raw wastewater to the terminal pumping station, and from there to treatment facilities, don't benefit from protective screens and must be able to handle the solid content within.

If a pump becomes blocked, the first indication operators receive is usually an alert via their telemetry system indicating a tripped motor protection switch. Most stations are equipped with two or three pumps, allowing them to keep operating with one unit off-line. However, a failure still requires the urgent dispatch of a maintenance team to lift the affected pump and clear the blockage before reinstalling and testing the pump. This would require two technicians travelling to the site and working for approximately two hours. Repeated occurrences across the network can significantly increase maintenance costs for the utility company.

To address the problem of blockages in network and terminal pumping stations, leading original equipment manu-



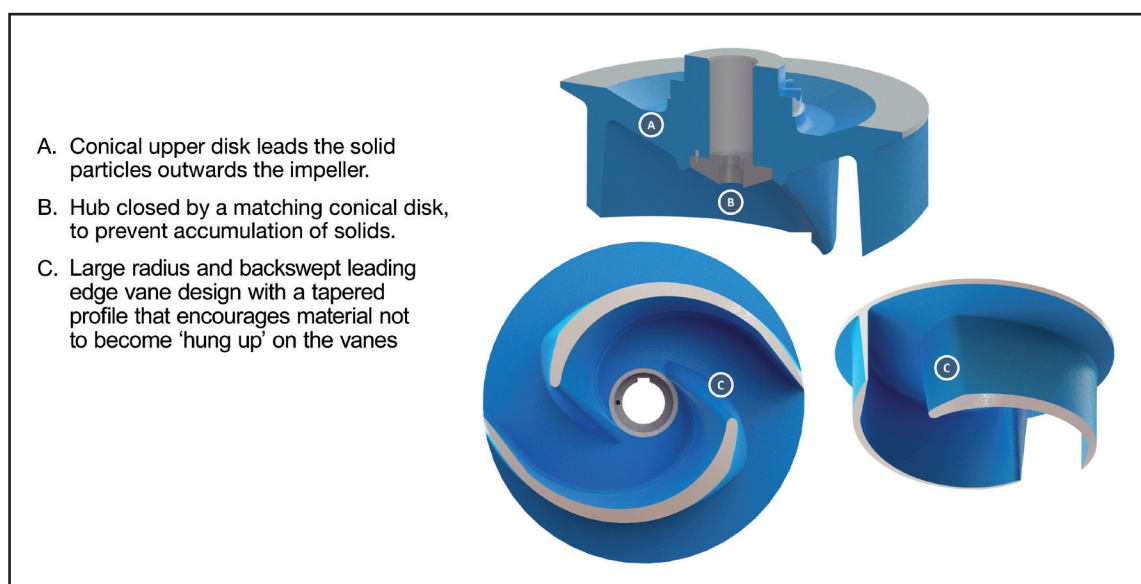
Sulzer's CB Plus range of pumps has been specifically designed for network pumping stations.



facturers (OEMs) have optimized the design of the impellers. In Sulzer's case, the introduction of the ContraBlock (CB) Plus impeller has delivered a considerable improvement in performance. This design can dramatically improve both the blockage resistance and the ability to maintain efficiency throughout the lifetime of the pump. The design has proven to handle sewage containing wipes, solids and fibrous material, with throughlet size diameter of 75 mm for smaller

Throughlet size diameters ensure optimum performance.





The CB Plus impeller design optimizes reliability and efficiency.

pumps or 100 mm for larger units of DN100 and above, according to various standards associated with wastewater management.

OPTIMIZED IMPELLER DESIGN

In 2009, Sulzer started introducing the first one-channel Contrablock Plus (CB Plus) impeller and in 2013 the first two-channel CB Plus impeller. Since then, the range keeps expanding.

The design uses a large radius and backswept leading edge vane with a tapered profile that encourages material not to become 'hung up' on the vanes, instead directing it to slide off into the downstream flow. Any remaining fibrous material that does catch on the impeller vanes will slide down the inclined leading edge profile and be sliced clear when it comes into contact with the plate below the impeller. At the same time, a conical upper disk moves solid material outwards as the impeller spins. A conical hub cover with a matching profile pre-

vents material from becoming trapped at the impeller-shaft interface. The geometry of the impeller ensures that the overwhelming majority of solids will pass straight through the pump. Special interrupted slots in the bottom plate maximize the disintegration of material without compromising hydraulic efficiency.

Any impeller operating in demanding wastewater conditions will eventually be subject to wear, leading to an efficiency reduction of approximately 2% after 2.000 hours of operation (one to two years of use in most pumping stations). Ideally, wastewater pumps should incorporate wear compensation features, such as wear rings, into their design that allow adjustment back to optimum efficiency.

In the case of the CB Plus, the bottom plate uses a precisely machined conical design that allows the gap between the plate and the impeller to be set at the optimal spacing for overall pump performance. Routine on-site

maintenance can include a simple manual adjustment that allows the optimum gap to be re-established, bringing pump efficiency back to the as-new condition. In contrast, the replacement of a wear ring cannot be achieved on site and will require the pump to be repaired in a local workshop.

Network and terminal pumping stations are the front line of every large-scale wastewater treatment system. Operators need to ensure that their systems can provide continual availability and high levels of reliability without excessive energy consumption and in turn minimize increases in rates for customers. Working with an experienced OEM to select the right pump design for each part of the network can make a significant difference to all those parameters, leading to big savings over the lifetime of the assets.

►► 59601 at www.pcne.eu



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N° 11 - NOVEMBER 2020

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COST-EFFECTIVE ROTARY LOBE PUMPS

Reliable pumps for gentle product treatment



To meet the requirements of lower flow rates and higher production capacities, the addition of the **Alfa Laval OptiLobe 10 and OptiLobe 50** adds 4 new pump sizes to the product range. These new pumps will also provide the possibility of having heating/cooling front covers for processes, where products tend to harden at low

temperatures. High precision rotors and low-shear operation ensure gentle handling of delicate products. With full cleanability, the OptiLobe also complies with the world's leading hygienic standards. Seal faces have direct contact with high-velocity product media. This ensures a fast and secure Cleaning-in-Place (CIP) process, reducing both cleaning time and contamination risk. Engineered for use within the food, dairy, beverage and home-personal care industries, these positive displacement pumps conform to CE directives and EHEDG, 3-A and FDA hygienic standards. The pumps are engineered with a wide performance envelope, due to an advanced rotor shape design and a rotor case that incorporates cusps. In addition to maximizing pump efficiency, these designs feature reduced pulsation and noise emissions. The pumps are also reducing the possibility of product damage by internal product recirculation.

►► 59559 at www.pcne.eu

ULTRASONIC FLOW AND ENERGY METER

Transit time meter provides cost-effective solution



Badger Meter's TFX-5000 ultrasonic clamp-on flow and energy meters are a versatile solution for measuring volumetric flow and heating/cooling rates in clean liquids as well as those with small amounts of suspended solids or aeration, such as surface

water or raw sewage. Typical applications include water mains, reclaimed water, lift stations and booster pump stations in water and wastewater; the energy transfer of chilled water (cooling) and glycol/hot water (heating) in HVAC; and produced water in oil and gas. The meter is intended for users seeking an accurate, reliable and affordable transit time metering device. The unit is available in a variety of configurations and can be selected with features suitable to meet particular application requirements. The TFX-5000 meter can be employed for a host of data logging tasks. Users can select up to eight parameters to log, including flow rate and total, signal strength, and alarms with a time/date stamp to an 8 GB microSD card. Users are alerted to out-of-specification flow conditions and can access a history with the most recent alarm, error and event codes. The TFX-5000 meter features a large, easy-to-read graphical display and provides Modbus RTU, Modbus TCP/IP, BACnet MS/TP, and BACnet/IP connectivity.

►► 59610 at www.pcne.eu

HYGIENIC ROTARY VALVE ACTUATOR

For retrofitting of ball and butterfly valves



The Type 2053 launch opens the hygienic actuator market for **Bürkert**, which will supply OEMs and end users primarily for food & beverage applications, including dairies, breweries and distilleries. Manufactured from Type 304 stainless steel, the actuator will also be presented to the pharmaceutical and water treatment sectors

as well as applications demanding hygiene and frequent wash-down. Available in sizes P0, P1 and P2, the actuator is compatible with any variety of ball or butterfly rotary valve. The actuator can be specified with a Bürkert Element control head from the on/off Type 8691 to the modulating process control of the Type 8693, enabling the Type 2053 actuator to be used as any part of a decentralised automation solution. Control capability is also provided within a compact package, enabling OEMs to reduce space requirements. Communication takes place over Bürkert Systembus (büS), based on the CANopen protocol, with support for PROFINET, PROFINet, Ethernet and Modbus/TCP. The Element control head interface is common to Bürkert's linear valves, reducing cost and time in stocking and procurement for existing Bürkert valve users upgrading to the new Type 2053 actuator. As the Type 2053 actuator uses the ISO 5211-compliant standard interface for valve mounting, it can also be retrofitted to virtually any brand of valve.

►► 59516 at www.pcne.eu

COMPACT AND ERGONOMIC VACUUM PUMPS

Smart solutions for research and laboratory applications



Leybold expands its ECODRY plus product family of dry multi-stage Roots vacuum pumps for laboratory, research and development and analytical applications. The current ECODRY 40 and 65 plus models

are now joined by the new, smaller pump sizes ECODRY 25 and 35 plus. Leybold thus completes its range of quiet, low-maintenance and economical fore-vacuum pumps. A characteristic of ECODRY plus, which is particularly important in research facilities and in analytical laboratories, is its low noise level of 52 dB(A). The new ECODRY 25 and 35 plus also have a particularly compact design. Thanks to technical optimizations, the vacuum pumps are smaller and more energy efficient. The pumps emit neither oil vapor nor particles. This is particularly important in research institutes and laboratories where a clean working environment is essential. The oil-free multi-stage Roots pumps ECODRY 25 and 35 plus also have a maintenance interval of five years, during which time they run without any servicing. No oil to check and change so users can devote themselves fully to their work. While the bigger versions are still available in the two voltage variants 200-240 Volt for Europe and Asia and 120 Volt for North America, there is only one variant required for each of the new ECODRY 25 and 35 plus worldwide.

►► 59623 at www.pcne.eu



FLOWMETER FOR CLEAN APPLICATIONS

Ultrasonic measurement for high accuracy in low ranges



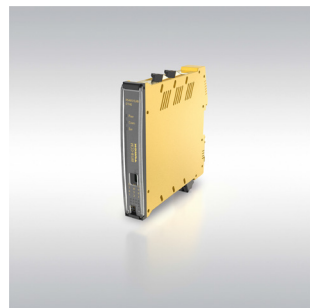
The Metraflow ultrasonic flowmeter from **Titan Enterprises** offers an ideal solution applications requiring a high degree of cleanliness such as are found in the pharmaceutical, medical, semiconductor and ultra-pure water markets. Typically production processes in these markets require flow measurement devices able to cope with low

flow rates and construction from ultra-pure materials so as to maintain hygienic, sterile and sanitary conditions. The single clean bore measurement tube construction of the ultrasonic flowmeter makes it ideal for almost any application where cleanliness is important. Made from high performance Perfluoroalkoxy Alkane (PFA) polymer, the flowmeter offers wide chemical resistance and the ability to precisely monitor process flow temperatures up to 60 °C (140 °F) and pressures up to 28 bar (406 psi). Using patented ultrasonic technology, with a single unbroken measurement tube, the Metraflow is a non-invasive device with excellent accuracy (calibrated to +/- 1.0% reading) and repeatability across flow ranges from 20 to 5000 ml/min. The compact integrated electronic, display and sensor package offers superior performance in a single assembly.

►► 59563 at www.pcne.eu

CONTROL CABINET GUARD

Bringing environment variables to higher-level systems



Turck is expanding its series of cabinet guards with the addition of the IM18-CCM. The integrated sensors of the narrow 18 mm device monitor temperature, air humidity and door distance, in order to send this information via Ethernet to higher-level IT systems. External devices such as vibration sensors for monitoring

states can also be integrated via Modbus RTU and CAN. The IM18-CCM is particularly suitable for OEMs wishing to provide basic condition monitoring values in their IT system. It detects critical states of the control cabinet directly in the field. Creeping changes or systemic problems can also be detected through long-term evaluations. The IM18-CCM thus bridges the gap between the OT and IT world and enables users to analyze the data material from the factory level directly from their office desk. The Linux platform of the IM18-CCM also allows installation of any customized condition monitoring software. In this way, measured values can be pre-processed and prepared on the device for the specific requirements of the application. The IM18-CCM is the third model in Turck's cabinet guard series. The two 12mm devices IM12-CCM and IMX12-CCM come with an onboard condition monitoring software for monitoring limit states and long term data series.

►► 59618 at www.pcne.eu



FREE DIGITAL SUBSCRIPTION

LOOP-POWERED ISOLATOR WITH LCD-DISPLAY

Digital panel meters certified for use in hazardous areas



The new addition to **Acromag's** Vertu brand of instrumentation is the VPM2000 Series of loop-powered display meters with process current output and alarm capabilities. These instruments supplement the digital indicator functions of a

panel meter with optional 4-20mA isolator output and/or alarm trip solid-state relays. A dual-line LCD display has large 0.7 inch digits, an optional bargraph, and a backlight for clear visibility in bright sunlight or dim lighting. The backlight glows red and flashes under alarm conditions. No separate power supply is required for easy installation almost anywhere. They are even UL/cUL approved for use in hazardous locations requiring intrinsically safe, non-incendive devices. The VPM2000 displays are simple to set up and install. USB connection to a PC makes setup fast and easy with the free configuration software which can save the file for copying to other units. Front-panel pushbuttons can also set operating parameters and serve as function keys to change the display or acknowledge alarms. A shallow-depth 1/8 DIN enclosure with a NEMA 4X IP65 front panel facilitates mounting. Internal PCBs are conformal coated for protection from the elements while a -40 to 75°C operating range enables use in extreme environments. Two open collector outputs and a digital input are standard.

►► 59485 at www.pcne.eu

HIGH FLOW GAS PRESSURE REGULATORS

High-Accuracy and Robust Design for Oil and Gas



ControlAir announced the introduction of the Type 1227 and Type 1230 High Flow Gas Pressure Regulators. They are direct-operated, pressure-reducing regulators suitable for use with compressed air, natural gas, or an assortment of other inert gases. These gas pressure regulators help maintain consistent inlet pressure to downstream equipment, allowing for the accurate control of distribution system pressures.

The Type 1227 is available with outlet ranges that span from 5 psi up to 150 psi and can be ordered with a variety of orifice sizes and materials providing application flexibility in the oil and gas industries. The Type 1230 Pressure Regulator utilizes a similar design to the Type 1227 but provides a much broader offering of output pressure ranges and valve disk materials. The Type 1230 is available with output pressures that span from 50 psi to 500 psi making it suitable for use across a vast range of industries and applications, especially those utilizing regulators in series for controlled pressure reduction across multiple stages. The Type 1227 and Type 1230 High Flow Gas Pressure Regulators are typically used in low and high pressure systems.

►► 59619 at www.pcne.eu

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