IPCO’s heat exchanger plugs seal leaking tubes safer and quicker
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Dear readers

A new year has started and this naturally means the start of a new series of Managing Aging Plants magazine. Six magazines packed with loads of informational – and hopefully also entertaining – articles are ahead of you, for you to enjoy reading, take with you whilst traveling, and of course discuss with colleagues.

You are currently looking at the first issue of 2018, in which we focus with the Cover Story on IPCO B.V., a Dutch manufacturer of tube plugs that is already well known in the Benelux (Belgium, Netherlands, Luxemburg), and is conquering the rest of Europe as well.

Further in this edition – in addition to articles that focus on Maintenance, Safety and Materials – you will find not just one, but two end-user interviews. David Sears travelled to Finland to catch up with Mrs. Sari Musch, Material and Inspection Specialist at the Neste refinery in Porvoo. And Candace Allison and Sarah Bradley spoke with Mr. John Backus, Nuclear Training Instructor with the Arizona Public Service Company.

Looking ahead

To already give you a sneak preview, in the March/April edition you can read an in-depth article provided by Senseye, about preventative vs. predictive maintenance and the role of Industry 4.0 in this respect. Further, our Editor Deirdre Morgan had the pleasure of speaking with Larry Wilkerson, who is Supervisor of Air Fugitives at the Golden Eagle Refinery in Contra Costa County, California. You can read what they talked about in the End-User Interview Deirdre is currently writing up.

In addition, for the next issue of the magazine, we especially welcome articles that focus on managing aging plants in Japan, as this edition will also be distributed at the Managing Aging Plants Japan Conference & Expo that will again be held in Tokyo, Japan, in June of this year. As always, I encourage you to get in contact when you wish to contribute a (technical) article, case study, news item, research results, or column, as well as in the case you would like to pitch an idea for other content, such as a blog post for the Managing Aging Plants website (www.managingagingplants.com).

I look forward to hearing from you!

Best regards,

Jolanda Heunen
Editor Print & Online
j.heunen@kci-world.com
Upcoming Events

15 – 19 April 2018
Corrosion 2018
This comprehensive conference is packed with technical education and knowledge exchange plus opportunities to connect with industry experts and peers focused on the prevention and mitigation of corrosion worldwide.
Location: Phoenix, AZ, United States
www.nacecorrosion.org

16 – 20 April 2018
Tube & Wire 2018
The Tube and Wire trade shows, which are run in parallel in Düsseldorf, Germany, bring together a large number of exhibitors from around the world.
Location: Düsseldorf, Germany
www.tube-tradefair.com

23 – 27 April 2018
IAMD
IAMD at the Hannover Messe in Germany is the trade fair for factory and process automation, systems solutions, industrial IT, power transmission and control. Main exhibit sectors include robotics, mechanical engineering, signal devices, software solutions, wireless automation, M2M communication, industrial communication, and plant engineering.
Location: Hannover, Germany
www.hannovermesse.de

07 – 08 June 2018
MAP Japan 2018
Managing Aging Plants (MAP) Japan will be held for the second time in Tokyo, Japan in the spring of 2018. The Conference & Expo that are organised at the National Museum of Emerging Science & Innovation provide the perfect platform for sharing knowledge and experience regarding the practical aspects of managing aging plants in Japan.
Location: Tokyo, Japan
www.plantenmei.com

11 – 15 June 2018
ACHEMA
ACHEMA is the world forum for chemical engineering and the process industry, held every three years in Frankfurt, Germany.

Topics that are addressed at ACHEMA 2018 include flexible production, chemical- & pharma logistics, materials and material processing, mixing and separation technology, and biotech for chemistry.
Location: Frankfurt, Germany
www.achema.de/en

19 – 22 June 2018
AUTOMATICA 2018
This event for smart automation and robotics features a large range of assembly systems, machine vision systems, components, and of course robotics. The event focuses on future-proof solutions for manufacturing high-quality products as well as digital transformation in manufacturing, human-robot collaboration, industry 4.0 and service robotics.
Location: Munich, Germany
www.automatica-munich.com

17 – 20 September 2018
GASTECH 2018
The Gastech Exhibition & Conference forms a meeting place for the global gas, LNG, and energy industries. Upstream, midstream, and downstream gas and LNG professionals from around the globe gather in Barcelona, Spain to do business. Gastech hosts major NOCs, IOCs, integrated energy companies, service companies, global utilities, EPC contractors, shipbuilders, pipeline companies, manufacturers and technology providers, who all play an active role in the global energy value chain.
Location: Barcelona, Spain
www.gastechevent.com

19 – 20 September 2018
MAP China
In September 2018, the inaugural Managing Aging Plants (MAP) China will be held in conjunction with Fugitive Emissions China 2018. At the Shanghai International Convention Center various topics will be addressed both at the conference and the expo, such as materials & corrosion, turnaround management, asset reliability, and future solutions.
Location: Shanghai, China
www.managingagingplants.com
Cover story

IPCO
By Jolanda Heunen
IPCO B.V. is a Dutch company that specializes in pipeline equipment. Based in Dordrecht, The Netherlands, where they manufacture their IPCO plugs which are then distributed to companies in the Benelux and more and more companies in the rest of Europe as well.

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Pöyry secures engineer services assignment from Sdn Bhd

Southern Power Generation Sdn Bhd has awarded Pöyry with an owner’s engineer services assignment for a 1,440 MW combined cycle power plant in Johor, Malaysia. Southern Power Generation is a project company established for this independent power producer project and owned by Malaysian state-owned power utility Tenaga Nasional Berhad (TNB) and SIPP Energy Sdn Bhd.

The project consists of two 720 MW natural gas-fired combined cycle blocks, with distillate as backup fuel. The project also includes new 275/132 kV air insulated substation and new 132 kV gas insulated substation. The plant will be located adjacent to the existing Sultan Iskandar Power Station at Pasir Gudang, Johor.

Pöyry’s assignment includes assistance in project management, design review, site supervision services, quality assurance and quality control, commissioning supervision services and services during warranty period. Pöyry is assisted in the assignment by its local partner, Minconsult Sdn Bhd. The overall schedule for Pöyry’s services is about four years.

STUK approves SGS Fimko Ltd to act as AIO

The Finnish Radiation and Nuclear Safety Authority STUK has approved SGS Fimko Ltd to act as Authorised Inspection Organisation (AIO). According to our accredited scope, we are now able to serve all Finland-based nuclear power plant license holders and plant units with their conformity inspections of components and structures in safety classes 2 and 3.

STUK supervises nuclear power plants during their whole life cycle. Based on Finnish legislation, STUK establishes safety requirements and ensures by supervision that the requirements are fulfilled.

STUK has authorised inspection organisations to conduct specific parts of the supervision on its behalf.

Unit 8 sets a new long-run record of 581 days

Unit 8 sets a new long-run record recently, generating low-cost, carbon-free electricity for its 581st straight day. During Unit 8’s last planned outage, Bruce Power invested USD 146 M in inspection and maintenance activities, as well as asset management, which will allow the unit to operate safely to its Major Component Replacement (MCR) Project, scheduled to begin in 2030. The MCR will then allow the unit to operate through to 2064.

With continued safe operations, Unit 8 has the potential to become one of the top-performing CANDU units in history, potentially adding nearly 250 days to its current long-run record.

During Unit 8’s planned maintenance outage, Bruce Power Operations staff will harvest life-saving Cobalt-60. This Cobalt-60 will help keep hospitals safe around the world by sterilizing medical instruments like masks, gloves and sutures.

Jacobs wins a contract for PDH completion at Borealis

Jacobs Engineering Group Inc. has been awarded a contract to complete a front end engineering design (FEED) study for a propane dehydrogenation (PDH) plant located at the existing Borealis production site in Kallo, Belgium. The contract award follows the successful completion of the feasibility study for the plant. When complete, the new PDH plant will have a targeted annual production capacity of 740 kilotons, making it one of the largest and most efficient facilities in the world.

As part of the FEED study, Jacobs is preparing the basic design package for both the inside battery limit areas as well as the outside battery limit areas of the new PDH plant. The FEED phase is scheduled for completion by mid-2018.

www.managingagingplants.com
### BWSC with MDT build Benin’s 120 MW power plant

The Danish power plant specialist Burmeister & Wain Scandinavian Contractor A/S (BWSC) in consortium with MAN Diesel and Turbo (MDT) has been awarded a EUR 125 M contract to build a 120 MW power plant in Benin. It constitutes the second contract for BWSC in Western Africa in 2017, and once completed, it will be the most efficient plant of its type in the region.

The project is a complete turnkey power plant project, which entails construction of a whole new power house for seven MDT dual fuel engines and all corresponding infrastructure. It is to be delivered within 18 months from effective contract. The dual fuel HFO and gas-fired power plant will be located at the Maria Gléta site, about 15 km from the city of Cotonou. The plant will provide enough electricity to supply the equivalent of about 300,000 European households and responds to the government’s goal to develop the energy sector in Benin in a sustainable manner. This new project is expected to significantly enhance the much needed electricity supply to power business growth and enhance living standards in the peri-urban areas surrounding Cotonou.

### Emerson named the ‘Industrial IoT Company of the Year’

Emerson, a global automation technology and software company, has been named the ‘Industrial IoT Company of the Year’ by IoT Breakthrough. The award recognizes Emerson’s extensive innovation and leadership in driving Industrial Internet of Things (IoT) technologies and strategies for customers in manufacturing industries, including oil and gas, food and beverage, chemical, life sciences and others.

To help overcome industrial business challenges, Emerson has harnessed the power of Industrial IoT for customers through its Plantweb™ digital ecosystem to enable broader process automation and deeper data insights that can improve operations.

A recent IndustryWeek survey sponsored by Emerson revealed that 60% of industrial companies are exploring or investing in Industrial IoT pilot projects, but only 5% are investing against a clear business case for how to best implement the technology.

To meet this need, Emerson’s Plantweb digital ecosystem includes consulting services to help customers build the best business case, backed by a broad portfolio of Pervasive Sensing technologies, an extensive suite of analytical software tools, secure and robust data infrastructure, and expert services.

### Ethos secures a contract from ITM O&M for Umm station

EthosEnergy has been awarded a three year contract by ITM O&M, an ENGIE majority owned company, for refurbishment work at the Umm Al Nar station in Abu Dhabi. The work will entail full butterfly valve refurbishment at the station with repair & services work carried out at the EthosEnergy Abu Dhabi workshop and on-site.

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**Industry Update**

- **January/February 2018**
- **www.managingagingplants.com**
Industry Update

SNC signs an agreement with petro-chemical company

SNC-Lavalin is pleased to announce that it has signed a Master Services Agreement, with approximate worth in excess of USD 100 M, with one of the world’s largest plastics, chemical and refining companies. The scope includes provision of all engineering support for the client’s Gulf Coast facilities. SNC-Lavalin is one of a limited number of firms with world-class expertise at scale in this field across engineering, procurement, construction, consulting services on cost and program management, training, and operations and maintenance. SNC-Lavalin will utilize its downstream capabilities to increase performance, improve processing, and ensure a partnership with the client to meet their long term goals on their facilities.

SCS Engineers to redevelop Brownfield site

SCS Engineers and SCS Field Services, the construction division of SCS, have begun work on a Design-Build Agreement with the City of Union. The agreement provides for the maintenance, assessment, permitting, potential remediation and construction of the former Pacific States Steel Corporation (PSSC) plant site. Performing the project in phases, SCS will be responsible for the following tasks: managing the operation and maintenance of the site; providing a technical and cost analysis of the potential to remove the existing consolidated waste to allow for mixed-use and transit-oriented development by the City. Additionally, SCS is tasked with preparing the preliminary design and cost estimates for constructing a 1,000 stall parking lot on the site; providing regulatory liaison services; conducting field sampling to characterize site materials; providing as-requested consulting services, and performing design-build services for parking lot construction.

Fortum delivers turbine and generator services for BIR

Fortum will deliver turbine and generator services for BIR Avfallsenergi AS and BKK Varme AS in Bergen. The contract was signed on 19 December 2017. It is an 8-year service agreement and started from 1 January 2018. BIR and BKK are running a waste to energy plant in Bergen, taking care of the municipal waste and delivering district heating. There are two incineration lines with one turbine and generator unit in each line on the plant. The service contract includes a 24/7 technical service support. The customer was looking for a combination of services for both turbine and generator units.

ExxonMobil, MagnaBond to collaborate

ExxonMobil Upstream Research Company announced that it has signed a three-year joint development agreement with MagnaBond, LLC to develop new technologies that could enhance cost-effective evaluation of well cementing, casing and tubing. The agreement was facilitated by the Industry Technology Facilitator as part of its initiative to address challenges associated with well decommissioning activities such as plugging and abandonment. The new collaboration combines ExxonMobil’s expertise in developing a wide range of inspection technologies and tools with MagnaBond’s strengths in technology transfer and supply chain design from other industries. Currently, evaluation technology cannot adequately characterize cement quality through multiple strings of casing. A well’s production tubing must be pulled in order to inspect the cement, resulting in additional time and expense for decommissioning activities. ExxonMobil and MagnaBond will work toward developing technology that allows for through-tubing cement evaluation prior to the arrival of a costly rig or workover unit.

Petrofac wins a rotating equipment contract in UKCS

Petrofac has been awarded a Rotating Equipment Management Services contract in support of Chrysaor’s operations in the UKCS. Under the 12-month agreement, Petrofac will provide fully integrated services across Chrysaor’s Armada, North Everest and Lomond assets in the North Sea. The new contract expands Petrofac’s existing role on the assets, which were acquired by Chrysaor in November 2017. A dedicated team of Petrofac engineers and support staff will now provide field service, equipment repairs, material procurement and technical support requirements to ensure operational targets for key rotating equipment are achieved.
Sulzer doubles capacity of performance testing

Performance testing of high voltage motors and generators is usually carried out to determine benchmark data following a major repair. However, increasingly, customers are requiring this information as part of a problem diagnosis or to verify performance figures for a component when its essential data has been lost. To keep up with growing demand, Sulzer has made a major investment at its Falkirk Service Center that will enable the test-bed load capacity to be doubled. The new investment by Sulzer will add a 2,000 kVA and a 700 kVA generator to the site that will be synchronized through a 4000A LV switchboard, as well as a new 2,500 kVA transformer, that will double the capacity of the test bed. The installation of the new equipment will increase the load testing capacity to 2,000 kW for horizontally-orientated motors as well an increase in voltage to 13.8 kV. The majority of the equipment tested in the additional capacity will be large, high voltage, AC motors, but the possibility to test DC motors up to 600 V, with a loading up to 800 amps will still remain.

AspenTech, ProSensus signs partnership

Aspen Technology, Inc. (AZPN) has confirmed an Implementation Service Provider (ISP) and training partnership with ProSensus, Inc. to further expand the implementation and use of aspenONE® Asset Performance Management (APM) software, including Aspen ProMV, by global manufacturing and process industry companies. ProSensus has enabled firms in the consumer packaged goods, pharmaceutical, chemicals, metals & mining and energy industries to optimize processes and improve product quality. Leading companies like PepsiCo, Johnson & Johnson, ARLANXEO and Eli Lilly maintain and maximize process and product performance with powerful ProMV multivariate analysis technology originally developed by ProSensus and now embodied in aspenONE APM software. Aspen ProMV is part of the aspenONE APM software suite combining big data, machine learning, and process modeling expertise to maximize performance across the design, operation and maintenance asset lifecycle.

Senseye announces 2018 upgrades

Senseye’s cloud-based software automates analysis of condition monitoring data and enables advanced prognostic capabilities, automatically diagnosing machine failure as well as forecasting the likelihood of future failure with a high degree of accuracy. By giving fast, direct access to Remaining Useful Life (RUL) information without requiring the user to have a data science background, manufacturers benefit from up to a 40% reduction in maintenance costs, as well as lowered unplanned downtime by up to 50%. As Senseye is made available on a Software as a Service (SaaS), every user benefits from ongoing upgrades to ensure that their machines are being monitoring by leading-edge technology. In-product enhancements for 2018 include: additional scalability enhancements, enabling manufacturers to monitor and share the learning of remaining useful life of thousands of machines based across multiple geographies; new compatibility with leading third-party industrial platforms, including GE Predix, Siemens MindSphere and SAP Plant Maintenance (SAP PM), and compatibility with the PTC ThingWorx Marketplace™ to offer predictive maintenance to users of PTC’s leading ThingWorx® industrial innovation platform. Developments in 2018 will include ongoing evolution of the product’s diagnostics and prognostic capabilities.
IPCO’s heat exchanger plugs seal leaking tubes safer and quicker

After first meeting with IPCO, producer of heat exchanging plugs, almost a year ago at an industry event in the Benelux, where Managing Aging Plants already had a very pleasant talk with the team behind this Holland-based company, we felt it was about time to catch up again. Armand Boogert, Sales Director with IPCO, gladly answered our call and invited us to come visit them in Dordrecht, in the west of The Netherlands. “We can talk over the phone, but I think it would be nicer for you to come over and have a look around our office,” Armand stated.

As Sales Director, Armand is responsible for all commercial activities within and outside of IPCO. “I started here in February 1991 and the company was founded in December 1989, so basically I joined almost right at the beginning,” he tells. Ever since its start the team have been working towards becoming the company that is known in the industry as a true service-provider. “Of course we sell products, but primarily we want to be there for the customer whenever they need us.” Service is therefore very important for IPCO, which includes providing training and products that are engineered to perfection.

Already in the early nineties of the last century the company made a very deliberate choice not to focus on just one area or one product. “This is because we believe this could make a company less stable and stability is of course important; not only for us but also for our customers who know that we will be in the industry for the years to come as well,” Armand explains. However, within the company, a fairly prominent place is reserved for the IPCO plug, a device that is as simple as it is ingenious.

Made to measure

The IPCO plug is a product that was especially designed as a solution for tube leakage in shell and tube heat
inspection and maintenance personnel need to consider repair or replacement in case of leakage. "Many heat exchangers have hundreds or even thousands of tubes and it would be silly to replace the whole heat exchanger when you can repair a few tubes," Armand continues. "The tube can be replaced, but sometimes this is not possible, for example when the pipe is in a U-shape. Or sometimes time is limited, a very speedy repair is desired, and then you can block-off the leaking tubes inside the heat exchanger with plugs."

"Whether it is because of corrosion, erosion, thermal activities, or any other cause, sooner or later tubes will start to leak and for a great deal this is completely normal."

Basically there are three ways for blocking-off a tube: you can bash in a taper pin, you can use a taper pin and weld it to the heat exchanger, or you can use a mechanical plug. "The taper pin can be okay but you don’t know what could happen in time," Armand tells. "Since the heat exchanger vibrates it could fall out one day. When you weld the pin to the heat exchanger it is secured, but there is a very high local heat build-up which will in time result in the cracking of other tubes, thus creating new leaks. We offer a different technique for which we use a hydraulic system, a machine with which you can place a plug into the heat exchanger."

"The IPCO plug is a product that was especially designed as a solution for tube leakage in shell and tube heat exchangers, a type that is found in almost every part of the heavy industry, including big refineries and chemical plants."
The way this works is: you have a taper pin, a ring, and a breakaway section and with the hydraulic machine the pin will be pulled through the ring. The ring will expand towards the tube where it will create a seal, and when enough power is applied, the breakaway section will break so that the installer knows it is installed correctly. "It is really very easy and can be installed by a factory’s own mechanical engineers or a contractor," Armand reassures. "However sometimes there are of course very typical situations, where it is difficult to perform a plugging operation. We have created a very simple instruction, based around the tooling and the plug so it is not very difficult, but we strongly advise to always have trained staff placing the plugs."

X1 and X4
Basically there are two variants of the plug, the IPCO X1 and the X4. Both work identical, however one is limited in size range but can go to extreme pressures – up to 500 Bar not really being an issue. The other has a times four (X4) range, a range of 2–2.5 mm, so much more expansion but a lower working pressure of 100 Bar. "Which is by the way still enough for most applications," Armand adds.
In deciding upon which plug should be utilised it is important to consider pressure, temperature and material. "When we know the exact data, so outside diameter, wall thickness, the material of the tube, pressure and temperature, we can supply the exact right type of plug for the job," Armand continues. "The material of the tube is leading for the choice in material for the plug; when it is a carbon steel tube, we will use a carbon steel plug, and when it is a brass tube, a brass plug will be advised."
In addition to the plug system, IPCO offer a testing system to be used before the plugging. "With a shell test you can easily see if there is leakage, but it can be difficult to pinpoint exactly which tubes are leaking. With our tube testing system – which is a pneumatically driven hand-held kit - you can quickly pressure test each individual tube."

"With a shell test you can easily see if there is leakage, but it can be difficult to pinpoint exactly which tubes are leaking. With our tube testing system – which is a pneumatically driven hand-held kit - you can quickly pressure test each individual tube."
First the Benelux, now Europe

IPCO started producing plugs for two main reasons. “We noticed that approvals were becoming more and more important for the European market,” says Armand. “And of course lead-time: as it is an emergency repair product, the lead-time has to be half an hour, one hour tops, and when a certain product is not in stock it needs to be produced and delivered straight away.”

IPCO started with serving the Benelux (Belgium, The Netherlands, and Luxembourg) region, but quickly decided to work together with companies in the rest of Europe as well. “Especially in the Benelux we give in-house presentations at the customer to explain what can be done. Outside the Benelux we work with representatives so that in time we can cover at least the whole of Europe,” Armand tells. “We would like to have more partners throughout Europe.”

“Especially in the Benelux we give in-house presentations at the customer to explain what can be done. Outside the Benelux we work with representatives so that in time we can cover at least the whole of Europe. We would like to have more partners throughout Europe.”

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Did you know?
The IPCO plug is completely certified under ISO and always equipped with full material certification. In addition, it is completely certified under the PED – the Pressure Equipment Directive. “The industry has to comply to full PED certification, all pressure equipment today is under the agreement of PED,” Armand tells. “We therefore decided, a long time ago already, that we needed to not just have material and ISO certification, but also have this PED certification in place. This is saving a lot of cost for the industry, for when an IPCO plug is used, everybody knows it’s fully certified so the inspector just ticks a box and it’s done.”
Communications: a ‘must-have’ tool for a materials engineer

MAP first had the pleasure of meeting Material and Inspection Specialist Mrs. Sari Musch in March 2016 when visiting the Neste refinery at Porvoo, Finland. There, in the company’s central office, she kindly outlined some of her work related to stainless steels. Two years later, MAP found it high time for a return trip to Finland to catch up with Mrs. Musch and her many and varied projects.

By David Sear

According to Mrs. Musch herself she does not really receive that many outside guests at the Porvoo refinery. And that’s something of a surprise for whenever MAP visits we are always treated to a friendly welcome, a hot cup of coffee and the opportunity to listen to an honest, in-depth review of materials.

And make no mistake about it, Mrs. Musch can talk with authority about materials from various angles: properties, selection, failure analysis, welding, etc. For she has continually looked for opportunities to expand and improve her knowledge of as wide a range of materials as possible. This is exactly why she joined the Neste refinery back in 2012, eager to work with stainless steels and some of the more exotic CRAs. She has certainly had her wish, having been involved in plenty of interesting cases within the refinery gates.

For example, as discussed in MAP’s previous report she has focussed attention on the refinery’s water quality which was affected following a leakage of resin balls from the ion exchange system. Now when safely contained inside the ion exchange unit those balls do an excellent job in removing calcium and magnesium from the boiler feedwater. However, when allowed to escape from the ion exchanger, to circulate and to subsequently become exposed to higher temperatures, these self-same balls
can degrade, causing corrosion problems elsewhere.

As Mrs. Musch explains, that’s because the resin balls are fully saturated with positively charged sodium ions (Na+) and contain a lot of sulphur in the form of sulphonic acid. The resin starts to decompose at elevated temperatures where evaporation takes place. The decomposition process is fairly complex but results in the formation of both sulphuric acid and sodium hydroxide. Comments Mrs. Musch: "So what we have is both an acid and a base. In some instances these two compounds will neutralise each other. Indeed, pH readings in some areas may show that the water is perfectly all right. However, these readings can create a false sense of security as, for example, sodium hydroxide can accumulate under surface fouling which leads to severe pitting corrosion or stress corrosion cracking."

The ideal solution from the scientific perspective, she indicates, would be to shut down the refinery, drain the feed water and condensate tanks and clean out the balls. However, there are clearly good economic reasons for waiting until the next scheduled outage, as closing even parts of a refinery can lead to an immediate loss of revenue. “We therefore have to accept that the resin balls will continue to be a concern for items such as heat exchangers, boilers, etc. For example, the tube bundles need replacing more frequently than normal. Fortunately now that we are aware of this particular corrosion mode we can take all the necessary steps well in advance. However, we are currently looking to hire a manager to be responsible for the water and steam systems so I am confident that he or she will be able to push ahead with the actual implementation of the clean-up project. This is an indication that the top management is seeing the need for a strong ownership for the boiler and the water quality issues.”

Sulphur levels
At this juncture MAP decide to ask Mrs. Musch for an update on some of the other topics she raised two years previously. Such as, for example, her concern that rising sulphur levels in the crude oil feedstock might necessitate using chromium alloys as an alternative to carbon steels in certain areas. In reply, Mrs. Musch notes that colleagues from local engineering company Neste Jacobs had in fact just concluded a material upgrade project in the crude oil distillation systems. “They reviewed the suitability of existing piping and equipment for increasing sulphur levels. This evaluation highlighted the need to upgrade from carbon steel to 5Cr or even to 9Cr/12Cr steels. However, if sulphur levels continue to rise then perhaps a further step up to stainless steels will be the next choice.”

Another research project instigated by Mrs. Musch in 2015 was to address fouling in a tank fabricated from 321 stainless steel clad onto a carbon steel baselayer. To that end she had coupons installed inside the tanks. With the coupons now having been removed and examined, Mrs. Musch says she needs to free up time to properly analyse the results. “Fouling can accelerate corrosion, so is something that I take very seriously,” she notes.
End-user Interview

Duplex cracks
A more recent area of attention for Mrs. Musch is a hydrogen-rich process unit, where cracks have been found in a duplex vessel. Commenting, she says: “the investigation is still ongoing but there is some evidence to suggest that improper manufacturing or welding practices may be part of the problem. The preliminary results revealed some microstructural anomalies which could have made the material susceptible to cracking.”

“It is important for everyone involved to remember that duplex is absolutely not the same as carbon steel,” she continues. “For example there are clearly defined welding procedures which must be followed. This type of information should therefore really be included in the purchase orders so that everyone involved is properly informed in advance. Only certified welders should be used but even then the procedures should be discussed so that they really appreciate what is needed and why. The cooling speed for one is a key parameter. But it is equally important for managers to consider what it is like for a welder to work inside a vessel installed in the field. In other words: make sure the welder has easy access to the work area and does not have to strain to reach the weld.”

Straightforward language
Mrs. Musch goes on to say that the ability to distill complex engineering issues into easily understandable language is an important skill for materials engineers. “We have developed a rich vocabulary that enables us to precisely define materials phenomena. That is ideal when looking to explain complex ideas to our immediate peers. But we also need to be able to discuss materials issues with specialists in other fields. For example, that could be with a refinery owner about the need to change materials. Or with a welder, to explain why it is important to follow specific procedures for welding exotic materials.”

This is why Mrs. Musch avoids using technical jargon during her regular presentations to Porvoo staff. “Start discussing microstructures and you can see people quickly becoming disengaged. Therefore I try to use a straightforward language to ensure that everyone understands and can contribute to discussions. My presentation shows materials failures that can happen in a refinery and how they can be avoided. For example, I recently explained to process operators why they need to be really careful with the operating window. If for whatever reason they raise the process temperature so that the material temperature is raised by just ten degrees that can reduce the furnace tube life by fifty per cent! That is a simple message but one which everyone can immediately understand.”
Your valves are talking to you. Are you listening?

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#detailsmatter
Oxifree tackles corrosion

After reading the Case Study from Oxifree about the UT testing they conducted with Cygnus Instruments, Managing Aging Plants got in contact with Oxifree Ltd. to learn more about the company and the solutions they offer. Managing Director Ed Hall gladly answered our questions. He has been with Oxifree since day one and is proud of what they have achieved in the eight years of existence, and with their new operations opening in NE Scotland, Oxifree are ready for an exciting new chapter in the UK.

By Jolanda Heunen

What can you tell about Oxifree?
Oxifree was established in 2009 to tackle the growing issue of corrosion across many sectors of industry. We are a small company with a big mission and in our eight years we have achieved representation in over forty countries worldwide. Our core product is TM198, a thermoplastic coating for the protection of complex metal assets.

How does Oxifree assist plant managers and engineers in their daily work?
Aging plants and asset life extension are a large drain on time and resources for plant owners and operators, therefore the budgets of the plant maintenance managers and engineers are constantly under duress. The degradation to equipment and materials is always going to be par for the course, however the unplanned is impossible to budget for!

Often the plan is to deal with this in shutdowns and via scheduled maintenance but it doesn’t always work out that way. An operational failure can cause major issues, not just with production but regarding potential impacts on health, safety and the environment as well.

We want to be part of the prevention – as well as the fix – but the more we can work with plant managers and engineers to develop preventative maintenance measures, protecting assets before they degrade, the better. The upfront costs can then save so much more than when the unplanned happens.

The fact that we can work while a plant is in operation is a big advantage; it allows the operator to do more during the regular planned shutdown, or make the shutdown period shorter. We can also work in a variety of environments, from cold and dry to hot and humid, so the scope is broadened.

Who do you consider to be your competitors?
Primarily petrolatum tapes, paints, and synthetic wraps. They have their place, but few are multi taskers. Paints can chip easily – exposing the asset underneath – and require frequent reapplication. Petrolatum tapes have significant preparation requirements and need extra products for complex geometries increasing application time. Synthetic wraps can split or become damaged with impact or adverse weathers.

Much of the competition has lengthy preparation requirements which means extended downtime for both preparation and application. Curing...
time can extend this even further, let alone the inability for ease of inspection or maintenance. Thermoplastic coatings, such as our product TM198, can be applied in so many more situations especially to metal assets with moving parts. There is often no downtime as it can be applied to live equipment and it can withstand much harsher environments with success.

Do you have any exciting projects coming up that you can tell a little about?
We have recently been awarded services with a major global oil and gas operator which is an exciting prospect. Being approved on a scale like this opens the door globally. One of our representatives has also just won a large $1.9m contract with a major operator providing our TM198 for a two-year service period. In addition, we launched our operational services arm in the NE of Scotland.
We recognise the need to support our clients, partners, and our representatives in the UK and Europe and feel that our new operations will enable us to provide a flagship for all Oxifree Service solutions.

"It's not just the cost savings, a corrosion free industrial world would remove associated failures, which in turn minimizes environmental, health, and safety risk."

In addition to the case study on Cygnus, are there any other case studies or application stories you would like to share with us?
We have conducted two recent case studies using NDT techniques, Cygnus and ACFM with TSC. It was important for us to highlight how adding this layer of protection to metal assets does not stop the routine inspections that need to be conducted, we wanted to show plant operators and engineers that prevention can go hand in hand with routine inspection and general operations.

Case Study

All testing included coated substrate, Cygnus couplant (blue gel) and Cygnus Dive UT thickness gauge.
Substrates were:
• 4mm blasted plates (Grey in colour)
• Gas Transfer pipe (Black in colour)
• Oxifree demonstration rig
Results

Test 1: 4mm blasted steel plate coated in Oxifree coating.
Measurement was taken through 6mm of Oxifree coating. The material was then removed from the exact spot of testing to demonstrate that the Oxifree coating had no effect on the thickness of the material reading.

Test 2: Gas transfer pipe partially coated in Oxifree coating.
This test involved measuring a section of the pipework coated in Oxifree material using Cygnus Dive UT gauge, then rotating the pipe to demonstrate that the only difference in reading is due to the manufacturing process.

Test 3: Testing of Oxifree coating while submerged.
A coated plate was submerged in water and tested for thickness as in the previous tests with the same level of results recorded.

Test 4: Testing Cygnus Dive on Oxifree Demonstration test piece.
The various test conducted showed, without fail, that UT testing was suitable for TM198.

What would a completely corrosion-free industrial world look like and how can Oxifree assist in achieving this?
It would certainly be a more efficient one! The savings to both capex and opex would be substantial with less unplanned maintenance and hopefully less failures. There are a few steps in the fight against corrosion, the first being identification – some of the top trouble spots are hard to see – take CUPS (Corrosion under pipe supports) for instance. The very nature of this issue is that it is hard to spot, often until too late. There are tools that can be in-

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stalled to monitor but they cost money and obviously then a fix would still need to be made. Taking a preventative approach using Oxifree would mean the risk is removed and operators can reallocate those expenditures. This is true for the prevention of corrosion but also the mitigation of further corrosion on aging assets. Other coating technologies cannot provide this option to live pipeline as they require pipes to be lifted from the support to remove oxidation, prepare the surface and then apply the product. None of this is necessary with TM198 as we can encapsulate existing issues and actively mitigate them at the point of application. But it’s not just the cost savings, a corrosion free industrial world would remove associated failures, which in turns minimizes environmental, health and safety risk. The right solutions need to endure both harsh environments and the test of time which Oxifree can.

**Does an installation need to be shut down before inspection using ultrasonic testing and how much time does the testing take?**

Typically no, a shutdown would not be needed unless access to an area of testing was prohibited during live operation. One of the benefits of this method of testing is that it does not take very long to get results and they are highly accurate. The advantage for Oxifree TM198 is that it does not interfere with this testing allowing operators to monitor pipework effectively.

**Can any pipe be treated with the thermoplastic coating or are there exceptions? For example regarding material, age, positioning, or environmental influences?**

The big advantage of thermoplastic coatings is their suitability for so many more applications than competitor products with the ability to apply to complex geometries. Minimal surface preparation means the asset is not subjected to harsh blasting which can take its toll on aging equipment. Due to the application nature assets in difficult locations can be reached as the equipment utilises 15m hoses which can reach into confined areas and still achieve application. They are also suited to applications in extreme conditions – wet, dry, humid, abrasive.

**Why NDT and Oxifree TM198?**

TM198 offers the corrosion protection metal assets need. We recently conducted testing with Cygnus UT equipment and were able to determine that TM198 (when correctly applied), completely eradicated any oxygenated air and electrolyte on the surface of substrates that cause and lead to corrosion. The test also proved that the UT echo perfectly identified substrate thickness through Oxifree material, eliminating any need to remove any applied Oxifree coating in order to inspect and fully assess substrate integrity. Oxifree recommends UT testing as an alternative for routine inspection where the material would typically be cut away and refilled. UT testing can determine wall thickness and detect defects, without damage or interruption to process equipment. This is not possible with other corrosion protection methods.

“The big advantage of thermoplastic coatings is their suitability for so many more applications than competitor products with the ability to apply to complex geometries.”

**About Ed Hall**

*Ed is the managing director of Oxifree Global Ltd, leading the company since 2009. He obtained his BA in Business Administration and Economics and has since held roles in business finance, sales, sales management, engineering team management, and was involved in product development and manufacturing. Ed has worked in both the USA and the UK and travelled extensively during his career so far, giving him a rounded insight into conducting business on a global scale. He is proud of the accomplishments Oxifree has achieved and believes strongly in their products, mission, and future.*

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For more than 130 years, the Arizona Public Service Company (APS) has powered Arizona’s growth, prosperity, and innovation. Today, APS continues to be the state’s largest and longest serving electric utility, providing 2.7 million people with safe and reliable energy. The company’s Palo Verde Nuclear Generating Station (Palo Verde), located near Tonopah, Arizona is the largest source of carbon-free electricity in the United States, with 6,400 MW of generating capacity and one gigawatt of renewable energy. With more than 6,400 employees, APS is dedicated to ensuring a bright future for Arizona. Managing Aging Plants had the pleasure of speaking with one of these employees, Mr. John Backus, a Nuclear Training Instructor, responsible for valve service training for the valve service group at the Palo Verde Nuclear Generating Station. He spoke with us about his current role as an instructor, the problem of part obsolescence and how that issue can be used to teach younger workers about adaptability.
An impressive career history

Even though John has been working at the Palo Verde plant for approximately 33 years, he actually began his career in 1979 as an electrician wiring houses. When he became bored with fishing wires he started working for Phillips Uranium in New Mexico before moving to South East Arizona and working in a large open-pit copper mine. It was in 1983 when there was a strike at the mine that John became aware of the Palo Verde Nuclear Generating Station, which was just getting started and needed maintenance electricians, especially ones with previous experience working in the copper mine. After successfully passing the entrance test, John was hired and helped with the start-up testing for the nuclear power plant, which he thought was “a lot of fun.” After 12 years working in that area, there was a change in management and he moved into the electric shop, eventually becoming team leader. At that time there wasn’t a separate Valve Services Group, but as an electrician he was able to work on both the mechanical and electrical aspects of valves, which he found really enjoyable. In 1990 the official Valve Shop was created, in order to have professionalism and consistency across the board and three years later the valve shop was made company wide and existed alongside the electric shop, mechanic shop, instrumentation & control (I&C) shop, and the HVAC shop. John said that it was at that point he moved to the valve shop, which he really liked. He was there for a long time before the training opportunity in the valve service shop opened up and he became the Valve Service Instructor. From there he moved to safety and non-discipline specific training and was busy constantly teaching the upwards of 700 people a year classes like FME conduct & maintenance, tagging & clearance, keeping up qualifications, etc. Not long ago, the Valve Service Instructor retired and John moved back into the valve service training and “really getting my feet wet again with it. I go to every outage to work with the guys in the valve shop, so I keep my qualifications up and then I go back and I use that opportunity to mentor as a training instructor,” he explained. “They really rely on me coming back to them having that experience because we have a lot of new people. Many have retired so we now have a lot of smart, young workers but they don’t have the hands-on experience. Most us grew up at Palo Verde; this is my only nuclear power plant so it’s all I’ve ever known. I learned without all the complications that you have today. Today technicians are held to a higher standard. That’s why they rely on me to come back to the shop and work with them.”

Current role

John is responsible for providing valve service training for the entire Valve Service Group at Palo Verde. He does all the training and prepares all the documentation to maintain the training qualifications. A lot of his job involves writing lesson plans, teaching courses, and ensuring all the paper work is correct because there are regulatory observations with the Institute of Nuclear Power Operations (INPO). He provides training on all the ‘normal type of valves’ the plant uses whether it is a Target Rock valve, solenoid air-operated valve (AOV), motor operated valve (MOV), either electrical or mechanical, etc. He also covers refurbish inspection, testing, and troubleshooting. Twice a year he leads the Craftsmanship Training, which he calls ‘Just-in-time-training’. This session is held right before an outage and covers anything the group wants to review or go over before the outage. John said that he really enjoys this course because the technicians in the shops actually present a lot of the material but he oversees the session, prepares all the lesson plans, and
ensures everything meets the specific SAT requirements.
When asked what a typical working day is like, he is quick to answer that his work weeks are often Monday to Thursday, with ten hour shifts. He begins most days with assessing what is going on in the plant trying to determine what upcoming work could be involved or if there are any problems that need to be solved. He then goes to the valve shop to work with the employees there. He will then observe their work and provide any feedback that he thinks would be useful. He confessed that the better part of most days is spent doing paperwork: making sure lesson plans are approved, that PowerPoint presentations are completed and approved by the leadership team and generally just making sure every aspect of the course is ready to go. “Then there is the teaching component of my job,” explained John. “I teach anywhere from 20- to 40-hour classes depending on what the specific subject is. So I have to always maintain my qualifications as an instructor. I also have to be observed to ensure I’m teaching everything correctly and I have a lab observation too. In order to even become an instructor I had to go through the standard INPO approved training course. I don’t have a teaching degree. I come from the school of hard knocks. What I enjoy the most about my job is actually teaching. I love being at the front, I feel very comfortable in front of an audience. I also enjoy working with all the people in the different shops. I also enjoy working with the new generation of workers. I love taking my knowledge and my experiences and incorporating all of that into the lesson plans.” But he clarified that this can also be a major challenge: making sure that his lesson plans adequately cover aspects that will help the workers while also meeting the fairly strict requirements of the SAT program. This is why after any class he teaches he circulates a feedback form so there is an element of post-training evaluation and he can incorporate any feedback into
End-user Interview

John is happy about the next course. He doesn’t enjoy the administrative aspect as much as the actual teaching but he does realize its importance. John also finds it challenging trying to keep on top of current information and ensuring there are enough hands-on opportunities to his lesson plans. He has to try and provide enough equipment for his hands-on refurbish classes but sometimes the trouble is finding enough space to house everything.

The problem of obsolescence

Yet another challenge that John faces more and more these days is the problem of parts, especially valves, no longer being available. He stated, “Obsolescence is already becoming a really big issue for us. Things are wearing out and certain manufacturers are not reproducing the same parts. During the last couple of outages we were making some changes with the plant equipment because of the obsolescence of a certain piece of equipment, so we have to constantly learn more about this problem and adapt to it. We’ve had to do training on it because we all have to have a complete understanding of the problem and how we can combat it.”

He continued to explain that it is inevitable that younger workers are going to face the issue of dealing with older parts that are wearing out but no longer being made, so the only option is to make room for new parts, but that also involves adhering to the strict requirements of the nuclear industry. So not just any part can be used to replace the ones that are wearing out due to age. John admitted that things are going to have to change in the industry to make it easier for obsolete parts to be replaced.

Supporting future generations

Doing everything possible to ensure that the next generation of workers in the nuclear industry are adequately trained is perhaps the most important part of John’s job. He detailed that, “Training the new generation is a big deal. The kids these days are really smart because they get a lot of book learning but that isn’t nearly enough. They also have to see it, and experience it, in the plants. I think a lot of it has to do with the fact that we can bring history to them, a history that we’ve seen but they haven’t. The situation in the plant is different now compared to when I first started. We don’t see the same things today that we did 10 or even 20 years ago. For example, today things, like valves, are just wearing out and that part may now be obsolete. When I was younger the focus was on making everything run correctly and smoothly but now the focus has shifted to how products are wearing out. We have to recognize what exactly is wearing out and why. What is causing it and how can that be prevented? How can we use a new part to replace an old one that is no longer available? It all comes back to being able to understand a problem and learn from it.”

John believes that the future of the industry will be to find ways to become more efficient and streamlined in plant processes. When he first started in the business, he said that everyone followed exactly what the manufacturer recommended, even if it seemed repetitive or no value added. In recent years, he has noticed that there is a shift and that now workers are working with the manufacturers and the engineering department to perform the correct amount of maintenance. However, John also believes that this calls for even better training and support for the future generations so that all requirements can be met in terms of the equipment used in the plant, especially with part obsolescence becoming a larger and more persuasive problem. He believes that workers have to be ready to adapt and that will be easier the more training and experience they have. As long as John is still instructing he will try his best to make sure they will get all the knowledge, experience and support they need.
For plant owners in the process industry, cutting corners on safety to reduce costs can be a very expensive mistake. One dramatic example is the oil spill in the Gulf of Mexico, which was a direct consequence of the explosion on the oil platform Deepwater Horizon. One of the main factors that contributed to the explosion was the sealing of the bore hole: despite warnings from experts, a cheaper solution was adopted that involved a higher risk of escaping gas. In retrospect, this would have been a negligible investment compared to the damages paid to the US government, which ran into of billions of dollars in double figures. Not to mention the damage to the company image, or the appalling effects on the environment and on people that cannot be quantified. Thus in plant construction, whether for the chemical industry, for firing technology or for incineration systems, systematic hazard assessment is essential.

By Bernd Rastatter and Andre Günther, Rösberg Engineering GmbH

Not only may false economies prove to be expensive in many different ways – they can also lead to legal consequences. There are clear legal requirements regarding the implementation of functional safety measures. In Germany, for instance the Industrial Safety Regulation (Betriebssicherheitsverordnung, BetrSichV) obliges operators of plants requiring compulsory monitoring to ensure the safety and protect the health of their employees. It lays down clear guidelines on hazard assessment and protective measures, and explicitly names the elements of infringements and criminal offences. Nevertheless, for reasons of cost many safety measures are not implemented at all, or are only implemented half-heartedly. Other stumbling-blocks are a lack of knowledge on the topic of functional safety, or confusion about finding one’s way through the complex ‘jungle’ of standards and guidelines. Here, establishing a Functional Safety Management (FSM) system can help not only to avoid major safety risks, but on a ‘smaller’ scale can reduce downtimes, meaning it pays off double. But let us consider one point at a time.

Learning from one’s mistakes can be expensive in the chemical industry or where firing technology and incineration plants are concerned. With a Functional Safety Management system, failures can be anticipated and avoided. (Photo: Georg Lehnerer/fotolia)
Implementing functional safety in practice

What exactly is FSM? It is a systematic procedure that can help to avoid potential failures even at the stage of plant planning and development. The failures that occur in a plant can be generally divided into two groups: stochastic and systematic. Stochastic failures occur by chance and can’t be prevented beforehand. One example is the unforeseeable failure of an electric component. If something like this occurs it is a case of minimizing the damage that could be caused by malfunction, and ensuring sufficient safety in advance by redundancy concepts. Whereas stochastic failures occur randomly and cannot be prevented in advance, systematic failures can be recognized beforehand and their consequences are foreseeable. For instance, an error in the instructions for inspecting a protection system results in an inspection that is wrongly carried out. Thus the intended function of the protective system is not ensured and as a result there may be damage to the plant, to the environment and, in the worst case, to people.

Systematic failures of this kind therefore need to be anticipated and avoided. A study by the Health and Safety Executive (HSE) demonstrates that this is worth doing. In Great Britain the HSE regulates major areas of health and safety at work. The study investigated 34 accidents that caused substantial damage, and came to the conclusion that more than sixty percent of these failures were built into the plant before it was commissioned (Fig. 1). Around 25% of failures arose through installations or changes made after commissioning. Only 15% of the failures that occurred had a stochastic cause.

How can a Functional Safety Management System help?

The main cause of systematic failures is generally: people. Thus it is important to support people during the planning and implementation stage, in order to avoid these errors – which are mainly down to the management – as effectively as possible. This is where FSM systems help. They are based on legal regulations, guidelines and standards. An FSM system is built on the ‘safety life cycle’ as defined in DIN EN 61511. Fig. 2 shows all the stages of hazard and risk assessment, from planning to commissioning and ending with decommissioning. Right at the beginning, people responsible for each of the total of eight phases are defined in a safety plan. In each of these phases the FSM system uses two main instruments: process definition (left-hand bar: Management and Evaluation of Functional Safety) and control of whether the process definitions are actually adhered to (right-hand bar: Verification).

“What exactly is FSM? It is a systematic procedure that can help to avoid potential failures even at the stage of plant planning and development. The failures that occur in a plant can be generally divided into two groups: stochastic and systematic.”
Fig. 3: Excerpt from a style sheet for Phase 1 of the safety life cycle for verification of the activity concerned. (Photo: Rösberg)

Process definition and control

Process definitions are created for each individual phase of the safety life cycle. For each phase the hazard level is also defined. That in turn influences who should perform verification. Where the hazard level is low, this can be done by employees within the company, but the higher the hazard level, the more independently the verification must be conducted, and for extremely dangerous processes the ‘four eyes’ principle applies. The question of who is allowed to verify which processes is decided not only by independence, but also by

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<th>Criterion</th>
<th>Result</th>
<th>Comment</th>
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<td>1</td>
<td>Monitoring of Safety Life Cycle phases</td>
<td>Have people been named in the safety plan, and have they been informed about the responsibilities entrusted to them?</td>
<td>✔</td>
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<td>2</td>
<td>Competence / process application</td>
<td>Presence of technical knowledge, training and experience relating to the process application?</td>
<td>✔</td>
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<td>3</td>
<td>Competence on technologies used</td>
<td>Presence of technical knowledge, training and experience relating to the technology used?</td>
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</tr>
<tr>
<td>4</td>
<td>Competence regarding sensors / actuators</td>
<td>Presence of technical knowledge, training and experience relating to the sensors and actuators?</td>
<td>✔</td>
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</tr>
<tr>
<td>5</td>
<td>Competence regarding safety technology</td>
<td>Presence of knowledge of safety technology (e.g., HAZOP)</td>
<td>✔</td>
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<tr>
<td>6</td>
<td>Competence regarding legal requirements</td>
<td>Presence of knowledge of statutory and regulatory requirements</td>
<td>✔</td>
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</tr>
<tr>
<td>7</td>
<td>Management and leadership qualities</td>
<td>Presence of sufficient management and leadership qualities for the relevant task in the safety life cycle</td>
<td>✔</td>
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Fig. 4: Dipl.-Ing. (FH) Andre Günther, Product Manager for Functional Safety at Rösberg Engineering GmbH, says: “Increasing safety is often thought to mean doing without freedom and flexibility. This is exactly what FSM is not trying to achieve. A well-set-up FSM system helps users to develop the best and safest solution as simply as possible.” (Photo: Rösberg)
competence. Both specialist qualification and professional experience in the particular area play an important role here.

Style sheets similar to quality management sheets are used for control. With these specially prepared lists, potential causes of failure can be systematically checked. When compiling these checklists for a particular plant, specifications from various standards can mainly be used. Individual adaptations are only necessary in a few cases. The aim of the catalogues of questions in these style sheets is to eliminate all possibilities for different interpretation as to whether, and how, tasks have been carried out.

Fig. 3 shows an example of an excerpt from a style sheet for phase 1 of the safety life cycle for verification of the task concerned. After each phase a ‘hK’ is made of whether all tasks have been performed in compliance with the rules. Only then will the Safety Manager give his ‘all clear’ for the next step.

Making work easier and improving safety at work

“Increasing safety is often thought to mean doing without freedom and flexibility. This is exactly what FSM is not trying to achieve. A well-set-up FSM system helps users to develop the best and safest solution as simply as possible.” Günther and his colleagues support plant constructors and operators in all tasks involving functional safety and also help with the integration of an FSM system. Plant operators who have previously installed a quality management system according to DIN EN ISO 9001 are already part of the way there. Günther explains: “The departments and their employees are then already accustomed to defined processes and the use of style sheets. And individual processes are already in place, such as e.g. steering and document revision.”

The Rösberg team help with the integration of QM and FSM systems by defining relevant interfaces. And they also assist in other stages, for example with setting up an FSM system: from comprehensive advice and document preparation to the final rollout. Rösberg’s employees have the necessary qualifications and also the professional experience required by the relevant standards. Among other things, the enterprise has developed its own style sheets verified by the TÜV (German safety and standards institution). These can be made available to the customer after consultation. Günther sums up: “Although the legal requirement for functional safety is clear, many people still hesitate to adopt an FSM system. By providing services in this area, we want to help lower the inhibition threshold so that implementation becomes straightforward, feasible and preventative – and people are not forced to learn from their mistakes when it is too late.”

About Rösberg Engineering GmbH

Rösberg Engineering GmbH, founded in Karlsruhe in 1962, offers tailored automation solutions created by around 100 employees working at five locations in Germany and China. Their scope includes basic and detail engineering for the automation of process and production plants. Rösberg also has extensive project planning and application experience in the use of all usual brands of programmable logic controllers (PLCs).

Many companies also put their trust in Rösberg for the configuration, delivery and commissioning of distributed control systems, as a manufacturer-neutral system integrator.

In the area of information technology, Rösberg has enjoyed international success for more than 25 years now with its I&C-CAE system ProDOK. With LiveDOK NG, Rösberg presents a system which offers efficient access to electronic plant documentation, and ensures maintenance and consistency of documentation over the whole life cycle of the plant. The app LiveDOK.mobile enables online/offline access to plant documentation on mobile devices, including Ex-Zone access. Plant Assist Manager (PAM) supports the user in documenting and carrying out optimized workflows. Under the name “Plant Solutions”, ProDOK, LiveDOK and PAM support not only the engineering, construction and modification of plants, but also continue to support the plant throughout its operative phase. All software products are now in the “Next Generation” (NG), meaning that they use state-of-the-art technology and offer many possibilities for visualization, modularization, databases and cloud applications. For more information, please visit Internet: www.roesberg.com or www.LiveDOK.com
In today’s chemical-transfer universe, some estimates say that centrifugal-style pumps with motor-speed capabilities are the choice of operators as much as 75% of the time in critical chemical fluid-transfer applications. However, this article will illustrate how recent advancements in the design and operation of another type of pump technology – positive displacement sliding vane – can be a more efficient, reliable and safer option when transferring critical chemicals in both fixed and portable systems.

The challenge
It’s an unavoidable fact of pump operation: mating shafts require alignment. Perhaps it is a direct-coupled pump with alignment between the motor and pump. Or a reduced-speed pump with alignment between the gear motor and pump. In either case, a coupler or multiple couplers transfer torque from the prime mover to the pump, possibly through an intermediate speed-reduction device. Each of these components (motor, gear reducer and pump) must be in alignment to ensure proper operation and efficiency.

Therefore, any upset in the system – including improper shaft alignment – can result in breakdowns that can lead to excessive downtime and high repair or replacement costs.

Challenges with shaft alignment in chemical-transfer applications?

The general impression is that the pumping systems used in high-volume, heavy-duty chemical fluid-transfer applications are rough-and-tumble beasts, able to, as the old Timex watch television commercials used to promise, “take a licking and keep on ticking”. In reality, they are delicate ecosystems in which all of the components must be kept in balance and operate in harmony, lest system failures and breakdowns occur that will lead to excessive downtime and repair or replacement costs.

By Geoff VanLeeuwen, PE
be accurately leveled so they align the shaft centerlines. Once leveled, each component must be carefully positioned to eliminate all angular and axial offsets. Couplings are installed only after these steps are complete. There are many coupling types. Some couplings are more forgiving to misalignment than others, but each will fail if careful alignment procedures are not performed. This causes expensive downtime, lost reliability and increased maintenance expenses.

Shaft fatigue is an additional consideration. Initially, a misaligned shaft will absorb the induced load. That load is transferred two times per revolution, which is even more significant at motor speeds of 1,800 rpm. Several hours later, that shaft has absorbed tens of thousands of cycles. Eventually, the stress from repeated load-deflection cycles will cause the shaft to fail. When the shaft breaks, the downtime is problematic for end users, because the pump unit is not moving fluid and production schedules are not met.

The nirvana for pump operators is a set-and-forget system that eliminates any chance of the shafts coming out of alignment, but the reality is that there are a wide variety of things – both operationally and in the way the pump is handled – that will cause pumps to fall out of alignment. The first is vibration, which occurs whenever a pump operates. It’s undeniable that some amount of vibration will take place when a pump is running; it is when the level of vibration is excessive that components loosen and cause the shafts to come out of alignment. A second major cause

“There are many coupling types. Some couplings are more forgiving to misalignment than others, but each will fail if careful alignment procedures are not performed. This causes expensive downtime, lost reliability, and increased maintenance expenses.”

The design of the new Blackmer® GNX Series Sliding Vane Pump eliminates the couplings between the gearbox and the pump and motor by rigidly connecting them in alignment with a C-face (or similar) motor on both the high-speed and low-speed sides of the setup. The result is a pump that will not need to be realigned either at initial installation or following a maintenance procedure, resulting in improved peace of mind for the operator.
of misalignment is maintenance. When pump or system maintenance is required, the pump is often decoupled from the motor. If the reinstallation is done in haste, the pump will be out of alignment when recoupled. This could be caused by a technician that has not been properly trained, or perhaps by someone who is rushing to complete the job because he has been stretched thin. In either case, that technician will be surprised by an unexpected and urgent maintenance event when that shaft or couplings fail.

Simply put, the shafts must be properly realigned every time the pump unit is maintained or relocated. The ultimate repercussion of a misaligned shaft is that the shaft or the coupling will eventually break or fail, which will necessitate the need for another costly maintenance call to either repair or replace the pump, all while the downtime is hampering the producer's ability to meet the requirements of strict production cycles.

"The nirvana for pump operators is a set-and-forget system that eliminates any chance of the shafts coming out of alignment, but the reality is that there are a wide variety of things – both operationally and in the way the pump is handled – that will cause pumps to fall out of alignment."

Some pump manufacturers have been able to work around vibration problems or misaligned shafts with the development of close-coupled motors, where the motor shaft also operates as the pump shaft, a design that is popular with centrifugal pumps. While this design does eliminate the need for shaft alignment, the operational window of close-coupled pumps is relatively small (require clean liquids, cannot run dry, small viscosity range, sensitive to high vapor-pressure liquids), which does not make them viable for use in most chemical-handling applications.

The solution

Recognizing the various shortcomings of centrifugal pumps, as well as the deleterious effects caused by shaft misalignment, the search has been on for a technology that can be classed as 'alignment free', while still possessing the ability to deliver the high flow rates and transfer volumes that are the backbone of chemical fluid-transfer operations.

In essence, what was needed was a design that eliminates the couplings between the gearbox and the pump and motor by structurally connecting them rigidly in alignment with a C-face (or similar) motor on both the high-speed (or motor) and low-speed (or pump) sides of the setup.

Blackmer®, Grand Rapids, MI, USA, a product brand of PSG®, Oakbrook Terrace, IL, USA, a Dover company, has found the solution with its new GNX Series Sliding Vane Pump. The GNX Series pumps are an enhancement of Blackmer’s legacy GX Series models, which have been in service since 1959 and are cast-iron pumps with an internal gear reducer for use in the transfer of various chemicals.
The GNX pumps use the proven features of the GX pumps and take them to the next level with the incorporation of a commercial-grade, single-stage gearbox. This innovative new gearbox fits between the motor and pump and is held in place by a permanent dowelled connection that creates a structural link between the high-speed and low-speed sides of the system. This redesigned gearbox is constructed of rigid aluminum housings (Frame 7) and cast-iron housings (Frames 8 and 9) and has NEMA C-face or IEC D-flange motor-input connections. The gearbox output has a proprietary hollow shaft that is compatible with the pump’s keyed shaft. This capability results in the industry’s first alignment-free pump that can produce flow rates from 20 to 500 gpm (76 to 1,893 L/min).

The alignment-free design is well suited for both fixed and portable applications with the gearbox possessing the ability to create turn-down ratios ranging from 2.1 to 13.1, resulting in more precise flow rates. Typical commercial-grade gearboxes have more moving parts and a beefier housing, which can result in higher purchase costs. Many rely on two-stage or three-stage speed reduction, which means that the lowest speed ratios between the high- and low-speed sides of the system are 3.0 or 4.0. This creates a maximum pumping speed that is usually less than 600 revolutions per minute (rpm), which is not enough for the demands of high-volume fluid-transfer operations.

The new GNX pumps have also been designed to fit into the same footprint as the original GX pumps. This allows the alignment-free pumps to retain a compact footprint and to be a drop-in replacement in existing installations. The GNX features a traditional 90-degree ported option; the new GNXH model offers a new 180-degree ported option for use wherever horizontal discharge piping or vertical pump mounts are desired.

A final benefit of the alignment-free pumps is that the permanently connected gearbox eliminates all couplings and allows all rotating components to be totally enclosed without the need of guards. This eliminates pinch points for the operator or technician, resulting in improved safety. Furthermore, seal leakage and product spillage are reduced by incorporating Blackmer’s locked-rotor design into the GNX pumps (which was not available on the legacy GX pumps). These safety improvements are important to successfully pass U.S. Occupational Safety and Health Administration (OSHA) inspections or audits as well as those utilized by other governments globally.

Operationally, the alignment-free pumps maintain the best traits of the legacy series, namely the high efficiency and dry-run capability, without damage during the self-priming or line-stripping stages. Other benefits of the alignment-free pumps include integral head-mounted drive with oil-lubricated, helical gears; sliding-vane pump design that adjusts for wear to maintain flow rates; and adjustable relief valve for protection against excessive pressures. This combination of time-proven operational features and the new alignment-free gearbox means that the pumps will deliver increased reliability, uptime, seal life, bearing life, shaft life and safety, with decreased and simplified maintenance.

Conclusion

We may think of pumps as rugged, robust pieces of machinery — and, when operated in a vacuum, they are — but because pristine operating conditions are rarely achieved, it is imperative that pumping systems are designed and operated in a way that reduces the amount of harmful stress placed on components. One area that has been difficult to achieve and maintain is shaft alignment, but with its new alignment-free GNX Series Sliding Vane Pump design, Blackmer anticipates that this worry may soon become a thing of the past.

For more information, please contact Geoff VanLeeuwen, Product Manager for Blackmer® and PSG®. He can be reached at geoffvanleeuwen@psgdover.com.
Endress+Hauser introduces Field Xpert SMT70 tablet PC

Endress+Hauser introduces the Field Xpert SMT70, a rugged tablet PC for commissioning and maintenance staff to manage field instruments and document the work progress. The tablet comes preinstalled with DeviceCare device configuration software and device library. The Field Xpert SMT70 supports HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, Modbus, CDI and Endress+Hauser service interfaces. It can connect to field instrumentation devices directly via a USB or Bluetooth wireless modem, or via a gateway, remote I/O or multiplexer to a bus system.

The Field Xpert device library has more than 2,700 pre-installed device and communication drivers, allowing it to work with many different instruments from a wide variety of vendors. The Field Xpert SMT70, therefore, works with virtually every modern field instrument with “One Click Connectivity.” The tablet is ready to perform diagnostics, configurations or commissioning with the built-in device configuration software. The tablet also supports Endress+Hauser Heartbeat Technology and FieldCare instrument diagnostic and monitoring functions.

The tablet comes in a general purpose configuration as well hazardous area configuration for Class 1, Division 2 Groups A,B,C,D, T4 and Class 1, Zone 2, Groups IIC, T4

USCO relies on Danieli for stainless steel complex

United Stainless Steel Company, USCO, relied on Danieli Service for resumption of operation at its stainless steel complex located in the Kingdom of Bahrain. Supplied by Danieli in 2007, designed to produce 100,000 tonnes per annum of austenitic stainless steel in 2B and polished finish, the complex was stopped in 2011.

Following a recent agreement between USCO and Chromiumtrade SA, a Swiss company that will procure black coils, manage operations and market the end products, the decision to restart operations was taken. Danieli Service was engaged to restore the plant to full production providing new spare parts, technical support, refurbishment and the upgrade of key equipment.

The upgrade covered the combined annealing and pickling line with in-line skin pass mill, the 20-high rolling mill, the coil grinding line, and the slitting and cut-to-length lines. Among the main interventions was the technological upgrade of the pickling line to a more eco-friendly process and improved strip-steering.

KCA Deutag is new senior VP of RDS

KCA Deutag announced that Albert Allan has joined the group as the new senior VP of RDS, its rig design and engineering subsidiary. Based in Aberdeen, Albert will have responsibility for spearheading RDS’s activities worldwide. He will also become a member of KCA Deutag’s executive management team, reporting directly to CEO, Norrie McKay.

Albert joins the group with a wealth of experience in the oil and gas industry, having worked in various projects, operational and construction management roles during his almost 30 year career. During that time, Albert spent 24 years with global provider of professional services and technologies, KBR where he was latterly VP Operations and, more recently, he was MD for the oil, gas and petrochemical business of international engineering and development consultancy Mott MacDonald.
Valmet upgrades Aranda marine research vessel

Valmet will upgrade the Aranda marine research vessel’s control and machinery monitoring system to meet current needs as part of a renovation project for the vessel. Valmet’s delivery includes the upgrade of the Valmet DNA control and machinery monitoring system, training and commissioning. The system is used to control and monitor the vessel’s machinery and monitor alarms.

The order was placed by Telesilta Oy, a Finnish company responsible for integrating electrification and the machinery monitoring system with other systems on the vessel. Prior to this order, Telesilta and Valmet have closely cooperated on many ship projects. Automated vessels include the harbor icebreaker Ahto, connection ferry Otava and oil pollution control vessel Hylje. Currently, the two companies are carrying out a comprehensive project on Molslinjen’s RoPax vessel that is under construction by Rauma Marine Constructions Oy at its Rauma shipyard.

Trimble announces CalAmp to supply telematic devices

Trimble has announced that CalAmp is supplying customized telematics tracking devices and systems management technology for Trimble’s Field Service Management (FSM) vehicle and asset monitoring solutions.

Trimble will focus on the value-add fleet management, work management, diagnostics, driver safety and mobility software and cloud-services that enable organizations to improve efficiency and productivity. The Trimble solutions allow fleet managers and equipment dealers to locate and monitor the health and utilization of their vehicles and equipment, and proactively manage maintenance.

The CalAmp devices are simple to install and their PEG™ (Programmable Event Generator) and PULS™ (Programming, Update and Logistics System) technology enables greater customization and easier device management. This technology improves field service response time by tracking vehicle and equipment location to efficiently deploy service technicians. In addition, the Trimble solutions incorporate equipment warnings and diagnostic information to improve first-time fix rates and increase customer satisfaction. Equipment dealers and fleet managers will benefit from the integration of Trimble’s solutions to improve their service and maintenance workflows and business systems.

Revamped Petrozavodsk reduce eutrophication, Lake Onega

The renovated Petrozavodsk wastewater treatment plant reduces the eutrophying emissions from the city to Lake Onega and improves the quality of drinking water. Petrozavodsk wastewater treatment plant has been identified as an environmental Hot Spot by the Barents Euro-Arctic Council because insufficient wastewater treatment has led to significant environmental contamination.

The plant fulfills the recommendations of the Baltic Marine Environment Protection Commission HELCOM regarding the removal of phosphorus, nitrogen and solids from municipal wastewater. Wastewater emissions from Petrozavodsk to Lake Onega and, through the catchment area, to the Gulf of Finland will be reduced by 75 tonnes of phosphorus a year in a way that is also cost-efficient. The new treatment plant consumes less energy and reduces greenhouse gas emissions.

The costs of the wastewater treatment plant totalled about EUR 35 M. This wastewater treatment project is the latest major achievement of the long-term environmental collaboration between the Fund and the Russian Federation.

The use and maintenance of the water plant is the responsibility of the Petrozavodsk Municipal Services Company.
DSP Group, Emza & Himax launch WiseEye IoT in Las Vegas

DSP Group®, Inc., a leading global provider of wireless chipset solutions for converged communications, Emza Visual Sense, pioneer of ultra-low power computer vision, and Himax Technologies, a leading supplier and fabless manufacturer of display drivers and other semiconductor products, have announced the launch of the WiseEye IoT. This is the industry’s first ultra-low power, always-on, intelligent visual sensor adding human presence awareness for consumer appliances and industrial IoT applications.

DSP Group’s ULE and SmartVoice solutions, Emza’s unique machine vision algorithms, and Himax’s innovative low power CMOS Image Sensor yield a commercially available sensor capable of detecting, localizing, counting and profiling people. When integrated into consumer appliances such as home assistants, TV sets, heating and cooling systems or security systems, WiseEye IoT enables battery-powered human awareness in the vicinity of the appliance in an extremely efficient and cost-efficient manners.

WiseEye provides intelligent occupancy detection and people counting in a battery powered sensor, so it is perfect for managing HVAC, factory floors, and other areas where motion detection is required.

SEP PDO submitted

The Snorre Expansion Project PDO (plan for development and operation) was submitted to the Minister of Oil and Energy December 21. Currently the Snorre-field consists of two platforms (Snorre A and B) and one subsea template. The Snorre Expansion Project (SEP) calls for installation of six large subsea templates providing 24 new well slots. These measures will increase the recovery factor from 45% to 50% in this complex reservoir.

Snorre has had three different operators since production started 1992: Saga Petroleum, Norsk Hydro, and now Statoil. Originally, Saga anticipated that production would cease in 2012-14. Now, the expansion project will extend the production 30 years beyond the original forecast. DEA Norge has a 8.57% interest in the license.

The latest temporary license extension expires in July 2018. Both the Snorre Expansion Project PDO and the license extension approval are expected from the authorities in June 2018.

GE supply Predix to Enel - improve software reliability

GE has announced that it will provide the Global Thermal Generation division of Enel, Europe’s largest power utility in terms of market capitalization, with its Predix-based software solutions to be deployed as predictive diagnostic tool in 14 of Enel’s thermal power plants located in Europe and Latin America, supporting their digitalization.

GE and Enel will deploy and optimize GE’s Asset Performance Management (APM) software at 13 gas-fired and 1 coal-fired Enel’s power plants with an overall installed capacity of 7 GW to monitor, predict and enhance the facilities’ reliability.

GE has previously supplied Enel with advanced technologies and services agreements on assets such as gas turbines and associated generators.

Predix is an application development platform purpose-built by GE to meet the scale, complexity, speed and security requirements of industry. GE’s Predix-based APM software application uses advanced predictive analytics to analyze data, detect and diagnose equipment problems before they occur, increasing asset reliability and availability, while reducing operations and maintenance costs.
Wärtsilä delivers smart power generation under EPC

The technology group Wärtsilä will deliver a 22.7 MW Smart Power Generation plant under a full Engineering, Procurement & Construction (EPC) contract to Cooperative Energy, a member-owned electric cooperative based in Hattiesburg, Mississippi. The project will consist of two gas-fired Wärtsilä 31SG engines, the first order for the world’s most efficient gas engine. The plant located in Bennsdale, Miss., will provide valuable grid support for renewable integration for the Cooperative Energy system as well as reliability during potential transmission outages caused by hurricanes or other severe weather conditions. The selection of the Smart Power Generation solution is advantageous as Cooperative Energy is in the process of installing increasing levels of renewable generation, notably new solar generation into their network. The new Wärtsilä 31SG engine solution will provide the required flexibility for renewable integration. The plant will replace an existing gas turbine power plant. The equipment will be delivered to the site in 2018, and commercial operations are expected to commence in 2019.

Greater Reims has renewed its contract in Veolia

Entering into effect on January 1, 2018, this nine-year contract is worth a cumulative €95 M for Veolia’s recycling and waste recovery business in France. Combining energy recovery and environmental excellence, this project to improve the Reims energy recovery plant will greatly benefit the region. As part of the contract’s renewal, €10 M will be devoted to work on improving the facility’s reliability and its energy efficiency resulting in an overall improvement to the energy recovery plant’s total energy performance. A new turbo-alternator will be installed to generate more than 12,000 MWh of recovered electricity. Carried out by VINCI in conjunction with Reims architects LINGAT, the work will qualify for the “Greater Sustainable Reims” label. It will become a green energy plant in its own right, thereby reducing Greater Reims’ TGAP (French tax on polluting activities) and delivering savings estimated at €3.1 M. Several measures will be implemented in association with Reims Champagne-Ardenne University aimed at encouraging local biodiversity. These will include the creation of a planted discharge area irrigated with storm water where fauna and flora will make the site additionally attractive.

BASF launches Citral website on progress of repair work

BASF has launched a website, www.basf.com/citral-plant, to inform its customers, industry stakeholders and the interested public about the progress of the repair work at its Citral production plant in Ludwigshafen. BASF was forced to declare Force Majeure on all its Citral and Isoprenol-based aroma ingredients and on Vitamin A and E, and several Carotenoid products. The website also provides up-to-date estimations of product availability after the start-up of the plant. BASF confirms that it still expects to start up the Citral plant in March 2018 at the earliest. The start-up procedure is expected to take several weeks. After initiation of Citral production, downstream products need to be manufactured in a step-wise approach. BASF is currently supplying its existing stocks available to customers in a fair and reasonable manner according to contractual obligations and applicable law. Customers that require specific information not covered on the launched website are kindly asked to contact their sales representative.
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