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Pump Centre

PUMPACTION

THE OFFICIAL NEWSLETTER OF THE PUMP CENTRE

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For more innovation in wastewater collection, visit www.sulzer.com

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Editor's Column

Dear Reader

The summer holidays are over and the nights are drawing in and the Pump Centre is starting to plan its training course programme for 2016. For 2016 we have brought on-board a couple of experienced trainers and they are actively developing some new course titles for us to launch in the New Year.

The importance of good training cannot be overstressed and it is vital to extract as much information as we can from the experienced engineers who are leaving the Water Industry due to the inevitable AMP 6 restructuring. As these engineers leave, decades of knowledge leaves with them, so the Pump Centre has recruited a few of them to distil their know-how into practical training courses and offer troubleshooting consultancy advice to its members.

Course titles that we are expecting to see for the New Year include:

- An Introduction to the Water & Sewage Process
- Sewage Pumping Station Design
- Pumps & Pumping Systems – Introduction / Intermediate / Advanced

Our training will be primarily delivered at two locations within the UK, Warrington in the North West of England and Reading in the South East. Other locations will be used on an ad-hoc basis as and when necessary.

The Pump Centre is also striving to work with its members to deliver a number of "Awareness Days". These are low cost events that cover specific topics that have been highlighted by the members as being worthy of discussion. Topics that will be covered include:

- The Water Industry Mechanical & Electrical Specifications (WIMES)
- Social Media
- Centrifugal Pump Repair

If any member has an idea for an awareness day please contact myself by email at john.howarth@esrtechnology.com and we can discuss how to move things forward.

The nomination process for the Pump Centre Young Engineer Award 2016

is now underway. Nominations must be submitted by 27th November 2015. This year the judging is a two stage process undertaken by an independent panel. The first stage is based on the information provided in the nomination form. The second stage for the top three short-listed candidates is based on a short presentation followed by a 15 minute interview in front of the selected judging panel.

The award process is a great experience for nominees and they have the chance of winning some great prizes. There is a massive need for the industry to get its succession planning right and it is vitally important to support and nurture the talent that is coming through – so please encourage your Young Engineers to have a go and enter the award – It will be great experience for them!

If you have not had an application form contact myself by email at john.howarth@esrtechnology.com and I will forward the necessary information.

John Howarth

Pump Centre Manager

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Advanced Flow, level and Water Quality Measurement

Smart Storm, based in West Yorkshire is delighted to join the Pump Centre. This coincides with the launch of Smart Storms latest product the Universal Smart Instrument (USI). Following several years of research and development the USI fills a gap in the market not met by other instruments and is specifically developed with the end user in mind. Based on the robust and reliable Windows CE the USI is as intuitive and simple to operate as a home computer or Smart phone.

It offers a huge step forward for process measurement and control with a touch screen colour graphics display, 20 years data storage, multiple communication ports, on-screen data reporting and Cloud based data retrieval as standard.

No other instrument in the market offers the wide functionality as the USI and as a single instrument with multiple sensor inputs the end user can replace several instruments making it a real cost saver. From a choice of flow, level and water quality measurements including pH, Redox, DO, Conductivity, Turbidity and Temperature, up to 16 different inputs can be simultaneously measured, viewed and logged. Of course the USI is also ideal for pump control with two level inputs, 6 relays and expandable 16 channels of 4-20mA outputs and coupled with its advanced programmable graphical menu it makes pump control simplicity itself. The USI is truly "Tomorrows Technology, Here Today".

Smart Storm also manufacture a complete suite of waste water instruments including waste water samplers, fat skimmers, pH meters etc.

www.smartstorm.eu

Smart Storm

Technolog Limited

Technolog offers over 30 years' experience in the design and manufacture of battery powered data loggers and pressure control products for the utilities. The products are complimented by a range of local and web-based software solutions.

Technolog are committed to producing quality products designed to withstand harsh environments at attractive prices. Our range includes the Cello GSM SMS/GPRS logger featuring frequent data transmission, two way communication and sophisticated alarm regimes. Variants are available for both clean and waste water applications. The Regulo electronic pump controller provides flow, time and complex closed loop control options. Our expertise in this area is complemented by Technolog's sister company, Utilitec Services, which specialises in designing and implementing pressure control schemes.

The success of any monitoring scheme depends on reliable data collection. Technolog have developed two data centres with an architecture specifically designed to collect large amounts of data from our remote read products. We offer a complete end to end data service which allows fast, reliable data collection and facilitates effective network monitoring.

Technolog are WITS founder members and offer a WITS-verified range of battery powered products which communicate by GPRS. The WITS protocol allows seamless integration of mains powered telemetry outstations and battery powered data loggers into telemetry master stations.

Technolog takes great pride in the level of customer service it offers and has a team of sales and support engineers dedicated to the water industry.

www.technolog.com

TECHNOLOG

Pulsar Push Further Into Exports With A Key Promotion

Ashley Vickers

Non-contacting ultrasonic level measurement specialists Pulsar Process Measurement have promoted experienced Internal Sales Engineer Ashley Vickers to the role of Sales Support Manager, to oversee the export business within Pulsar that now represents more than half of the company's sales. One key focus for Ashley is to spearhead the company's growth in the important South American market, working with existing distributors and appointing new outlets throughout the region. Ashley is a fluent Spanish speaker and has worked for Pulsar for more than seven years, though his involvement in the ultrasonic industry goes back more than two decades. To 'replace' Ashley in the internal team, Pulsar has appointed Robert Aylen to the position of Internal Sales Engineer.

This is an exciting time for Pulsar as they approach their twentieth anniversary. Pulsar now has a product range that runs from self-contained dBi Intelligent Transducers and Blackbox ultrasonic components right the way through to the Ultimate Controller, which offers a complete pumping station controller with RTU and asset management system in one high-specification package. Pulsar's distributors throughout the world have a great range to choose from, and can find products that are ideal for the needs of their local market. Evidence of that was the recent deal that Pulsar's distributor down under, Bintech, struck with Australia's largest water company for Pulsar Ultra 3 pump control systems right across Western Australia. Reliability and performance were key, but so was the system of distributor expertise and Pulsar's support that have seen Pulsar equipment in use in thousands of applications all over the world.

www.pulsar-pm.com

Pump Centre Conference 2016
Call For Papers / Presentations

Dear Pump Centre Member

The annual Pump Centre Conference & Exhibition is being held on **Thursday, 12th May 2016** at the **International Centre, Telford**.

This is a call for presentations for both the Main Conference and the Breakout Sessions.

Main Conference – "Innovative Pumping - Challenging the norm"

We are looking for six 30 minute presentations on the main conference theme of **"Innovative Pumping - Challenging the norm"**. Alongside the presentation we require an 800+ word paper for inclusion on the Conference Proceedings CD.

Innovative Pumping - Challenging the norm
"Innovation is the life blood of any organisation looking to develop and meet or exceed its customers' demands. Pumps and pumping systems serve essential roles in a wide variety of installations serving society and innovation in the development of pump and system design, control, operation and maintenance is essential. The Conference will be looking to identify innovation in these areas and where best practice can be found".

Presentation topics could include:

- Innovative approaches to pump design and development.
- Advances in pumping system control and optimisation
- Application of Building Information Modelling (BIM) to pumping systems design
- Reducing costs using innovative products and / or solutions
- Innovative ways of reducing planned and reactive maintenance
- Innovative high level ideas for pumps and pumping systems development - what could the future hold in say 2030?

All presentations must be technology focused. Case histories are ideal and preference will be given to presentations which involve both manufacturer/supplier and contractor/end user.

If you are interested in participating, **please email john.howarth@esrtechnology.com for an application form and return it by 6th November 2015 latest.** If there are more requests than available presentation slots, a technical committee made up of Pump Centre Council Members will decide on the final conference programme. The programme will be finalised and announced in early December 2015 and more details will be circulated to the chosen presenters.

Pump Centre Young Engineer Awards 2016

Nominations are invited for the **Pump Centre Young Engineer Awards 2016**.

For many years the Pump Centre has encouraged and supported the development of Young Engineers in the UK who work with any aspect of pumps and systems. One of the ways it does this is by making an award to those whose level of achievement and development is recognised as being above average for their position.

The awards are presented in two categories, Professional and Apprentice, each year at the Pump Centre Conference dinner held at the Telford International Centre. The 2016 awards will take place on the 11th May 2016.

Award categories

To qualify for nomination in the Professional Young Engineer category the candidate must be 28 years of age or less on the 1st March 2016 and have a formal qualification in an Engineering or related subject.

To qualify for nomination in the Apprentice Young Engineer category the candidate must be 24 years of age or less on the 1st March 2016 and have proven experience on engineering projects as appropriate to their field of work.

In each category the selection process will comprise two stages. In the second stage finalists will be invited for interview and to give a presentation.

Eligibility for nomination

The competition is open to:

1. Employees of Pump Centre member companies
2. Employees of non-member companies who work closely with Pump Centre member companies (e.g. contractors, consultants etc.).
3. All nominations must be endorsed by a representative from a Pump Centre member company.
4. Each Pump Centre member company can nominate or endorse up to 3 young engineers in each award category.
5. The endorser and nominator can be the same person.
6. The nominator must have known the nominee in a working capacity for at least one year (e.g. manager, team leader, foreman etc.). The nominator does not have to be an employee of a Pump Centre member company.
7. The nomination form must be completed in full by the nominee, nominator and for non-members be endorsed by a Pump Centre Member.

All nomination forms must be returned to the Pump Centre on or before **27th November 2015**.

The awards are not limited to anyone working in one type of company or Pump Centre membership category. Anyone working for a Pump User, Consultant, Contractor, Manufacturer or Component / Service Supplier is eligible for nomination.

Candidates can be in any of the major disciplines and there is no restriction regarding the type of work carried out. The nominee's type of experience is also not limited to any one type or category. What's more important is the level of achievement of the nominee and their personal development and the contribution they have made to their business.

For more information and to receive a nomination form please contact;

John Howarth, Pump Centre Manager
john.howarth@esrtechnology.com
More information is also available at www.pumpcentre.com

Bosker and Jacopa – a Winning Team for UK and Ireland

Jacopa Ltd and Machinefabriek Bosker en Zonen BV (Bosker) have announced an agreement that gives Jacopa the sole right to distribute Bosker's highly-regarded water and wastewater screen equipment for the UK and Ireland municipal water and wastewater markets.

The Jacopa and Bosker management teams have worked together successfully for a number of years, and the new agreement builds on this strong on-going relationship.

Bosker has been designing, building and installing low-maintenance trash rake machines since the 1960s, and globally is the most experienced producer of this type of equipment. Bosker trash rakes can be found at larger pumping stations, sewage works and water intakes, among other locations, and the company has also developed the Bandit range to cater for smaller pumping stations and other types of water inlet.

Jacopa has an exceptional reputation for quality, competitive pricing and expertise that delivers an outstanding return on investment for customer equipment, solutions, services and projects.

The high-quality range of Bosker® equipment integrates well with Jacopa's own heritage, which includes many of the best known, most respected and reliable brand names in screening and treatment in the wastewater industry.

The Bosker® range of trash rake screens complements Jacopa's own products and services, and will enable the company to enhance its cost-effective, reliable and high performance solutions for the UK and Ireland municipal wastewater markets.

Managing Director Alex Lloyd said: "Together, Bosker and Jacopa combine the skills, know-how and experience derived from many years of providing wastewater screening services and solutions. There are over 1100 Bosker machines installed globally, reflecting their great reputation for reliability and robustness".

"The Bosker-Jacopa combination is also strongly placed to undertake refurbishment, upgrades and servicing for existing equipment as well as having the capability to design, supply and install new solutions. Both companies have excellent reputations for customer service, so we believe this new agreement is a great outcome."

www.jacopa.com

Jacopa MD Alex Lloyd (centre) with Bosker's General Director, Dick Bosker and Sales Director, Rob Haak.

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WEG drives play key role in saving 500 tonnes of CO_2 per year at new sustainable housing development

500 tonnes of CO_2 per year is expected to be saved at Kingston Heights, a new sustainable housing development in south west London, thanks to its pioneering use of water from the River Thames to supply heating, hot water and cooling. When completed, this state-of-the-art estate will be heated and cooled by a pioneering open water heat pump system, with virtually no on-site carbon emissions. When it came to choosing a drive solution for this highly-efficient system, automation provider Electraspec specified WEG's innovative variables speed drives (VSD). The company installed four highly-efficient CFW11 VSDs within the control panel that will operate the heat pumps.

Kingston Heights is a £70 million development in Kingston-Upon-Thames that will comprise 137 residential units, including 81 private apartments, 56 affordable homes and a 142 bedroom hotel. The development relies on a sustainable open water heat pump system, which provides heating, hot water and cooling to the buildings.

The system works by recovering the solar energy which is naturally stored in the Thames, with up to 150 litres of water a second being extracted after passing through a two-stage filtration process. The water then passes through heat exchangers to harvest the low grade heat before being returned to the river with a temperature change of no more than +/- 3°C. The process is totally environmentally-friendly and produces zero on-site carbon emissions, in contrast to the estimated 500 tonnes of CO_2 that would otherwise be emitted by a combustion-based system, and is expected to reduce energy bills on the development by around 16% per annum.

To reach these ambitious energy saving targets a drive solution was needed that ensured reliability while offering ease-of-use. Thus, the company turned to automation company Electraspec, who designed a bespoke pumping system control panel, equipped with two 18.5 kW and two 30 kW CFW11 drives. "Kingston Heights is an ambitious and pioneering project, so we were keen on providing WEG's VSDs because of their efficiency, reliability and ease-of-use," comments Eric Knight of Electraspec. "By effectively controlling the flow according to temperature, WEG VSDs will contribute to boosting the pump system's energy efficiency and will play a key role in helping Kingston Heights achieve its ambitious energy saving targets".

WEG's CFW11 drives are designed to ensure a precise control of pressure, flow and temperature while optimising power consumption through speed control, particularly in applications such a pump control systems. With intelligent thermal management features providing automatic cooling to the internal components, the CFW11 also ensures reliable operation.

Additionally, the drive offers a user friendly HMI with large character graphics, enabling quick and easy installation. The product also features the SoftPLC function that attributes PLC functions to the inverter and can be operated remotely. This function contributes to reducing maintenance and associated costs thus enhancing productivity and efficiency. "We are able to control the system from our laptops and are immediately alerted if there is a problem," comments Eric. "For example, this function enables us to operate speed and run commands without having to be physically on site".

Thanks to its Multi-pump Control feature, the CFW11 is able to control up to five pumps and keep constant pressure regardless of flow fluctuations. The VSD also monitors suction pressure and tank levels, alternating the pumps according to their operating time, and ensuring uniform wear and tear for motors and pumps.

About WEG

WEG is a major global player in the power distribution, automation and control sector. The company employs 28,000 people worldwide with global sales that now exceed US $3-billion, representing increasing global success across a wide range of product groups. These include the latest generation of transformers, LV control gear, generators, gear motors, inverter drive systems, soft starters, LV/MV and HV motors, ATEX- compliant explosion proof motors, smoke extraction motors and full turnkey systems

www.weg.net/uk

Atlas Copco pioneers two-in-one coalescing filter technology

Atlas Copco has launched the UD+ coalescing compressed air filter, which combines two filtration processes in one product. The UD+ is unique in the market and promises to help users achieve energy savings, efficiency gains and reliably clean compressed air.

The UD+ is the newest addition to Atlas Copco's extensive line of compressed air filter solutions. This two-in-one filter combines the reliability and performance of wrapped filters with a 40% reduction in pressure drops compared with pleated filters.

"Our compressed air solutions are of the highest quality, so our air treatment solutions should be too," explains Paul Clark, Business Line Manager, Industrial Air. "With the UD+, we have launched a compressed air filter innovation that saves space, energy and money without compromising on reliability and air quality."

Traditionally, two inline filters are needed to bring oil aerosol and solid particles in the compressed air down to acceptable levels for most applications (ISO 8573-1 Oil class 1 and 2; ISO 8573-1 Solid particle class 1). The UD+ replaces those two filters, saving space and reducing pressure drops by 40%. Extensive testing has shown that the UD+ achieves the excellent air quality of two traditional filters, thanks to the glass fibre filter media package that is wrapped around the filter. This technology is not only more efficient, it also offers increased reliability over traditional, pleated filters, which are prone to cracking.

The UD+'s reliability and performances are certified according to ISO 12500-1:2007 and ISO 8573-2:2007 standards by TÜV Rheinland. Available models range from a capacity of 9 l/s to 8000 l/s.

For more information about the UD+ filter and to learn about its working principle watch this video: https://www.youtube.com/watch?v=07k1LGkfzA0&feature=youtu.be

www.atlascopco.com

Pulsar's Global Ultrasonic Capability the Key to Major Australian Contract

As the principal supplier of water, wastewater and drainage services throughout the state of Western Australia, Water Corporation manages more than 100 wastewater treatment plants and over 1,100 pump stations across an area more than a quarter of the size of the USA.

After trials and extensive experience with a wide variety of both contacting and non-contacting alternatives, Water Corporation has chosen UK manufacturer Pulsar Process Measurement to be a preferred supplier of level measurement and control requirements.

The Corporation will use hundreds of Pulsar's specialist non-contacting ultrasonic sensors and controllers, with technical and sales support from Pulsar's regional office and Australian distributor.

Since 2012, Water Corporation has installed over 200 Pulsar ultrasonic units, and has recently purchased a further 346 to install throughout its Perth Metropolitan network. Pulsar's Australian distributor Bintech is supplying both equipment and know-how through their Western Australian representative John Hoskins of Gateway Technical Services.

With such an extensive network operating in the often extreme conditions of Australia, equipment has to work reliably. Water Corporation undertook a detailed investigation of equipment in use throughout its sites, reviewing and comparing performance. The Corporation was able to identify Pulsar equipment as consistently being a reliable system.

Pulsar has grown to the point that the company is now the leading specialist ultrasonic manufacturer in the world, with non-contacting measurement systems working successfully from the heat of Australia to the cold of Canada, from China to the United States. With regional offices strategically positioned around the world working with an extensive network of trained and accredited distributors, Pulsar can confidently supply and support equipment anywhere in the world.

"Water Corporation's choice of Pulsar equipment demonstrates the lower support costs and high reliability that we offer, and we are delighted to be able to help them to solve technical issues and provide a high standard of service to the people of Western Australia," said Pulsar's Regional Manager Asia Pacific, Colin Murphy.

"Our policy of strongly supporting national specialists such as Bintech/Gateway Technical Services means that users can be absolutely confident of great on-going advice and training wherever they are."

www.pulsar-pm.com

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xylem
Let's Solve Water

KSB supplies KRT pumps to Anglian Water's Southend WRC

KSB have supplied two new Amerex KRT pumps with specially fabricated Duckfoot for Jet Aeration tank at Anglian Water's Southend Water Recycling Centre (WRC)

The need for energy savings, improved carbon footprint and lower whole-life costs is becoming an important driver for innovation in Anglian Water. As a result KSB Amarex KRT duty standby pumps were installed in their Jet Aeration tank at the Southend site to replace existing pumps. KSB Amarex KRT is a vertical, single-stage submersible motor pump in close-coupled design. It is available with various impeller designs and can handle all types of abrasive and aggressive waste water in water and waste water engineering.

The Jet Aeration tank was commissioned and built at the Southend site during the mid 1990's by Anglian Water and serves two functions: Transfer of atmospheric oxygen into the liquid and the agitation of the tank contents. The Jet Aerator consists of three components: The KSB Amarex KRT pump which provides recirculated and pressurized liquid to the jets, the air blower which provides oxygen to the submerged jet at the necessary pressure; and the jet assembly itself. A twin guide rail system was supplied for installation using a specially designed and fabricated straight-pattern duckfoot by KSB Ltd.

Two submersible KSB Amarex KRT pumps were installed at the outlet base of the jet aeration tank, with suction level at the pump at 0.5m, discharging to a 400mm GRP pipe down the centre of the 32m long x 12m wide tank. The KSB Amarex KRT pumps are rated at 370 l/s delivering against a static head of 5.18m and friction head of 0.91m, giving the total developed system head of 6.1m. A 200mm air pipe is mounted above the water pipe and the air/MLSS flow is Jet Aerated through 32 nozzles.

Efficient aeration is all about maximising the contact of oxygen from air with the wastewater. At the heart of the process in the Southend Jet Aeration tank are the KSB pumps. Liquid is discharged through the inner jet nozzle as a high velocity jet stream, and spreads slightly as it travels through the outer air/liquid nozzle. Within the air/liquid nozzle, the spreading liquid jet stream traps air prior to discharging into the basin. The high velocity air/liquid cuts through the static basin liquid until the momentum dissipates creating a ''plume'' of air bubbles which rises to the surface. Due to the turbulence caused by the large difference in velocity between the jet and basin liquid, the bubbles formed are quite small and create a powerful air-lift effect. Mixing is therefore caused by the liquid jet action, and by the flow of liquid/bubbles in the plume rise area. As air flow to each nozzle increases, more air will escape the plume and rise directly over the jet as larger bubbles. In order for the jet to operate properly, air must reach the nozzle properly. This means that an equal amount of air must reach each nozzle, and the jets must all be at the same elevation.

Project Manager Alison Taylor of WRNI stated; 'This Project has been delivered in an integrated collaborative approach with KSB working alongside AW Operations and the @one Alliance to meet the demands of the site in a timely, efficient and effective manner'.

www.ksb.co.uk

New Product launch from SEEPEX SCT's Big Brother has arrived!

Increased Productivity and lower energy requirements, these 2 benefits complement each other in the latest development to SEEPEX's Smart Conveying Technology (SCT), the innovative technology for progressive cavity pumps

In addition to the well-established 1-stage design for pressures up to 4 bar, SCT is now available in a 2-stage design for pressures up to 8 bar. The 2-stage design has the same features as 1-stage SCT: a stator split into two halves, which can be removed from the rotor without dismantling suction or discharge pipework, a quick release rotor, and an intelligent re-tensioning system.

It has been further developed for higher pressures, and continues to offer enhanced pump performance, longer component life and easy maintenance.

SCT has many benefits, all of them proven in many different applications and industries, and recognised with 3 international awards for innovation. The key benefits are:-

- Lower power requirement compared to conventional design PC pumps
- Reduction in maintenance time up to 85%
- Re-adjustable when wear occurs, extending stator life by up to 200%
- Planned predictive maintenance without unplanned downtime
- Blockages and rags removed easily
- Reduced risk of ragging
- Health and Safety requirements reduced by lighter components

The end result; productivity is improved by reduced downtime and faster maintenance.

2-Stage SCT is a valuable addition to our range to deliver improved performance and lowest life-cycle costs for our customers.

www.seepex.com

Life cycle costs in pumping systems

It is commonly accepted it can be possible to save more than 25% of energy on pumping installations by applying variable speed drives correctly. Depending on the application it can even in some cases be as high as 40-60%. By simple calculations a good estimate can be made of the potential energy saving for a specific installation. The amount of energy saved is determined by the system characteristics and the characteristics of the pump. Figure 1 below shows a curve representing the energy savings of an idealized pump dependent on the speed.

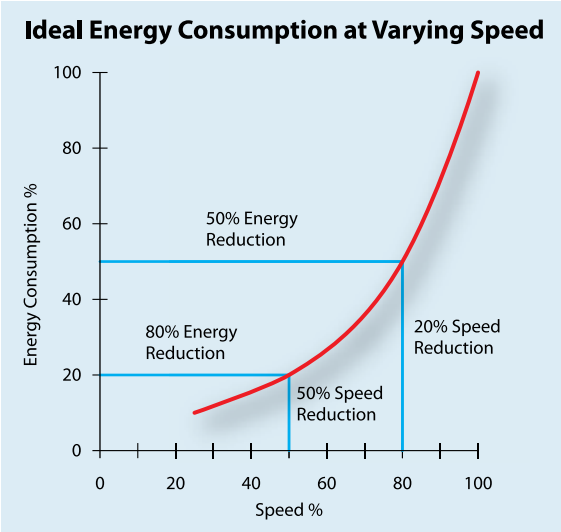

Figure 1: Ideal energy consumption using variable speed drives

For centrifugal pumps running at 80% speed the theoretical energy saving is 51%. However taking changes in efficiency of pump, motor and drive into consideration, as well as the fact that the static pressure is never 0, a saving of 30-40% is more realistic.

For more specific estimates on the energy savings some drives manufacturers have software calculation tools, which base on the installation cost and system characteristic can provide a detailed simulation of a return on investment.

Looking at installations today, there are many other factors, which should also be addressed. The focus on life cycle cost instead of installed cost is becoming more accepted in the industry and this can result in higher quality premium solutions being installed, offering a quicker ROI (return on investment) and extended product lifetime rather than focusing only on the lowest initial purchase price. This is where the real differences between solutions become clear.

Some of the factors, which are important, but have been neglected for many years; are VSD maintenance cost and related costs of operation. Maintenance cost can easily be estimated based on the expected lifetime of components under the assumed operating conditions and this can for some variable speed drives add extra cost in the drive lifetime to replace internal fans and capacitor banks for example.

Looking at the environment where the variable speed drives are to be installed, is also very important. In many wastewater installations, there are aggressive components in the air such as Hydrogen Sulphide. To protect the electronics from corrosion from airborne gasses, it is important to have knowledge about the pollution levels at the installation point to be able to specify the requested protection from the manufacturers.

The related cost of operation is more complex. When estimating the impact on related operational costs there are many aspects to take into consideration and often a more detailed knowledge about the application is required by the drives manufacturer to provide the best technology for each specific application. VSD heat dissipation levels varies across manufacturers and technologies, which can result in large differences in operational cost. First of all the heat from the drive comes from electricity consumed to modulate the output frequency to the motor. Also any additional external filters that may be required for the drive will also will have additional heat losses.

Having a higher heat loss will require additional cooling of the panels and the control room, which means even higher energy consumption!

In many installations, it is very common to use air-conditioning to reduce the heat in the control room to a level, which is within the specification of the electronics installed. However this is a very expensive way to remove the heat. This shows how important it is to look at the technical specifications of a drive to a higher degree to specify that drives should have a maximum heat dissipation of for example 2-3%, including all relevant filters and auxiliary components. Often manufacturers specify the drive efficiency based on the basic drive with an absolute minimum of filtering and other options.

In order to reduce the requirement for air-conditioning of a control room, it can be very valuable to consider the cooling concept of the drive, when making your selection. There are ways to remove the heat dissipated from a drive, without cooling down the entire control room and without putting additional heat load on other equipment.

First of all there is the possibility to use liquid cooling. Liquid cooling means that the usually air cooled heat sink on the back of the drive is replaced with a heat exchanger, through which a cold liquid flows to remove the heat from the drive. Typically around 80-90% of the heat dissipated can be removed through this cooling concept. One of the disadvantages is that there is a need for cool liquid, which in some cases could simply be seawater. Alternatively a cooling unit is installed, which can cool down the water, which is then recirculated to the drive.

A modern alternative is called "Back Channel" cooling. Utilizing this feature air can be ducted through the regular air cooled heat sink on the drive, but without ever entering the control room. This is typically available in drives rated to 90kW or more, which are designed for decentralized installation in the control room or mounted within a full Motor Control Centre. The drive is designed to allow optional air entry and exit directly from the back of the drive. The built-in heatsink fan is designed to cool the drive disregarding if the air is coming from the back of the drive or from the bottom.

With this design the installation can be mounted directly against the wall or ducted away. All air can then be circulated directly from the ambient and back to the ambient without heating up the control room and without passing over the electronics inside the drive. Up to 90% of the heat can be dissipated from the VSD using this technology significantly reducing the heat load on a control room. Figure 2 below shows an example of this type of installation.

www.danfoss.co.uk/vlt

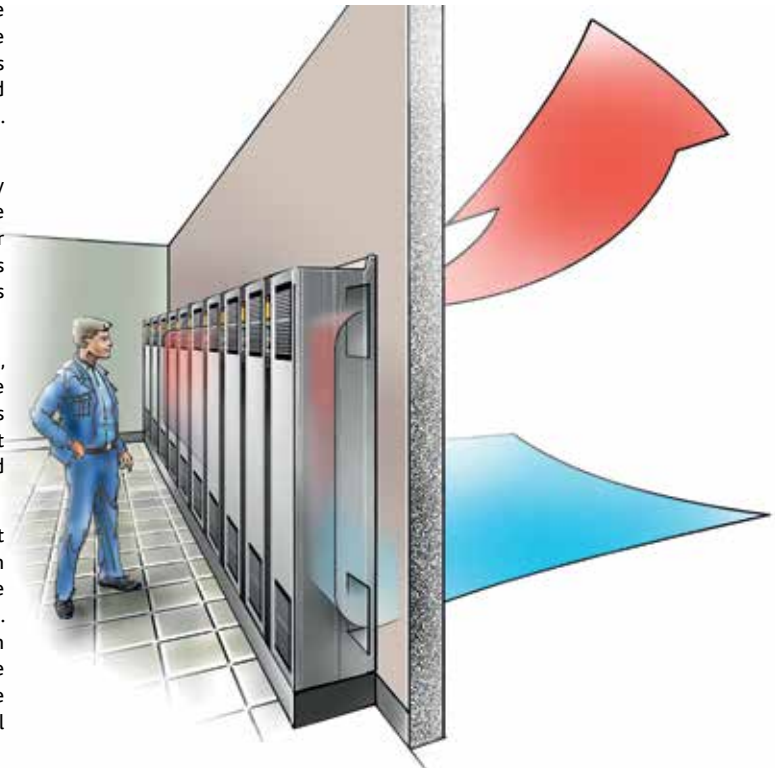

Figure 2: Back channel cooling – wall mounted

New high pressure pump FPP2/IPP2

Can you handle the pressure, Packo Pumps can!

Food industry in general is looking continuously for solutions to increase their production efficiency. Applications with extremely high system pressure become more and more common, especially in filtration processes such as reverse osmosis. As a worldwide partner for the food industry this new tendency has led to a new innovative hygienic Packo pump series FPP2 & IPP2. These hygienic pumps can operate at a maximum inlet pressure of 40 bar, a flow rate of 50 m³/h at a differential pressure of 7 bar. These unique and performant pumps were introduced in the market during the last international shows CFIA, Rennes and Anuga in Cologne. The first reactions were very promising!

Extreme high performance to handle extreme high pressure

The new hygienic, high quality and robust pump range, series FPP2 – IPP2 is especially developed to operate under the most severe conditions. It is a fully machined construction in thick stainless steel 316L, suitable for handling an inlet pressure up to 40 bar! Today the pump is available up to 50 m³/h at a differential pressure of 7 bar, higher flow rates will be available very soon.

Typical Packo Pumps quality

For this new development the typical Packo Pumps philosophy has been followed: a construction with standard components such as IEC motors and mechanical seals in accordance to EN12756, a hygienic design with electro polished surface as a standard, etc. The pump is available in an industrial execution as well for applications where hygiene is less important.

Typical applications are reverse osmosis of whey, wine and beer filtration, etc.

Packo Pumps, The specialist in stainless steel centrifugal pumps

Packo Pumps is originally researcher, designer and manufacturer of sustainable and innovative industrial pumps. Our pumps rank among the best of the world when it comes to hygiene and cleanability. Packo pumps are also an important link in the reliability and the improvement of the energy efficiency of our customers. To this end, we develop and constantly improve more pumps tailored to our clients, for the most diverse applications.

Our slogan "We Optimize Your Flow" reflects our ambition to be a valued partner in the optimization of your business processes.

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Deep down – Borger's maintenance-in-place pumps are a winner for National Grid

As the first Severn Bridge approaches its 50th anniversary, the millions of drivers that cross it each year will be blissfully unaware of just how crucial the pumping operation is some 70m below the land in the tunnel that connects a vital National Grid cable from England to Wales.

Valued at £80M, the 2.2 mile tunnel is protected by Börger pumps that remove one million litres per day of water ingress from underground springs. Systems are firmly in place to prevent homes and industry from any power shortages, but the knock-on effect from a total pump failure would cost around £1M to £1.25M - per day.

Mention the Severn Bridge to most folk these days and they'll usually refer to the mighty construction that hosts part of the M4, but just to be clear, we're talking here about its perhaps less glamorous neighbour, hailed as the dawn of a new economic era for South Wales when opened 30 years earlier by the Queen. This is the first Severn Bridge, slightly further up the river, which now carries part of the M48 motorway. Deep down in the tunnel with the National Grid cable, it's a strangely warm, damp, noisy environment where the lights have to stay on and corrosion sets to work amid the somewhat eerie stalactites.

Following a refurbishment of the tunnel a decade ago when the pumping out of the spring water was reduced from two points to just one (at Aust on the English side of the Severn), National Grid has been busy working towards the best possible solution for automated control of the tunnel's pumping system, as Substation Engineer, Steve Parker, explains:

"We've gone from what could be described as 'panic breakdown maintenance' – to a controlled, managed quarterly program", he said.

"This has come on the back of switching from two screw pumps to four rotary lobe pumps made by Börger. Although this upgrade has involved a capital cost, we're already well on our way to getting that back by the huge amount of time and labour we save on servicing".

He added: "For the screw pumps we'd need a minimum of three personnel just to go down into the tunnel to carry out an inspection that could take at least two and half hours. To bring one of the pumps out for repair or maintenance required winches, which then became an extremely time-consuming health and safety event, lasting up to two and half days! Including the cost of two full-time fitters, we'd have to jack the screw pump apart in order to cut the main rotor in half, which overall, was a costly and sacrificial exercise that I considered no longer manageable. Removal of one of the two screw pumps also left us vulnerable with a single point of failure. We needed a much smaller, more reliable, more cost-effective and easier to maintain pump regime, which is where Börger came in".

The installation of four stainless steel Börger pumps, which was carried out by Almax Technologies, has reduced inspection time to just 40 minutes. For servicing, the Maintenance-In-Place (MIP) feature of the factory-tested pumps means that all four can be stripped down, oil changed, rotors checked, in a day (or less), right back to the gearbox seals. Fitted with "Optimum rotors", the 18.5kW Börger units pump out 40m^3 per hour at 70m head (7.5 BAR vertical discharge), and have a suction lift of -5.5m. Only two pumps are in action at any one time, operating alternately on a 20 minute shift system so as to preserve their lifetime. In the event of a flood, then all four pumps would automatically leap into action – and compared to leaving just one screw pump in place, removal of a Börger unit would still leave three working if needed. Soft-start inverters get the variable-drive pumps up and running so as not to shock the pipework.

"In fact, it's been the existing pipework that has presented us with more problems", continued Steve Parker. "We're now changing over from plastic to stainless steel to reduce vibration".

National Grid is also introducing a new control and monitoring system, which Steve Parker says he held back on until the performance and maintenance of the pumps could be firmly established. Flow meters currently check on the pumps' typical 63m3 per hour of water, but the new smart system will help improve efficiency on site even further because a complete history will be available at an operator's fingertips, with graphics to study trends and much more – accessible via a smart phone if required.

Steve Parker concluded: "Compared to the saga of servicing our screw pumps, all we need to get at the

Börger pumps are basic tools, which can be taken down into the tunnel with ease in a small holdall. The simplicity of the Maintenance-In-Place feature is a real benefit - four Eye-bolts on the front of each pump – and the pumps themselves are rock solid, despite being in such a harsh, almost oil-rig type environment. They have taken massive hammerings – but been totally resilient. Beautifully reliable".

www.boerger-pumps.com

To repair or to replace – how to best serve your servo motor

The servo motor has an air of mystique around it, even after such a long service life in industry. As a result, there are plenty of maintenance engineers who choose not to repair such equipment themselves. There are others who do try to fix their own servo motors, often with disappointing results. The third group simply replaces faulty equipment – which can lead to repeated problems or unnecessary downtime if a repair is more appropriate. Here, Tony Young, of service, maintenance and replacement specialist CP Automation, explains the key points to consider when deciding whether to repair or replace a servo motor.

Tony Young - CP Automation

When making a decision about a faulty servo motor there are three points to bear in mind. These are the cost of the repair versus the cost of the replacement, the speed with which the overall system needs to be up and running again and the availability of spares from the servo manufacturer or its agent.

The first of these points is a simple decision based on economics. A good service partner will always provide two quotes – one for repair and one for replacement so you can compare easily. You should never be driven down one route or the other by the repair partner. The second point is normally a question of downtime. If you have a paper mill incurring thousands of pounds of downtime costs an hour, the decision to simply take the quickest route is a no brainer. However, the question of the availability of spares is slightly more complex. If a manufacturer requests that you deal with its agent to replace an encoder or resolver for instance there can be a delay due to stock levels (or conversely, some agents might speed the process up). The crux of the issue is that while you may have the skills to repair a servo, if you don't have the contacts you might still incur unnecessary costs.

When making these decisions, the principles remain the same throughout industry; the size and rating of the servo doesn't make much difference, nor does the application in which it is used (except in so far as these factors will influence the three points I have already outlined).

In addition to these basic choices, there can be benefits to a repair that aren't associated with a replacement, and vice versa. If you choose to send a servo to be repaired, your maintenance partner might discover that the route cause of the problem is elsewhere and that the malfunctioning servo is only a symptom of a greater ailment. Because the motor is the portion that revolves, when it isn't working one assumes that the problem lies with it. However, the motor is often fine when it is tested; this tells us that the problem is elsewhere. Normally, such further repairs are confined to the servo drive or controller but it isn't unknown for this analysis to diagnose a bearing misalignment, for example.

Of course, if a problem with another piece of equipment is spotted, there is a cost associated with replacing or repairing it. However, there is also a saving attached to not having to replace the servo again a few months down the line. In any case, if a servo is replaced by one from another manufacturer then the associated drive and control electronics will often have to be replaced at the same time.

As a director of a company that performs these repairs, I'm very conscious that I'm protecting the good name of the OEM when I make any recommendation. If a customer elects to replace a motor and then discovers further problems like those I've already outlined, he may decide that the fault lies with the goods and not their use. This could unfairly bias him against a particular manufacturer.

If the decision to repair a servo motor is made, it's essential that it is sent to the repair partner 'as failed'. It can then be set it up on a test rig to get an accurate diagnostic before it's dismantled. This also provides a footprint of the positioning of the electronic commutation device in relation to the motor windings. As a result, it can be precisely realigned after the repair - exactly as it was when it left the manufacturer. This isn't to say that if a motor has had some work done on it in-situ it can't be resurrected, simply that the process will be more difficult, longer and more expensive in terms of both charges levied and downtime incurred. It's a bit like calling in a PC Doctor to your home – if a virus had created problems in the settings on your computer it would be better to leave the virus where it was so that the IT engineer can get a good idea of what caused the problem and thus of all the associated side effects. The principle applies across all areas of repair really.

To conclude, the utopian solution when a servo motor problem is identified is to both repair and replace. This is especially true if you have a number of similar systems using identical servos. It provides the quickest solution and insurance against any future problems – because you have an identical spare on site that can be slotted into place

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Estimating Maintenance Costs in a WLC Assessment using 'Maintenance Profiling'

Bob Went, Pump Centre Consultant

1. Introduction

Bob Went

The Whole Life Cost (WLC) or Life Cycle Cost (LCC) approach to estimating the costs to own, operate and maintain an asset over its life was introduced into the water industry by the author as a purchasing methodology for pumps in the early 1990s. It has now become a well-established procurement approach for a wide range of installations and is of particular benefit when comparing one option with another.

The WLC of a pump or any other asset is the summation of all costs incurred in the design, procurement, installation, operation and disposal of the pump at end of life. Various WLC models are available to determine the WLC of a pump. An LCC model and guidance notes may be downloaded free of charge from the Pump Centre WIMES website. Europump / Hydraulics Institute have also published a guide on the subject.

WLC elements are very often the same when comparing one option with another, for example, Design, Procurement, and Building costs. With the exception of similar costs, the most significant variables are Capital, Energy, and Maintenance costs.

2. Estimating Whole Life Cost

Comparison of Capital costs for different options in a WLC assessment is relatively straightforward requiring checks for compliance with the specification, performance and features. Energy costs over the asset life are more difficult to estimate due to escalation in energy prices and increased energy consumption caused by wear, changes in pump duty, and changes in the properties of the liquid being pumped. This article will focus on assessing maintenance costs in a WLC assessment and an approach to determining them.

a. Maintenance Costs

Maintenance requirements fall into two categories - **Planned Preventative Maintenance (PPM)** and **Reactive Maintenance (RM)**. PPM includes the routine checks and service activities required to compensate for wear, maintain operational efficiency and ensure that the pump remains operational for the longest period of time at minimum cost. PPM costs can be determined based upon manufacturer's guidelines and information contained in the Operation and Maintenance (O&M) manuals and can normally be forecast with a reasonable degree of accuracy.

b. Estimating PPM and RM Costs

PPM and especially RM costs cannot be estimated with total accuracy. Many variables influence these costs and many of these will also change over time. Wear rates on pump components will increase with time until the part requires replacement which can occur during a PPM or an RM event. The efficiency of the pump will also gradually reduce, thereby increasing energy consumption. The properties of the liquid being pumped may change with time and occasionally contain solids causing damage. Although the number and types of variables affecting PPM and RM activities may be considered generic the degree to which they affect costs are very often site specific.

PPM and RM costs may be considered in the following major categories:

- number and type of resources required including technicians, administrative support, and Health and Safety support
- time required to complete the PPM or RM task plus travelling time and time to access the pump
- spares and consumables

c. PPM and RM Cost Elements

PPM schedules are normally specified by the pump manufacturer and adopted, sometimes with modifications, by the end user. The costs incurred would be based upon the PPM schedules.

The major PPM and RM common cost elements are outlined below.

Time

The time required to complete a task may be broken down into a number of activities.

Travelling time to and from the site from the maintenance base including any extra time required to collect spare parts and deviations from the route to pick up colleagues.

Time required to gain access to the pump before any work can begin. This will include preparation of method statements, removing access covers and erecting safety barriers, testing the atmosphere to ensure a safe working environment, erecting scaffolding to provide safe access and clearing away and restoring on completion.

Time required to carry out the task. This will be different from one point in time to another and depend on how easily work on the pump can be carried out at the site.

Resources

The type and number of resources required for any activity is determined by the nature of the activity and site requirements. The generic PPM schedules for a pump, for example, specify the technical resources required but to these must be added the requirements for Health and Safety cover, site attendance, etc.

Spares and Consumables

The spare parts and consumables required will depend upon the scope of the PPM or RM activity and the nature of the pump duty. Some activities will require only consumables (such as grease, oils, etc.) whereas others will also require spare parts to be fitted.

d. Problems Forecasting Reactive Maintenance Costs

Whilst PPM activities may be reasonably forecast, RM activities very often cannot because they occur at random, sometimes without warning and with many variables influencing the level of response required. Forecasting RM costs, especially over a long time span, is therefore very difficult and not a precise exercise. It is further complicated by the fact that some RM events may not require immediate attention whereas others will. RM events also frequently occur out of hours and / or during Bank Holiday breaks.

Estimating RM costs has sometimes been a hit and miss exercise not based on hard data due to the uncertainties. A more objective data based approach is required. So how can PPM and RM costs in a Whole Life Cost analysis be estimated with any degree of confidence?

3. The Concept of the Maintenance Profiling Approach

The concept of Maintenance Profiling takes account of all the PPM and RM costs for a pump at the site where it will be installed by reference to site specific data. The costs for a PPM or RM task will vary from one site to another. It therefore makes sense to refer to site specific data and prepare a profile of all the PPM and RM events and associated costs for the same type of pump installed in the same location.

Where pumps are being installed into an existing pumping station or into a new pumping station on an existing site, operational experience and data should be available to create a Maintenance Profile (MP). The PPM and RM cost data in the MP will thus cover a range of events that are specific to the site in question. Some suggestions for the way in which to enter data into a WLC model are described in section 4 c below.

A WLC analysis will ensure that the most appropriate pump is chosen but it will only be valid if the PPM and RM costs for the pump are accurate. The Maintenance Profiling approach, by taking site specific PPM and RM data into account, will considerably improve the accuracy of the WLC analysis. The Maintenance Profiling approach is described in section 4.

There are also many instances where pumps are installed in new installations where there is no historic PPM and RM data available. In these instances it would be advisable to obtain data from an existing site where the following are the same:

- type of pump and its duty
- properties of the liquid to be pumped
- type of installation (e.g., inlet P.S.)
- Operational regime (e.g., hours run, stop / start frequency and sequence, etc.)
- PPM policy and scope applied

This data would form the basis to enter into a WLC model and although not as accurate as that obtained from an existing site, it will be objective and more accurate than data based upon subjective assessments.

4. The Maintenance Profiling Approach

The maintenance requirements and costs for time, resources and spares and consumables in PPM and RM activities are heavily influenced by the nature of the installation at the site. Estimating PPM and RM costs in a WLC model must therefore take into account the requirements that a particular site installation will impose.

The Maintenance Profiling Approach is the process of forming a cost profile or model of the PPM and RM history for similar pumps performing the same duty at the site where the new pumps will be installed. This data can then be used in a WLC assessment to more accurately predict the PPM and RM costs over the lifetime of the new pumps. Although forecasting maintenance costs over many years, particularly for RM events, is not a precise art using data from an existing installation in an objective assessment will provide a greater degree of accuracy.

a. PPM and RM Cost Model Elements

Many RM cost elements, such as travelling and access times, are also incurred during a PPM activity. PPM schedules are relatively easily derived and should be costed based upon the characteristics of the site where the pump will be installed. There may also be opportunities to reduce the cost of PPM tasks by scheduling visits to other sites in the vicinity on the same day.

The location of the pump installation and ease of access could have a significant impact on determining the costs incurred in dealing with an RM event. Pumps installed at the base of an 85 metre shaft in a city centre will require far more time and effort to access than similar pumps in a shallow dry well in a less populated area. The properties of the liquid being pumped will have a significant impact on pump performance and affect the level of RM required. Due to differences in the system and nature of the liquid being pumped the same pump may operate very well with low RM requirements at one site but operate very poorly with high RM requirements at another. In addition, the operational scenario and the way in which the PPM plan is prepared may not be the same at different sites. Some companies, for example, adopt a zero PPM approach for certain types and sizes of pump, irrespective of duty, whilst others apply PPM across the board.

All of these variables will therefore determine the level of RM required and be site specific.

The scope of PPM activities will vary dependent upon the site and type of pumps installed. Taking a waste water wet well installation as an example, they would typically include the following:

- Travelling time to and from site. The cost of this may vary considerably from one site to another depending on location of the maintenance base and starting point.
- Erection of safety barriers and provision of safe access
- Ventilating the well and checking atmosphere
- Removal of debris from the sump
- Time working on the pump carrying out the PPM or RM activity. How easily this can be carried out at the site varies. For example, lifting the pump periodically and the time required for this will depend on site specific constraints such as lifting equipment, working at height etc.
- Checking condition of power cables and guide rails
- Checking and cleaning sensors
- Checking the pump is correctly seated on the suction support footstall
- Pumping down to 'Snore' level and cleaning sump walls
- Replacing covers and removal of safety barriers on completion

Some sites may require additional activities to those listed, for example in regards to access arrangements and checks specific to the type of pump. The costs associated with the above activities, including resources, administration, and spares and consumables, will form the overall PPM or RM cost. Administrative costs are incurred in arranging the PPM, scheduling it, and ordering the spares and consumables required.

The scope of spare parts and consumables used will vary not only with time but also with the site specific characteristics. Pumping a liquid containing high levels of grit at one site may cause accelerated wear of the pump impeller whereas higher levels of rags and Fats, Oils and Grease (FOG) may cause blockages at other sites. Generic PPM schedules will therefore require modification to account for specific site conditions.

Maintenance Profiling provides an objective data based approach to determining PPM and RM costs to go into a WLC model that can be used for procurement purposes. The data can be updated periodically after the pump is in service to calibrate the WLC model and provide more accurate and updated information for future pump WLC assessments.

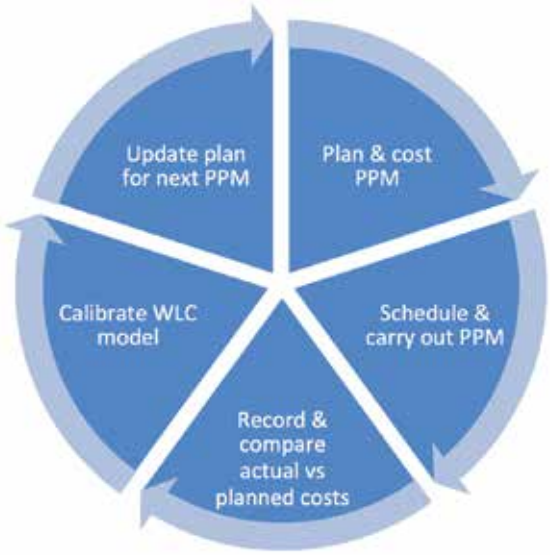

Figure 1: PPM and WLC Update Cycle

Figure 1 shows a typical sequence of events in determining and updating PPM costs. The initial scope of the PPM activity is planned and costed based upon the supplier's recommendations and experience of similar pumps in similar installations. Once the PPM activity has been completed the costs incurred may be compared with those planned and an analysis carried out to determine the reasons for any significant variation. It may well be that a site specific requirement comes to light that had not been anticipated or that a better way of completing the task becomes apparent. The output from this can then be used to calibrate the WLC model produced at the procurement stage and update the maintenance plan and costings for the next PPM event. Going progressively through this process with each PPM event will provide a more accurate costing structure and form a cost database that can be used for other installations. It may also be a starting point for WLC analyses at other similar sites.

b. RM Cost Model

Many of the costs and processes used to determine PPM costs will also apply to determining RM costs. However, whilst the RM model will include many of the activities and costs in common with the PPM model (e.g., travelling and access costs) there will be others that cannot be forecast as easily. To estimate these costs, records for an existing pump of the same type and duty ideally installed in the same site and location should be obtained. An analysis of the data over the life of the pump will show the frequency of RM visits, the nature of the failures and the timescales, resources, and costs incurred for each event.

The RM model will obviously be much more complex than the PPM model due to the unpredictable nature of the RM events. As a starting point, RM events may be classified as shown in Figure 2. Classifying data in such a manner helps to identify common failure scenarios and assists with a root cause analysis. Whilst the main objective of the exercise is to forecast the WLC more accurately, the opportunity to reduce RM events and increase MTBF by analysing the data during the process should not be missed. Figure 2 also shows some examples of causes and consequences of failure, such as the impact on the process due to an RM event. The cost of a process failure can be significant.

Mechanical	• Failure of bearings, seals, wear rings, couplings, etc. • Damage to impeller, pump casing, coatings, etc. • Excessive vibration, material failure due to incorrect selection
Electrical	• Motor failure, excessive power consumption • Frequent overload trip • Cable damaged or cable connection problem
Hydraulic	• Blockages, cavitation, air entrainment causing vibration • Low or no flow, low discharge pressure • Insufficient suction pressure
System	• Build up of solids on water surface in the sump • Change in system causing pump to operate away from BEP • Impact of an RM event on the process - e.g., treatment failure

Figure 2: RM event classifications and example issues

Having obtained historic data for RM events, the next step is to turn this into a format suitable for entry into a WLC model. At this stage it is worth analysing the data to determine whether some existing RM events can be avoided with the installation of the new pump. Some events may be caused by site specific issues for which there is no practical solution or due to lack of budget availability. The sump design, for example, may not be ideal especially if larger pumps are being installed. However, although it may not be practical to construct a new sump there may be options available to install baffles to help improve the flow into the pumps. Analysing the existing RM data to see what viable options are available to reduce the number of events provides a significant benefit and should be considered before applying the data gathered into the WLC model.

c. Data Entry into a Whole Life Cost Model

Having obtained the PPM activities and RM events data, the next step in the Maintenance Profiling approach is to segregate those activities / events that are likely to recur in future from those that can be prevented. PPM costs can be predicted with a reasonable degree of confidence based upon previous experience and manufacturers' recommendations. RM events should be classified as those for which an economic solution is available and those for which there is no economic solution. For all RM events where there is an economic solution, remedial action should be taken before installing the new pump. This has obvious benefits and is an important step in the process. The frequency and costs of RM events that do not have an economic solution should be assessed over the life of the pump. The overall process for determining the WLC for RM events may be as summarised as follows:

- Select a similar pump with the same duty and in the same location as the new pump is to be installed.
- Obtain RM events data for the pump selected, ideally over a long period that includes major and minor RM events. The accuracy of the RM cost calculation will be improved where data is available over a longer period of time.
- Analyse the data to determine whether any RM events can be cost effectively prevented from happening again.
- For the remaining RM events classify them as either Mechanical, Electrical, Hydraulic or System related.
- Further apply a priority classification that signifies the urgency of the response required. Category 1, for example, may signify an immediate response, category 2 a first priority next day response and category 3 a within 5 days response. Such a classification helps to estimate the call out and resource costs. Table 1 shows an example of a simple spreadsheet layout for recording such information.
- The frequency of occurrence for each event should be used to forecast the likely frequency of occurrence during the WLC period. A damaged impeller, for example, may only occur once during a WLC period whereas blockages are likely to occur more frequently.
- The cost for each RM event should include all associated costs including travelling time, resources, spares and consumables, Health and Safety compliance, and administrative costs.
- Using either an existing company maintenance software package or a spreadsheet (example shown in Table 1) the cost per RM event may be computed over the asset life (the WLC period). The final column shows the product of the individual event cost multiplied by the frequency in the WLC periods.
- The WLC for all RM events is the summation of the WLC per event costs in the final column.

Estimating RM costs over the asset life of a pump spanning many years cannot be a precise exercise due to the variables and uncertainties involved. This process however, provides a more objective means of determining the costs. It also provides a database that can be used to help forecast the WLC for other installations and the opportunity to carry out further analysis to reduce the number of RM incidents and costs further. The value of gathering and analysing such data should not be underestimated.

5. Data Sources

The importance of having accurate data available to effectively manage a maintenance programme cannot be overstated. There are many well established maintenance management programmes on the market that can be used to obtain the data described in this article if not carry out the analysis as well. The availability of such data can also be of great benefit in troubleshooting problematic installations and reducing the number and frequency of RM events. For those who do not have a corporate maintenance software package capable of deriving and analysing data as described there are other potential sources available albeit requiring more effort.

Job sheets (in paper or electronic format or both) are in common use to record maintenance activities and in many cases include much of the data described above. Where electronic job sheets are in use transferring the data into a format for WLC analysis may not be a very time consuming exercise whereas data in paper format will require another level of data entry activity.

Many companies employ Workforce Management or Service Mobility solutions whereby service technicians use PDAs or tablets to both receive their work schedule and enter data regarding the maintenance activity when completed. Modern Workforce Management packages come with a wide range of very powerful facilities allowing companies to schedule the technicians workload (in many cases using Dynamic Scheduling), monitor progress, track the time taken to complete the task, prepare an electronic invoice at site, and take photographs and monitor performance vs. targets. All of this information is relayed back to the service centre for subsequent analysis and action. A Workforce Management package could extract the data discussed in this article and possibly carry out

Type of event	Frequency in WLC term	Priority	Cost inc. spares & resources	Whole Life Cost per events
Mechanical				
Failure of Bearings, Seals, Wear rings	1	1	650	650
Damaged impeller, coatings	1	1	1500	1500
Excessive vibration	2	2	400	800
Electrical				
Excess Power consumption	1	2	750	750
Overload trip	3	1	285	855
Cable damage	2	1	1000	2000
Hydraulic				
Blockages	10	1	500	5000
Low discharge pressure	2	2	550	1100
Low suction pressure	3	2	485	1455
System				
Pump operating away from B.E.P.	4	3	685	2740
Buld up of solids on water surface	12	2	400	4800
Increased system resistance	2	2	1000	2000
Totals	43		8205	
		Total WLC for all RM events		23650

Table 1: Schedule of RM events and WLC summary

the analysis dynamically. This would provide ongoing and up to date information which would be of great benefit to the business.

Acquiring the data described in this article also has a value in its own right. Quite apart from the business benefits discussed the data acquired can be used to benchmark installations elsewhere. With sufficient data available and having developed an understanding for the differences in PPM and RM costs from one site to another, it may be beneficial to compare similar pumps with similar duties at different sites. There will of course be differences in the two installations for the reasons explained earlier in this article and hence the need for the Maintenance Profiling approach. However, as data is gathered for different sites the reasons for the differences will become apparent. It may be, for example, that the nature of the liquid being pumped and its content is very different from one site to another and is something over which there is no control. It also may be the case that differences are due to factors over which the business does have some control, for example, the operational routine, approach to maintenance (or no maintenance) or materials (or coatings) used for pump impellers. Having the data available and in a format that allows analysis enables a business to optimise their overall operation and significantly reduce costs. One should also not overlook the commercial value of gathering such data. There are many companies who do not have the resources or installed base to gather and analyse the data as discussed. Being in a position to benchmark others' installations could be commercially advantageous, especially to a company whose core business is a service offering to maintain installations for others.

6. Building Information Modelling (BIM)

There are a number of ways in which the data discussed in this article can be gathered and analysed and some of them have been outlined. A development that may make the Maintenance Profiling approach much easier and faster to apply in the future is Building Information Modelling (BIM). BIM is a new approach to exchanging information in a digital format and with further development may have significant application to FM management. Whilst BIM may not currently be at a stage of development to carry out the data acquisition and analysis described, it may very well be able to do so in future.

BIM is the process of designing a building collaboratively using one clear system of computer models rather than as separate sets of drawings. BIM has been adopted in many areas of construction in recent years and has reportedly saved large sums of money by eliminating errors between different contributors to a building design. BIM has '*....saved Crossrail millions*' according to Malcolm Taylor, the head of technical information at Crossrail.[1] BIM is being promoted by the government who introduced it in 2011 as part of its Construction Strategy to reduce public sector asset costs by up to 20% by 2016. The BIM Task Group (http://www.bimtaskgroup.org/about/) are supporting and helping deliver the objectives of the Government Construction Strategy and the requirement to strengthen the public sector's capability in BIM implementation with the aim that all central government departments will be adopting, as a minimum, collaborative Level 2 BIM by 2016. BIM is also being promoted by several other task groups in various industry sectors, one of which is BIM4 Water (http://www.bimtaskgroup.org/bim4water/).

Level 2 BIM is achieved when all parties working on a project work together using 3D CAD models but not necessarily a single shared one. Information is shared through a common file format allowing everyone to use that information with their own to form an amalgamated BIM model. The CAD software used must be capable of exporting to one of the common file formats. This allows all parties to access the model and check the data. BIM level 3 is seen as the ideal scenario where all parties would use the same shared project model held in a centralised location. All parties would be able to access the same model thus removing the potential for conflict of information errors. 4D BIM is currently being discussed which would allow BIM data be used to analyse time.

Future projections are 5D BIM to include cost management and 6D BIM to include facilities management.

The BIM Task Group has published a strategic plan for level 3 BIM[2] that includes reference to the development of BIM in future. The plan states that '*The availability of in service performance data on a wide scale will also enable smarter decisions to be made by clients and operators at all levels*'. This aspiration for Operations and Performance Measurement and Management to be included within BIM will hopefully enable better collection and analysis of PPM and RM data for use in a WLC model using the Maintenance Profiling approach.

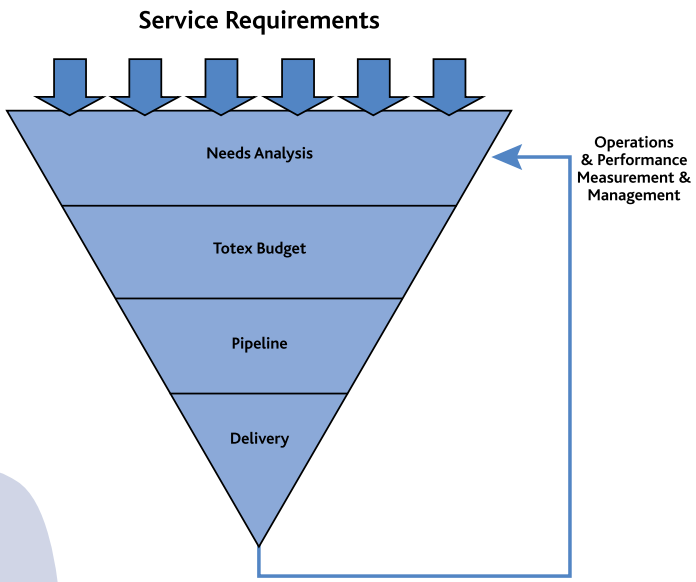

Figure 3: Transparent Investment Model - Reproduced from 'Level 3 BIM - Strategic Plan' Report

Figure 3 is reproduced from the BIM Task Group 'Level 3 BIM - Strategic Plan' report and shows the inclusion of 'Operations & Performance Measurement & Management' activity in a future BIM environment.

Although the current application of BIM may not be the vehicle to collect and analyse data for the Maintenance Profiling Approach, 6D BIM may very well be.

7. Summary

The WLC approach is well established as a methodology to ensure the most economical pump is procured taking into account all the costs of ownership. Planned Maintenance and Reactive Maintenance costs form a significant part of the cost of ownership but have been challenging to accurately estimate, especially the RM component, over an extended period of time. Maintenance Profiling using data from existing similar installations can provide improved accuracy and the opportunity to reduce expenditure. Data collection and analysis is essential and may be of significant commercial value.

[1] 'Big Data in Action' article, Professional Engineering magazine July 2015
[2] 'Digital Built Britain: Level 3 Building Information Modelling - Strategic Plan' HM Government February 2015

Pump Centre

Conference and Exhibition 2016

To be held on Thursday, 12 May 2016 at
The International Centre, Telford from 08:00-1600hrs

The Pump Centre Conference and Exhibition is the premier UK event for pumps and pumping systems. The event is predominantly, but not exclusively aimed at the Water Industry.

The 2016 Conference is bigger than ever before and most of the UK's major suppliers will be exhibiting. There will be approaching 1000 attendees under one roof making it the ideal venue to meet industry experts and key contacts from across the supply chain – pump users, manufacturers, suppliers, contractors and consultants.

The event includes a full technical programme and engineering breakout sessions!

This is the ideal event for both EXHIBITORS & DELEGATES – all the key players under one roof at the same time.

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If you are interested in exhibiting or attending contact Jim Eaves on 07968 707753
Jim.eaves@esrtechnology.com
For more information – visit the website – www.pumpcentre.com

Pump Centre

Pump Centre, ESR Technology Ltd, 202 Cavendish Place, Birchwood Park, Warrington, Cheshire, WA3 6WU
pumpcentre@esrtechnology.com **www.pumpcentre.com**

New Stratos launched by Wilo

Wilo has launched its new improved version of the popular Wilo-Stratos glandless circulating pump for hot water heating systems, air conditioning and closed cooling circuits here in the UK.

The enhanced version of the pump can now deliver to systems based on actual need thanks to the efficient 'Q-limit" operating mode and it also boasts a new and improved energy efficiency index (EEI) of 0.20 or less. This exceeds the value prescribed by the 2015 Ecodesign Directive and also meets the ErP benchmark requirement.

By optimising the hydraulics and the motor, Wilo has succeeded in improving the energy efficiency index once again. That's an impressive 15% increase in efficiency compared to the earlier Stratos. The new software for the highly efficient Wilo-Stratos features the new "Q-limit" operating mode, and thanks to this new function, the new Stratos not only saves more energy, it reduces the system noise at the same time.

Proven quality and superior reliability remain core features of this new model. Thanks to the familiar red button technology, the Wilo-Stratos guarantees easy and reliable operation. The freely positionable display which features optimised legibility, allows for vertical and horizontal installation. The pump housing has a cataphoretic coating which prevents corrosion caused by condensation, making it extremely durable.

www.wilo.co.uk

New and updated Pump Centre training courses for 2016!

The Pump Centre has a well-established and extensive programme of scheduled and in-house training courses covering a wide variety of many subjects which it has offered for many years. Demand for the courses has been high and is now increasing in order to satisfy companies' requirement to have trained staff in-house that can deal with pumps and pumping systems related issues. Such needs include ensuring those who design and procure pumps and pumping systems have the right skill set to do their job and deliver cost effective and reliable installations for their business. All Pump Centre courses are delivered by lecturers with many years of experience in their field in both design and operational roles.

To satisfy the increase in demand and offer a wider range of courses the Pump Centre has developed a new and enhanced training programme for 2016 including new and updated training courses. The majority of the courses will be scheduled to run in both Warrington and Reading and will also be available to run in-house.

The new courses include a 3 day **Pumps & Pumping Systems - Introduction, Intermediate and Advanced** course. Delegates may choose to attend one or all three days of this course which will cover the basics and topics such as parallel & series pumping, pump components, variable speed curves, cavitation, sump design, surge analysis and fault finding. Another new course is the one day **Pumps & Pumping System - Non Engineers** course which is designed for those who work in a pump company but are not pumping system design engineers and in other disciplines such as administration or finance. The course provides the delegate with an appreciation of the basics, different types of pumps and pump systems.

Other courses include a one day **Sewage Pumping Station Design** course which will focus on the particular requirements for sewage pumping, a one day **Introduction to the Sewage Treatment Process** course that will outline the processes and equipment in a modern sewage treatment plant and an **Effective Presentation skills** course that will aim to provide delegates with the skills and confidence they need when preparing and presenting presentations to peer groups and senior management.

For details of these and all other Pump Centre training courses please refer to the Pump Centre website www.pumpcentre.com or contact Jim Eaves.

Jim Eaves 07968 707753 or jim.eaves@esrtechnology.com

Pump Centre

Training & Awareness Day Provisional Programme 2016

Title	Date	Full Price	Members Price
Pumps & Pumping Systems – Introduction (Reading)	19 January 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Intermediate (Reading)	20 January 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Advanced (Reading)	21 January 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction, Intermediate & Advanced (Reading)	19 – 21 January 16	£795 + VAT	£556 + VAT
Introduction to the Water Treatment Process (Reading)	2 February 16	£350 + VAT	£245 + VAT
Introduction to the Sewage Treatment Process (Reading)	3 February 16	£350 + VAT	£245 + VAT
Pumping in the Water Industry – 4.5 days (Reading)	8 – 12 February 16	£995 + VAT	£696 + VAT
Introduction to Valves (Reading)	16 February 16	£350 + VAT	£245 + VAT
Principles of Electric Motors & Drives (Warrington)	17 February 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Non Engineers (Reading)	23 February 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction (Warrington)	15 March 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Intermediate (Warrington)	16 March 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Advanced (Warrington)	17 March 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction, Intermediate & Advanced (Warrington)	15 – 17 March 16	£795 + VAT	£556 + VAT
Centrifugal Pump Repair Awareness Day – TBC	1 March 16	£120 + VAT	£96 + VAT
Centrifugal Pump Repair Awareness Day – TBC	3 March 16	£120 + VAT	£96 + VAT
Sewage Pumping Station Design (Reading)	8 March 16	£350 + VAT	£245 + VAT
Effective Presentation Skills (Reading)	5 April 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Non Engineers (Warrington)	12 April 16	£350 + VAT	£245 + VAT
Introduction to the Water Treatment Process (Warrington)	19 April 16	£350 + VAT	£245 + VAT
WIMES Awareness Day (Reading)	19 April 16	£120 + VAT	£96 + VAT
Introduction to the sewage Treatment Process (Warrington)	20 April 16	£350 + VAT	£245 + VAT
Conference & Exhibition 2016	11 – 12 May 16	FREE	
Pumps & Pumping Systems – Introduction (Reading)	24 May 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Intermediate (Reading)	25 May 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Advanced (Reading)	26 May 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction, Intermediate & Advanced (Reading)	24 – 26 May 16	£795 + VAT	£556 + VAT
Pumping in the Water Industry – 4.5 days (Warrington)	TBC May 16	£995 + VAT	£696 + VAT

Title	Date	Full Price	Members Price
Introduction to the Water Treatment Process (Warrington)	7 June 16	£350 + VAT	£245 + VAT
Introduction to the Sewage Treatment Process (Warrington)	8 June 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Non Engineers (Reading)	14 June 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction (Warrington)	13 September 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Intermediate (Warrington)	14 September 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Advanced (Warrington)	15 September 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction, Intermediate & Advanced (Warrington)	13 – 15 September 16	£795 + VAT	£556 + VAT
Sewage Pumping Station Design (Warrington)	20 September 16	£350 + VAT	£245 + VAT
Pumping in the Water Industry – 4.5 days (Reading)	26 – 30 September 16	£995 + VAT	£696 + VAT
WIMES Awareness Day (Warrington)	TBC October 16	£120 + VAT	£96 + VAT
Scottish Conference Mini Conference	6 October 16	£120 + VAT	£96 + VAT
Waste Water Screening & Preliminary Treatment (Warrington)	12 October 16	£350 + VAT	£245 + VAT
Compressors Awareness Day – TBC	17 October 16	£120 + VAT	£96 + VAT
Positive Displacement Pumps – Holiday Inn Washington	20 October 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction (Reading)	1 November 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Intermediate (Reading)	2 November 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Advanced (Reading)	3 November 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Introduction, Intermediate & Advanced (Reading)	1 – 3 November 16	£795 + VAT	£556 + VAT
Social Media Awareness Day (Warrington)	8 November 16	£120 + VAT	£96 + VAT
Principles of Electric Motors & Drives (Reading)	9 November 16	£350 + VAT	£245 + VAT
Pumps & Pumping Systems – Non Engineers (Warrington)	10 November 16	£350 + VAT	£245 + VAT
Introduction to Rolling Element Bearings (Warrington)	15 November 16	£350 + VAT	£245 + VAT
Pump Maintenance (Warrington)	16 November 16	£350 + VAT	£245 + VAT
Why Mechanical Seals Fail (Warrington)	17 November 16	£350 + VAT	£245 + VAT
Pumping in the Water Industry 4.5 days (Warrington)	21 – 25 November 16	£995 + VAT	£696 + VAT
Introduction to Valves (Warrington)	6 December 16	£350 + VAT	£245 + VAT

(Awareness Days are highlighted in red).

Pump Centre members receive 30% discount off training courses and 20% discount off Awareness Days

All courses (unless indicated) will be held at:

All Reading courses will be held at: Best Western Calcot Hotel, Reading, RG31 7QN

All Warrington courses will be held at: The Lymm Hotel, Warrington, Cheshire, WA13 9AQ

The majority of our training courses can be run "In-House" at a venue selected by the Client. In-house courses become cost effective when clients have 8 or more members of staff to be trained. Please contact the Pump Centre for a quote.

To discuss your training requirements contact:
Jim Eaves: 07968 707753 or email jim.eaves@esrtechnology.com

To reserve your places contact:
Karen Bridgeman: 01925 843512 or email karen.bridgeman@esrtechnology.com

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