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A NOTE ON THIS ISSUE:

Welcome to September's MPT! Before you leave for this year's WEFTEC, check out our special section (pg. 12) featuring MPT's choices for must-see exhibitors at this year's show. From well-known international brands to up-and-comers in the industry, you'll want to block off time in your schedule to visit each one.

Also in this issue, our Case Studies section includes a close-up look on maintaining high performance in extreme conditions (pg. 16). Kevin Schoeters of Atlas Copco shows how, at over two and a half miles above sea level, his company's portable air compressors are lifting vertical mining operations to new heights.

In our Water & Wastewater Focus for this issue, every wastewater treatment facility eventually faces the challenge of aging and deteriorating equipment (pg. 20). However, replacing the old with the new isn't always the best decision. Check out how Sentry Equipment proves that, if you want to give your equipment extra life, repair and retrofit services might be the best answer. Enjoy!



J. Campbell, Editor
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WOOD TO MODERNIZE AND EXPAND BRITISH COLUMBIA'S ELECTRICAL INFRASTRUCTURE

Wood has been selected by BC Hydro, a Canadian electric utility corporation, to modernize and expand the electric grid in British Columbia to meet the province's 2030 emission reduction targets.

Under the \$200 million, seven-year master services agreement, Wood will deliver engineering, procurement and construction management services to modernize power lines, substations, and transmission and distribution lines. These modifications will provide cleaner and more reliable energy to communities across the province.

In January 2024, BC Hydro outlined its investment plans to sustain and expand the electricity system to ensure it is fit for the future. BC Hydro currently provides power to 95 percent of the population of British Columbia, with 98 percent of this power coming from clean renewable sources.

Justin Jackson, senior vice president of process and chemicals Americas at Wood, says: "We have been working with BC Hydro for over fifteen years with a history of successful project delivery. Our unrivalled knowledge and expertise in British Columbia have positioned us well to partner with BC Hydro and deliver the modifications required to reach their emissions reduction targets."

AWWA ACHIEVES EVENTS INDUSTRY COUNCIL FOUNDATIONS LEVEL CERTIFICATE

The American Water Works Association (AWWA) announces that it has earned the Foundations Level Certificate from the Events Industry Council (EIC), marking a significant step in the association's commitment to sustainable and socially responsible conference and event management.

The EIC Foundations Certificate Program guides organizations in establishing policies and plans designed to launch successful sustainability and social impact programs within events. AWWA earned its certificate based on the evaluation and approval of AWWA's best practice principles. These include plans and policies around sustainability, social impact, diversity, equity, inclusion and belonging, and conference code of conduct.

"By earning the Foundations Level Certificate from EIC, AWWA reaffirms its commitment to stewardship, continuous improvement, and shaping a sustainable water future," says AWWA CEO David LaFrance. "We are committed to embedding sustainable practices into every aspect of our events."

Now that it has earned the Foundations Level Certificate, AWWA will work closely with EIC, third-party auditor Alliance for Audited Media (AAM), and Colorado-based sustainability consultants Honeycomb Strategies (HCS),



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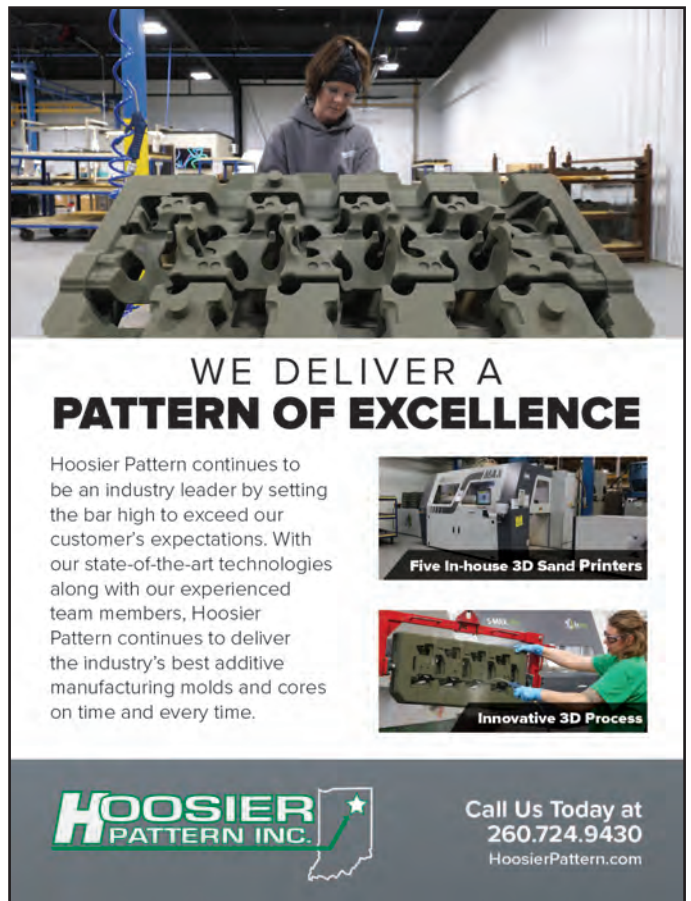
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to conduct a full logistics audit on the 2025 Annual Conference and Exhibition (ACE25).

LUCAS OIL FOUNDER HONORED WITH NHRA LIFETIME ACHIEVEMENT AWARD

The founder of Lucas Oil, Forrest Lucas, has been awarded the prestigious NHRA Lifetime Achievement Award. The honor was presented at the Annual Sportsman Appreciation Dinner during the NHRA U.S. Nationals at Lucas Oil Indianapolis Raceway Park.

Lucas is celebrated worldwide for his exceptional contributions to the automotive industry and motorsports. For more than twenty years, Lucas Oil has been one of NHRA's most prominent supporters, serving as the title sponsor of the Lucas Oil Drag Racing Series, which features the best and most decorated sportsman competitors in drag racing.

"I can't say enough about Forrest Lucas; he truly embodies the spirit of drag racing, sharing the same resilience and passion that runs deep in our sport," says NHRA President Glen Cromwell.

Beyond his business acumen, Lucas has been a generous philanthropist and sports marketing giant. His strategic sponsorships span amateur and professional sports, from the iconic Lucas Oil Speedway to high-profile partnerships like Lucas Oil Stadium. Lucas Oil's presence

is also prominent in events like Monster Jam and through sponsorships of the Dallas Cowboys.

PFAS REDUCTION PROJECT AWARDED STOCKHOLM JUNIOR WATER PRIZE

Christopher Whitfeld and Wenqi (Jonathan) Zhao from the United Kingdom receive the prestigious Stockholm Junior Water Prize 2024 for their work on PFAS pollution in the Thames Basin. HRH Crown Princess Victoria of Sweden presented the winners with their award during a ceremony at World Water Week in Stockholm.

Per- and polyfluoroalkyl substances (PFAS) pollution is a growing concern worldwide. Focusing on the Thames Basin in the United Kingdom, where there are with no equitable solutions to the problem, Whitfeld and Zhao developed a geospatial neural network, predicting PFAS values to within 10 percent of experimentally validated values. For this, they were announced the winners of the Stockholm Junior Water Prize, an international competition where students between the ages of 15 and 20 present solutions to major water challenges.


The winners were presented with their prize during an award ceremony at World Water Week by HRH Crown Princess Victoria of Sweden, the Prize's Official Patron. The Stockholm Junior Water Prize has been organized

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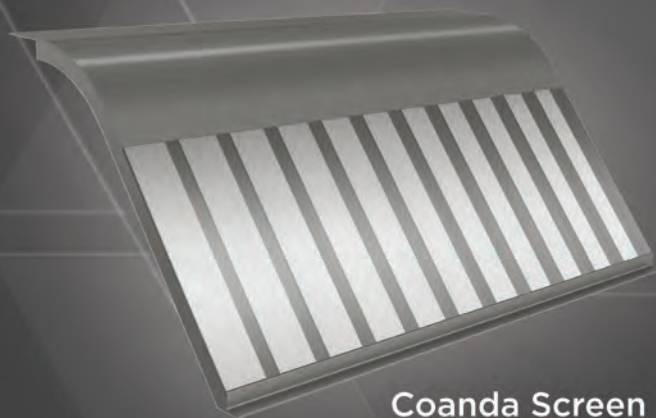
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INNIO RECEIVES THIRD CONSECUTIVE ECOVADIS PLATINUM MEDAL

Innio Group has been awarded the 2024 EcoVadis Platinum medal for the third consecutive year. This award underscores Innio Group's measurable ESG progress in categories such as environment, labor and human rights, ethics, and sustainable procurement. At the same time, it is a huge motivation for the entire Innio Group team to continue their efforts to be at the forefront of sustainable growth. The Platinum medal places Innio Group, along with its Jenbacher, Waukesha, and myPlant product lines, in the top 1 percent of more than 130,000 companies assessed globally.

This rating marks the fifth annual review cycle of INNIO Group by EcoVadis and is a testament to the company's consistent business and sustainability strategies. The award recognizes Innio Group's robust sustainability program and reinforces its position as a leader in delivering innovative energy solutions and services for a climate-neutral future.

"Earning the EcoVadis Platinum medal for the third consecutive year is a major achievement," says Dr. Olaf Berlien, president and CEO of Innio Group. "INNIO Group sets the right priorities. We drive innovation in energy and build trust and transparency."

ARI-ARMATUREN ACQUIRES WARREN CONTROLS, EXPANDS AMERICAN PRESENCE

ARI-Armaturen Albert Richter GmbH & Co., a leading European valve-industry company, announces the acquisition of Warren Controls, Inc., a control valve company based in Bethlehem, Pennsylvania. The acquisition is part of ARI's strategic plan to expand its presence in the USA and strengthens its position as a global player in the valve industry.

The acquisition of Warren Controls brings with it a wealth of experience and expertise in the control valve industry, which will complement ARI's existing capabilities in the USA. The acquisition will also enable ARI to expand its product portfolio and offer its customers a wider range of products and services.

"We are excited to welcome Warren Controls to the ARI team," says Heinrich Brechmann, managing partner and CEO of ARI-Armaturen.

"The acquisition is a key part of our strategy to expand our presence in the USA and offer our customers a wider range of control valves and we believe that the combination of ARI and Warren will create a strong and dynamic force in the valve market," adds Andy Stewart, managing director of ARI-USA.

The acquisition of Warren Controls, Inc. was subject to regulatory approvals and was completed August 12, 2024.

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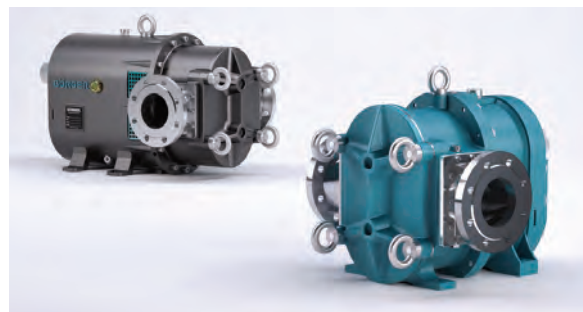
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Atlas Copco's portable XAS 88 air compressor at work in Chilean mine.



HIGH PERFORMANCE AT HIGH ALTITUDE

Overcoming extreme challenges in Chile's vertical mines

BY KEVIN SCHOETERS, ATLAS COPCO

At over two and a half miles above sea level, Atlas Copco's portable air compressors are lifting vertical mining operations to new heights; providing the essential toughness, precision and power required for such a high-intensity application.

In the heart of Chile's demanding mining environment, Vertical Mine Chile has been leading the vertical assembly service sector for over fifteen years, specializing in the installation, maintenance, and repair of high-altitude structures. Operating in some of the world's most challenging conditions, including extreme altitudes, irregular terrain, and harsh weather, Vertical Mine Chile relies on a range of Atlas Copco's notoriously rugged portable air compressors and tools to meet these demands.

MEETING EXTREME ENVIRONMENTAL CHALLENGES

It's safe to say that Vertical Mine Chile faces unique challenges in their operations. Working at great heights,

often on steep slopes or unstable ground, and under severe weather conditions such as strong winds and intense solar radiation, demands robust and reliable equipment. Atlas Copco's portable air compressors and tools are crucial in these high-stakes environments, ensuring the necessary air and mobility.

Marcos Rodríguez, operations manager of Vertical Mine Chile, highlights the importance of their equipment: "In the field of industrial vertical works where precision, air, and mobility are fundamental, we have found in Atlas Copco's equipment our most reliable allies. As specialists in the installation, maintenance, and repair of high-altitude structures, we face extreme challenges that demand the best in terms of technology and performance."

PRECISION AND EFFICIENCY

One of the critical projects includes work at Codelco Andina's basin, over 2 miles above sea level. Here, Atlas Copco's portable air compressors are vital for drilling during the

installation of dynamic barriers, mesh fortification, and Pexgol pipe anchoring. Vertical Mine Chile utilizes Atlas Copco models XAHS 400, XAS 88, and U190, essential for their operations ranging from drilling to manual operations on the face of the slopes.

"The main challenges we face in our operations include extreme altitude and mobility on complicated ground. Atlas Copco's equipment, such as the XAS 88 and U190 compressors, stand out for their ability to operate at great heights and their ease of movement, which allows us to carry out our tasks with precision and efficiency," adds Rodríguez.

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Atlas Copco's portable U190 air compressor at work in a Chilean mine.

extreme temperatures, thanks to the exceptional quality of their materials, size, weight, and durable components.

These units feature HardHat™ technology, a robust medium-density polyethylene cover resistant to corrosion, impacts, and fading, ensuring maximum durability in demanding applications.

"We chose Atlas Copco's equipment for several reasons. Firstly, their power and reliable quality are unmatched, making them ideal for our specialized operations. Additionally, the ability to move our equipment by helicopter over 4,000 meters above sea level is crucial, and these compressed air units perform exceptionally well. Plus, the after-sales service has been impeccable, providing us with quick and effective support at all times," Rodríguez notes.

CONCLUSION

In an industry where failure is not an option, and the harshest conditions are the norm, Vertical Mine Chile's reliance on Atlas Copco equipment underscores a partnership built on resilience, reliability, and top-tier performance. In one of the world's toughest environments, Atlas Copco's portable air compressors and tools are essential to ensure the success and safety of critical operations; helping Vertical Mine Chile to set new standards for excellence in high-altitude industrial operations. ■

KEVIN SCHOETERS is vice president of communications for Atlas Copco and can be reached at kevin.schoeters@atlascopco.com. Atlas Copco Group enables technology that transforms the future. We innovate to develop products, services and solutions that are key to our customers' success. Our four business areas offer compressed air and vacuum solutions, energy solutions, dewatering and industrial pumps, industrial power tools and assembly and machine vision solutions. For more information, visit www.atlascopcogroup.com.

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BALANCING COST AND PERFORMANCE

Getting more power from your equipment

BY TERRY REYBURN



Every wastewater treatment facility eventually faces the challenge of aging and deteriorating equipment, affecting operational efficiency. Drives struggle to keep up their power, skimmers deteriorate and break, and corrosion wears away at crucial components. Not only do these factors demand additional maintenance and labor from employees, but also pose a threat of critical failure. To avoid a complete shutdown, plant managers may turn to new equipment purchases. However, replacing the old with the new isn't always the best decision.

MORE THAN ONE SOLUTION

While purchasing new equipment is often an obvious solution to increasing power, identifying repair and retrofit services offers distinct,

cost-effective advantages over new capital expenses. A common misconception about repair and retrofit services is that this option is only reserved for minor, more contained maintenance concerns. However, repair and retrofit services can be applied to equipment across an entire project, restoring integrated systems to their maximum efficiency and, in some cases, even better than their original condition.

Repair and retrofit services can offer a wide variety of solutions, but why is this path becoming a popular option over a new equipment purchase?

PRICE ALWAYS MATTERS

In the initial construction of wastewater treatment facilities, several factors are considered when purchasing original equipment. Life-

cycle, replacement, and historical costs are considered carefully when planning a construction budget. However, equipment corrosion and, ultimately, machine failure are challenging to plan for. Numerous external variables can skew the expected equipment lifecycle and the efficiency of components in a wastewater treatment facility, throwing budgets out of whack and sticking decision-makers in an undesirable financial situation.

In the right applications, repair and retrofit services are budget-friendly options to help restore underperforming or deteriorating equipment to excellent condition, preventing the chance of critical equipment failure in the long run. Repair and retrofit service providers can also access equipment conditions across entire integrated systems,



EMPLOYEE LABOR AND TRAINING

While new equipment can be exciting, it can also be a pain point for employees. With any new equipment installation comes different maintenance protocols, lengthy training on features and specs, and overall comfortability with the latest equipment. While equipment manufacturers provide the necessary tools for proper integration and training, the process of learning new equipment can sometimes be a drawn-out experience that impacts the efficiency of both employees and the operation.

With repair and retrofit services, there is rarely an interruption in protocols or training. In many cases, service providers will simply take a piece of equipment that's corroded or damaged and add anti-corrosion coatings, improve connection points, and reinforce with appropriate materials. Because the vital structure and functionality is left virtually untouched, employees spend minimal time learning how to properly use the repaired equipment. For larger repair and retrofit projects like a clarifier drive, most repair and retrofit service providers will also provide a monitoring panel. Some key features include a torque display

identifying underlying potential risks that pose a future threat to operations efficiency. The short-term cost to long-term benefit ratio of repair and retrofit services cannot be understated; extending the life of equipment gives facilities more time to accrue funds and restructure budgets for new equipment purchases and future growth.

SEAMLESS INTEGRATION

A wastewater treatment facility can consist of equipment from several different manufacturers. When initially constructed, careful consideration is given to ensuring that the interplay and interdependence of this equipment are at their most harmonious. However, replacing any one of these equipment pieces can throw off this ecosystem. New advancements in technology are constantly being made, and with this comes the challenge of compatibility. Now, the purchase of new equipment must hinge on budgetary restrictions and the availability of compatible equipment.

Repair and retrofit services help plant operators bypass the problem of finding compatible equipment. In almost every scenario, repair and retrofit service providers

can modify and restructure the existing equipment to increase its resilience, power, and efficiency while maintaining its already established role in operation. Many service providers are well-versed in specs and maintenance across all major equipment manufacturers, allowing them to find solutions quickly. Removing the concern of compatibility from the equation makes solving issues with damaged equipment much less invasive and disruptive to project flow.



and torque alarms for real-time data, running lights for easy monitoring of equipment, and a control knob for fine-tuning of clarifier speed. An integrated control panel can make the already minimal learning process even easier.

Some learning is required, whether purchasing new equipment or performing a repair and retrofit service. However, repair and retrofit services are the least invasive and rarely interrupt the normalcy of maintenance and monitoring tasks.

CHOOSING THE RIGHT PROVIDER

Building a long-lasting and trusting partnership with a repair and retrofit service provider is critical, just as it is with building a relationship with a supplier. Many of the same key qualities of equipment suppliers apply to repair and retrofit service providers: response time, honesty, adaptability, etc. However, one key quality of a repair and retrofit service provider stands above the rest: speed and efficiency.

Project turnaround time is the number one factor that decision-makers should consider when choosing a service provider, especially for emergency repair



situations. A valuable repair and retrofit service provider should be able to make almost immediate site visits for evaluation and consulting, be composed of a team of veteran engineers, and have minimal installation time.

A relationship with a repair and retrofit service provider is much more involved than a supplier manufacturer's. These teams aren't just experts in one piece of equipment - they are prepared to perform a comprehensive deep dive into an entire facility and learn projects to provide the best solution. However, once this relationship is built, repair and retrofit service

providers are an incredibly valuable asset. As previously mentioned, these partners can respond to immediate concerns and evaluate and identify potential problems before they cause emergency action. A strong partnership with a repair and retrofit service provider can significantly impact the long-term health of the facility.

Ultimately, every facility and project has unique needs, and there's never an easy answer for finding solutions to problems. But, when it comes time to add more life to motors and drives or give your equipment extra life, repair and retrofit services might be the best answer. ■



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CLOSING TOMORROW'S SKILLS GAP TODAY

Future Cell creates a bright future for aspiring engineers

BY BEN WARREN, SSP PUMPS

The skills shortage in engineering services is very real and is hitting hard in some sectors of the economy. In particular, the Engineering Construction Industry Training Board (ECITB) has highlighted a number of workforce challenges facing the water treatment and oil and gas sectors due to an aging workforce. For example, an estimated 19.5 percent of engineers currently working in the United Kingdom are expected to retire by 2026.

Ensuring that the industry's future engineering needs are met is going to call for significant investment in skills among the next generation of engineers. While industry bodies like Engineering UK and others are calling for clear and properly funded STEM skills plans, many commercial organizations are boosting the skills of their own employees through innovative training programs.

ADDRESSING THE SKILLS SHORTAGE

SPP Pumps is combatting the skills shortage challenges with its Future Cell initiative. This new training area is aimed at both apprentices and existing employees who want to reskill into an engineering role or simply take the opportunity to learn from experienced colleagues.

Designed, planned, and implemented by SPP's Machine Shop team, Future Cell's initial objective was to provide apprentices, as well as employees who wanted to retrain in engineering, an opportunity to extend their knowledge and skills through a series of challenges—



working on real life pumping products and projects.

Investing hundreds of thousands of dollars in specific equipment and developing learning programs, the project was designed with a practical focus, ensuring that participants would gain hands-on experience and recognized qualifications through work-based operations in a fully equipped operational machining cell.

INVESTING IN THE FUTURE GENERATION

Because training is not limited to apprentices only, more experienced employees who want to retrain into engineering roles or expand their machining abilities are also able to benefit.

Two new CNC machines with remote monitoring and wireless probing help enable trainees to develop key programming and machining skills while producing critical pump components. Success of the initial three-month project proved the value of such an approach and secured further investment in equipment, with a state-of-the-art Electric Discharge Machining (EDM) tool recently been added to the program.

Also, with the purchase of three conventional machines, trainees are given the opportunity to become proficient in the underpinning knowledge essential to CNC machining and production engineering. In addition, a bespoke

quality area in the machining cell gives apprentices the capability to inspect both their own and others' work to both SPP's and broader industry standards—essential for safe, high-quality operations.

Future Cell was launched late 2023, and within its first three months had exceeded its six-month productivity goal.

PEOPLE ARE AT FUTURE CELL'S HEART

A large part of the program's success was ensuring that the project leader had personal experience of being an apprentice. Having joined SPP Pumps at sixteen as a mechanical engineering apprentice and benefiting from outstanding training to become a multi-skilled machinist, I was humbly selected to lead the Future Cell program.

In 2013, after successfully completing my apprenticeship, I took up a role within SPP Pumps' machine shop; taking every opportunity to learn new skills, including additional responsibilities and further developing my leadership skills. It was only through this career opportunity that I realized the level of diligence and application needed to progress. Rather than going to my head when named as the Rising Star at the Pump Industry Awards (PIA) by the British Pump Manufacturers Association's (BPMA), it increased my belief and determination that it was possible to train the next generation of engineers and promote opportunities that a company like SPP can offer young people.

As its name suggests, Future Cell has a clear objective to develop the next generation of skilled machinists. With the help of other experienced members of our team, we aim to offer a versatile training environment covering all key machining disciplines, while producing high quality components and reducing sub-contracting costs.

SPP invested in me at an early age and gave me the opportunity to learn invaluable skills. We've created a

structured training plan that ensures all apprentices cover the essential skills. We identify individuals' strengths and weaknesses and tailor their training accordingly, ensuring they gain the necessary knowledge and confidence to make technical decisions to help optimize the process' capacity and productivity.

We are keen to raise the aspirations, employability and opportunities among local young people, as well as the wider community. Future Cell provides a golden opportunity for young men and women interested in engineering—and specifically the pumping sector.

REWARDING OUTCOMES

The machining team has been engendering excitement and interest in engineering to the local community through primary school visits, secondary school careers events, and scouting engagements. Together with STEM, the highly successful Future Cell initiative is the

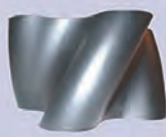
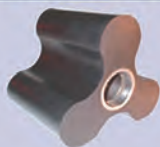


most recent investment in SPP's wider project to address and hopefully head off the future skills shortage.

With provisions for all ages often featuring discussions around imagining a world without pumps, the team has sought to increase understanding that a career in the engineering, and more specifically the pumping industry is available and rewarding. ■

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LOWERING MUNICIPAL WASTEWATER TREATMENT PUMP MAINTENANCE TIME AND COSTS

Correct initial design will extend the progressing cavity pump's life: Part 2 of 2

BY JEFFREY BYE, NETZSCH PUMPS USA

See
Part 1
www.mptmag.com



In the first part of this series, we explored how pump configuration options can contribute to cost reductions or minimize maintenance. Now, we wrap up by diving deep into the various materials of construction compatibility as well as concerns over solids handling and fluid media size. Overall, as you examine the varied serviceability options, you'll recognize the importance of optimizing pump design for cost-efficiency and longevity in wastewater treatment.

MATERIALS OF CONSTRUCTION COMPATIBILITY

Are important to ensure long life, abrasion resistance, temperature, and resistance to upset conditions. For example, consider the following:

Polymers, neat vs blended:

Neat polymer requires a specific construction to ensure the rubber does not swell (swelling causes excessive compression and premature failure). This typically requires FKM/FPM elastomers with 316SS construction. Whereas made-down polymer can use Buna and carbon steel.

Ethylene propylene diene terpolymer (EPDM) avoidance: EPDM is not compatible with oils. This should not be used for typical municipal sludge.

Corrosion: This is normally seen as a chemical attack. It can be an acidic or a base. It eats away at the material or can cause swelling or detrition of the materials, resulting in premature failure.

Hardness: This attribute helps to promote long life. Typically, the harder the materials for rotors, the longer they will last. However, the same cannot be said for stators. Sometimes having a softer stator (<60 Shore A durometer), can extend life when pumping very abrasive particles.

Temperature: Temperature can cause the elastomers to expand resulting in excessive compression or on the opposite side, shrinkage due to the cold. This will reduce compression of the stator on the rotor resulting in more slip, lower flow or inability to pump against the backpressure of the system. With freezing temperatures, if the fluid is frozen, cast iron castings could crack.

Adding rotor coatings for increased hardness: Tungsten carbide coatings will make the rotor last 3 to 4 times longer. Re-chroming to add a new layer to the worn rotor is another option and while it is significantly less costly than the rotor coating, it is not recommended. Re-chroming may add a new layer, but the plating is not equally deposited and does not renew to factory tolerances. It also creates high points or low points

to the rotor diameter; it does not restore the original diameter. This reduces stator life and may affect pump performance.

Percent solids: determines how fast the pump can run and impacts pump configuration. It ultimately dictates the viscosity of the fluid being pumped. Water like sludges (2% or less), present few limitations on a pump design. However, as the percentage increases, so do the design considerations, such as: mechanical seal, max rpm, motor size, wear resistance, geometry configuration, suction pressure, piping layout, and ancillary equipment.

Fluid media size: Every pump has a maximum particle size it can handle. When it comes to PC pumps, there are two considerations: particle size and max "ball size". The particle size

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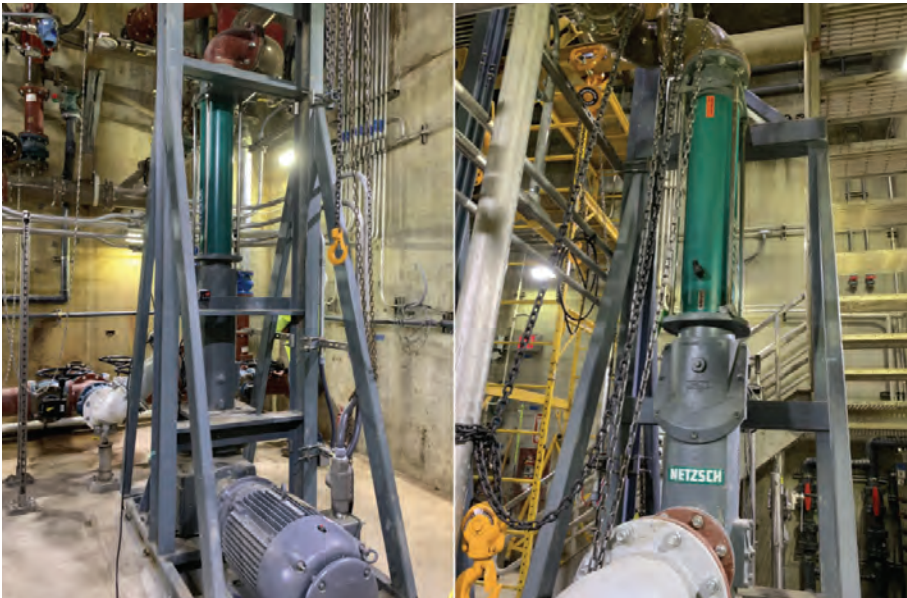


Figure 5: Example of vertical pump

relates to the amount of particles and average size of particles in the fluid. The max ball size is the largest soft size particle the pump can handle which is typically 80% of the rotor diameter.

Type of shaft seal and seal water/flushing options: This is always a highly debated topic of conversation. With many options, multiple seal manufacturers, and a wide range of applications, each fluid being pumped has certain requirements, each with pros and cons. Depending

on the application the design may require packing, single component seal, cartridge seal, double seal, or some new style of seal. It is best to consult with seal and pump manufacturers for the best solution for your process.

There are a variety of shaft seals for different applications and care must be taken to get the right one for the application. Depending on the seal there may be a complex seal plan that must deliver water or fluid to the seal to ensure it operates properly. Otherwise, operators

run the risk of the added expense associated with maintenance to pull the pump apart to get access to the seal—the last piece in the pump. Here are some examples that may not fit every application: wastewater to thin sludges (<6 percent) with or without quench or flush could use single slurry seals with a knife edge, encapsulated component, or a standard single mechanical seal, either a cartridge or component. Thick sludges (6 to 10 percent) with quench and/or flush can use single slurry seals, single inverted slurry seal, double mechanical seals, or packing. Cake calls for packing, double seals (>10 percent) with quench and/or flush, double mechanical, or packing. Neat polymer or made-down/mixed emulsion polymer should use single slurry seals, standard single mechanical seals, or packing, while made-down/mixed/emulsion polymer should opt for single slurry seals or standard single mechanical seals.

Correct joint type for application along with the right joint options:

The joint to be used depends on the pump size, loading, and operation. For smaller pumps, pin joints are adequate. Pin joint longevity can be increased, however, with a double sealed joint option or the covered seal joint option which protects against abrasion and sharp objects but, for larger pumps, additional joint options are available.

Pumps that will operate with many stops and starts may function more effectively with a gear joint. Double sealed, oil filled gear joints are preferable to those using grease; oil refills and replenishes itself, whereas grease, once pushed out, does not replenish. This makes for a more robust, long life joint, that will tolerate frequent stops and starts (>3-4 starts/hour).

Joint angularity: This is the distance between the joints. Increased joint distance provides a longer joint life. Three forces impact



Figure 6: Components of a NEMO® progressing cavity pump in FSIP design.

joints: axial (X), shear/bending (Y), and rotational (torque). Higher angularity (Y-axis forces) means less joint life. While you do not want too long a pump, one with a longer joint distance will last longer.

Suction lift requirements:

It is common to have suction life requirements for WWTP applications. PC pumps work great for suction lift. However, there are some tricks for ensuring the pump is set up correctly to perform as intended. Having the wrong setup can cause the pump to not work properly or to fail. Consult with your pump manufacturer on their recommendations for suction lift.

Pump orientation: The pump orientation can make all the difference for operational longevity, space saving or for simplifying the piping layout. PC pumps can be positioned in many ways. With PC pumps being inherently long due to the design, it is possible and becoming more prevalent to install them vertically as older plants make upgrades with limited room in the existing buildings. This saves space and preserves the benefits and capability of using a PC pump.

PUMP SERVICEABILITY

Most pump manufacturers offer a full service-in-place (FSIP) option without needing any additional footprint in the often space-constrained process line. In this case the rotor, stator, and mechanical seal can be removed without the need to remove suction or discharge piping, drive, or electrical components. Some can even upgrade existing installed pumps; however, flow and pressure reductions may apply. This can be a time saving alternative to standard servicing, which may require removing piping to get the space needed to service the pumps, as well as unbolting numerous components to take the stator off, and even calling in an electrician

to remove electrical components to access the pump for servicing.

PIPING SYSTEMS AND ACCESSORIES

The system design should consider these piping system factors:

- Suction side liquid trap for priming
- Large pipe inner dimensions (IDs) to reduce friction losses
- Long Radius Elbows
- Reduce suction and discharge pipe lengths as much as possible
- A discharge check valve
- Expansion joints
- Avoid pipe stress on pump
- Some form of pressure relief, for example a pressure relief valve (PRV), pressure switch, or burst disc

PUMP PROTECTION

Pump design should include consideration of stator dry run protection, choice of motor thermostats, flowmeter, variable frequency drive (VFD) or over-

current. The pump should be designed to avoid cavitation and should include pressure gauges for suction and discharge and isolation from process fluid.

CONCLUSION

The design of progressing cavity pumps plays a crucial role in controlling maintenance costs and extending product life in wastewater treatment plant applications. By carefully considering key design elements such as speed, drive configuration, sealing options, joint types, and piping systems, operators can make informed decisions that contribute to cost reductions and minimize downtime. Additionally, selecting the right equipment and implementing money-saving strategies post-installation can further enhance the efficiency and longevity of pump systems. Ultimately, a well-thought-out design approach not only benefits the immediate operation but also ensures long-term cost-effectiveness and reliability in wastewater treatment processes. ■

JEFFREY BYE is municipal director for Netzsch Pumps USA. The Netzsch Group is an owner-managed, international technology company with headquarters in Germany. The Netzsch business units Analyzing & Testing, Grinding & Dispersing, and Pumps & Systems represent customized solutions at the highest level. More than 4,000 employees in thirty-six countries and a worldwide sales and service network ensure customer proximity and competent service. For more information, visit www.netzsch.com.

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MAXIMIZING POWER PLANT FLEXIBILITY

How to support producer profitability during the energy transition: Part 1 of 3

BY MATTHIAS NICKL, THORSTEN WOLF, ROBERT HOSTETLER, NICOLA ERHARD-WINTERBERG, DAVID FERNANDES, AND CRISTINA BECLE, SIEMENS ENERGY

As renewables grow in the energy mix used by North American power producers, keeping generating assets best utilized requires operating them with a flexibility that often exceeds the original capabilities of most plants today. Combined cycle power producers need to get into markets fast—when prices are high – and get out fast, when margins may be low or even negative.

Given the steady growth of renewables in the North American

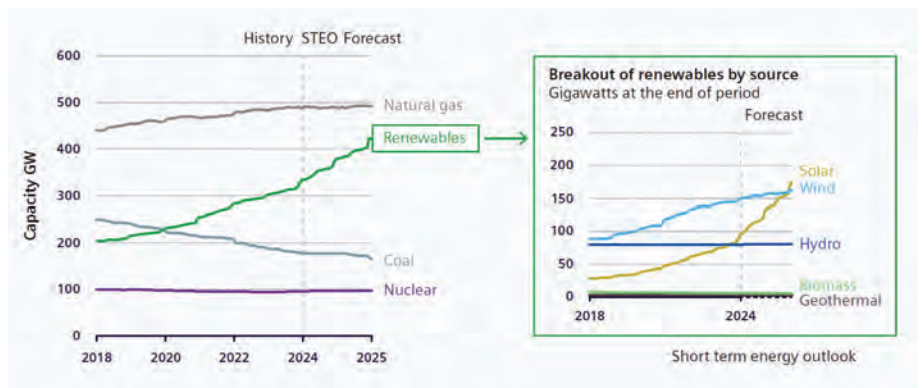


Figure 1: Energy source trends in U.S. annual electric generating capacity 2018–2025. (Source: U.S. Energy Information Administration)

energy mix, volatile fuel prices, and current and proposed governmental legislation, the operational profiles of combined cycle power plants (CCPPs) are dramatically changing from base load to cyclical modes. In addition, ancillary services are playing a growing role in helping to ensure grid reliability and accommodate an energy resource mix that will continue evolving with more renewables.

These trends affect both regulated and unregulated markets. They require power producers to have more flexibility in their asset utilization in order to meet revenue goals, expand operating margins, and maintain profitability. How fast and reliably they can exercise that flexibility is critical, too.

CCPP operators must not only generate power as efficiently as possible but also have their plants ready to ramp whenever power markets are paying premium prices. Increasing plant operational flexibility can help operators both minimize generation costs during times of low power prices and help capture the margins peak prices offer.

This paper focuses on measures intended to optimize CCPP operational flexibility for North American producers. It explains new operational profiles due to the energy transition, which make enhanced startup and shutdown processes necessary. These include optimized hot, warm, and cold starts, as well as improved ramp-up / ramp-down load gradients.

RENEWABLES COMPLICATE PROFITABILITY

Among the 3,000 utilities operating in the United States and the sixteen major utilities operating in Canada, no two are alike. Each serves customers of all kinds, from household consumers to heavy industries. They can span different regional geographies with wide variations in seasonal demands, which can change dramatically from year to year.

Their energy sources can vary widely, too, as can the age and composition of their generating capacity. Additionally, individual operators must comply with ever-changing federal and state environmental requirements, and regulated producers must abide by strict tariff structures.

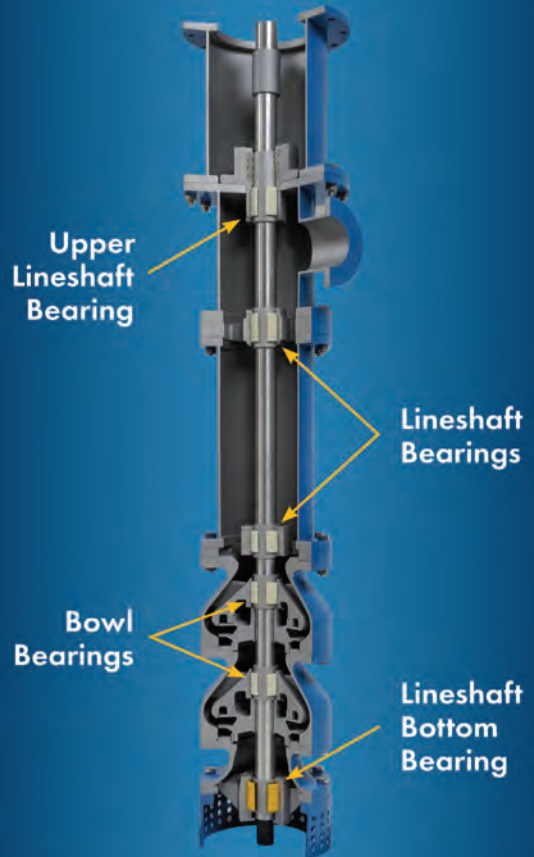
Finally, there are myriad other operating variables that can potentially affect a utility's margins and, ultimately, its profitability.

CHALLENGES TO A DECARBONIZED ENERGY FUTURE

All North American utilities and independent power producers face one common challenge: the rapid growth of renewables in the power-generation mix as the power industry continues moving toward a de-carbonized energy future.

In 2023, renewable energy sources—wind, solar, and hydro, chief among them—accounted for 22 percent of

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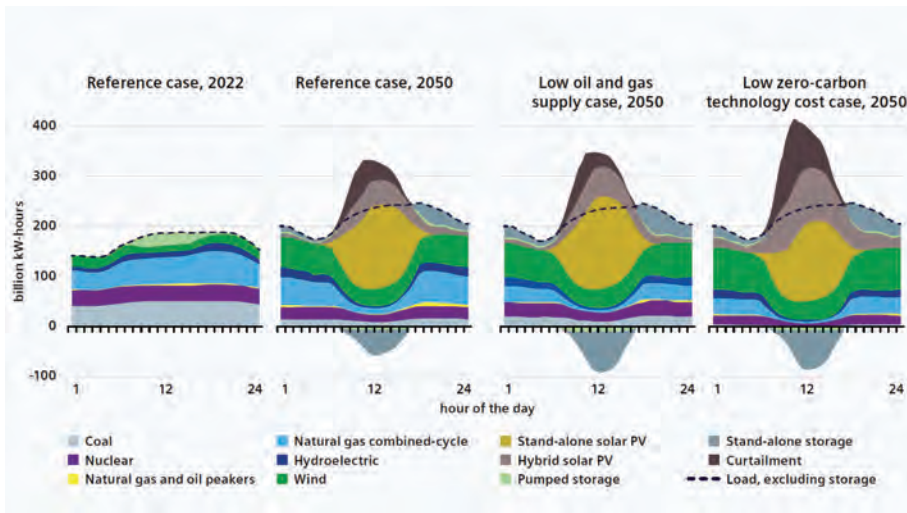


Figure 2: Hourly U.S. electricity generation and load by fuel for selected cases and representative years in billion kilowatt-hours. (Source: U.S. Energy Information Administration, Annual Energy Outlook 2023)

generation. From those sources, new solar projects coming online in the near-term are expected to propel solar's growth 75 percent by 2025 while wind will grow 11 percent in that same time period. Looking even further ahead to 2050, solar and wind generation is forecast to provide the energy for between 55 and 85 percent of total U.S. power generation.

Figure 1 illustrates the forecasted U.S. power-generating mix through 2025, showing solar overtaking wind and both eclipsing coal and nuclear combined.

Figure 2 illustrates different forecast scenarios by 2050 for hourly U.S. electricity generation and load by fuel for selected cases and representative years, according to the U.S. Energy Information Administration. Of course, 2050 holds much uncertainty in how these scenarios will unfold, but all scenarios clearly show the diminished role of coal compared to the fuel mix behind power generation in today's grid. Across all long-term scenarios, the gas fleet remains essential for reliable grid operation although the operational profile evolves significantly.

In fact, coal's anticipated exit from today's grid by 2030 is straining the remaining dispatchable resources, particularly the natural gas turbine fleet, which will be ever more

challenged to balance increasing electrical demand and increasingly variable supply.

Asking more from today's fleet creates an opportunity for plant owners to position their assets optimally for their future usage profile so they can potentially maximize both their utilization of those assets and their operating margins.

These described trends are manifesting themselves in today's grid in specific seasonal patterns. This evolution is expected to grow in frequency and magnitude throughout the country over time.

OPERATIONAL FLEXIBILITY'S IMPACT ON PROFITABILITY

While rapidly falling prices of solar and wind technologies per kilowatt have spurred the growth of their adoption in recent years, renewables have secured government funding incentives to expand their deployments even more.

The U.S. Inflation Reduction Act (IRA) of 2022 offers \$370 billion in tax credits to boost the nation's use of renewable energy. Some industry observers estimate these credits will triple the amount of utility-scale green power in the United States. from today's levels to approximately 750 GW by 2030. While investment tax credits were primary motivators heretofore, the addition of production

tax credits may accelerate solar's development even more.

This rapid expansion of renewables will likely require upgrades to North America's grid, including ISO / RTO interconnections. At the same time, the variability caused by the intermittency of renewables means power producers who can become more flexible in how they operate their generating assets from day to day and season to season can improve business outcomes.

Indeed, utilities are already taking action. Factors such as power price variability, increased emission requirements affecting fossil power, and new market mechanisms are driving a shift in the operating profiles of CCPP assets from base load to flexible cycling modes. To adapt, CCPP assets may need to enhance their operational flexibility through improved start-up and shut-down times, higher load gradients, and other asset optimization concepts.

A LOOK AHEAD

In upcoming installments in the series, we'll explore different operational concepts and how they influence the bottom line. As we'll see, the core principles for these operational flexibility improvement concepts can be adapted to different sectors and pay off over time. ■

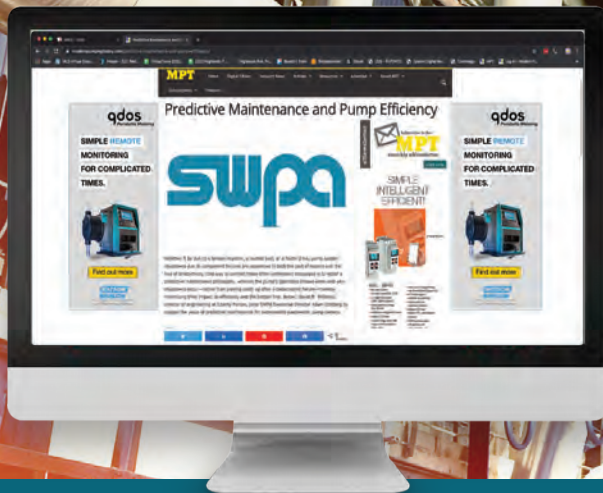
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INCREASING THE RELIABILITY OF ROTATING EQUIPMENT

Two types of bearing isolators function best in challenging sealing environment BY CHRIS SOLFELT, INPRO/SEAL



Pumps are routinely placed into severe duty applications where durability and reliability are critical. But, even the most expertly designed and stout pieces of equipment can be vulnerable to downtime and, eventually, failure in these challenging conditions if not maintained properly.

Proper lubrication and protection of the bearings are key factors supporting pump longevity. Without proper lubrication, failure is inevitable and leads to high-cost repairs, replacements, and downtime.

While there are many lubrication methods, there is one that has gained popularity and relevance for pumps in downstream applications, such as refining and petrochemical: oil mist. This lubrication method uses

an aerosol mixture of fine oil droplets suspended in air. A secondary system takes oil from a supply tank and atomizes it into finer particles. That particulate mixture is then distributed to the bearings.

Oil mist has gained traction in downstream applications because it provides precise lubrication, which means less power consumption; less lubrication excess and waste; fresher lubrication coverage on the bearings; and better pump mean time between failures (MTBF).

BENEFITS AND PROMINENCE OF OIL MIST

While oil mist continues to grow favorably among pump operators, it presents sealing challenges. The main difficulty associated with oil mist is keeping it contained

within the equipment. Because the lubrication particles are very fine, minuscule openings or leak paths can allow the oil mist to escape, impacting bearing life and operator safety. A leading cause of equipment downtime and lost production is bearing failure, and failed bearings occur predominantly by lubrication loss and contamination. Additionally, stray hydrocarbons can be inhaled or pool on surfaces and create potential fall hazards. Proper sealing selection is important to operator safety and equipment reliability.

The American Petroleum Institute (API) recognizes the benefits and prominence of oil mist, which is why most API pumps are oil mist lubricated equipment. Meeting the API standard—specifically API 610—means having bearing housings with one of two specific sealing solutions. It states that “bearing housings shall be equipped with replaceable labyrinth-type or magnetic-type end seals and

deflectors where the shaft passes through the housing. Lip-type seals shall not be used. The seals and deflectors shall be made of spark-resistant materials.”

Additionally, the U.S. Environmental Protection Agency (EPA) has tightened regulations on emissions and other particulates. While regulation development is ongoing, operators are continually pressed to reduce carbon emissions and eliminate hydrocarbon leakage. As oil mist is an aerosol mixture, it is not always possible to detect leaks with the naked eye. Preventing leakage starts with having the right bearing seal technology in place.

A CUSTOM-MADE, RESILIENT SOLUTION

Bearing isolators are two-part compound labyrinth, or magnetic, seals consisting of a rotor and stator working in conjunction to protect rotating equipment from lubrication loss and contamination ingress.



However, not all of them are the same. For oil mist, operators must be aware that bearing isolators are engineered to order, utilizing specialized materials, design concepts, and features to provide their application the right protection. The technology

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is not general or plug-and-play with any piece of rotating equipment. In the case of oil mist lubrication, the proper design of the bearing isolator will determine if the equipment is protected. There are several design criteria to consider when selecting a bearing isolator for oil mist applications.

Labyrinth-type Bearing Isolators

Bearing isolator, operators should make sure there is a coalescing ring, that blocks mist from escaping through the labyrinth, where it is collected and deposited back into the bearing housing through the lube return. Another essential component is a vapor-blocking, or VBX, ring. Bearing isolators depend on centrifugal force to operate; however, there are times when equipment needs to be shut down. The VBX ring ensures that the labyrinth path is shut off and no oil mist can escape while the equipment is at rest. During operation, centrifugal force provides lift so that it is still operating with a non-contact design.

The stator/rotor interface is another key piece of internal technology. Properly designed interfaces provide permanent IP66-rated protection against contamination ingress. A contamination chamber should also be a part of the bearing isolator's design to collect contaminants trying to enter the bearing housing and expel them through the expulsion port using centrifugal force and gravity. Another important design element is the D Groove. As the name suggests, it is a D-shaped groove built into the rotor that captures oil on the shaft. The oil runs along the groove and

is returned to the bearing housing.

Aside from its sealing and protection benefits, labyrinth-type bearing isolators also are known for their longevity. Because they don't depend on contact as a sealing mechanism, this technology can last as long as the equipment. The VB45-U bearing isolator from Inpro/Seal is designed with these criteria in mind to create an effective oil mist seal for downstream operators.

Magnetic-type Bearing Isolators

This technology works differently but is still an effective choice for oil mist lubricated environments. Magnetic-type seals utilize two precision-lapped faces that are magnetically energized to create a liquid-tight seal. The critical element is ensuring that the seal is designed so that the faces maintain proper lubrication and that the face loading is distributed equally around the rotor and tuned specifically for oil mist.

Additionally, operators must take extra care while installing magnetic-type seals so the faces aren't damaged. Flat faces are critical to maintaining a quality seal. Magnetic-type seals are a great choice for oil mist as positive contact seals effectively seal fine mist particles.

The Inpro/Seal VBMag bearing isolator is a magnetic-type seal perfect for oil mist lubricated pumps. Both labyrinth and magnetic-type bearing isolators do not cause shaft wear, a common problem tied to elastomeric lips seals, which can wear quickly at the contact point and damage the shaft.

CONCLUSION

Bearings are valuable components that support the proper functionality of pumps. Like any essential component, though, they require adequate protection. The best technology to guard against premature bearing failure is bearing isolators, and it is critical to select the correct bearing isolator design that incorporates features specific for oil mist lubrication. Selecting a general bearing isolator design may not ensure adequate protection and can result in lost lubrication and bearing failure, resulting in decreased MTBF and workplace hazards. ■

CHRIS SOLFELT is the product manager for Inpro/Seal and can be reached at csolfelt@doverprecision.com. He has nine years of experience in the bearings and seals industry for rotating equipment, including five years at Inpro/Seal. Inpro/Seal is a world leader in the design and manufacture of permanent bearing protection and complete shaft sealing solutions for a variety of rotating equipment across multiple industries. For more information, visit www.inpro-seal.com.

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BOLSTERING THE BAKKEN'S TWILIGHT YEARS

EIR's Morgan Howrish urges operators to redevelop, even amid low price points

Enverus Intelligence Research (EIR) is releasing its annual Williston Play Fundamentals that examines the distribution of remaining inventory across the play using economic and geologic viability. The report also dives into redevelopment performance and remaining potential, covering a variety of strategies. Below, EIR analyst and co-author of the report Morgan Howrish discusses how this forecast could shape the area's future.

MPT: *For those unfamiliar with your report, how would you describe Play Fundamentals?*

MORGAN HOWRISH: Play Fundamentals is an EIR research series that dives into a key geographical basin or technology. A collective series, with each play updated annually, it includes technical research and interactive maps, investment opportunities, benchmarking, macro trends and basin analytics, empowering readers to make intelligent connections and, overall, more informed investment, operating and strategic decisions. It is considered the most in-depth research EIR offers and among the most-read analysis series in the energy industry.

MPT: *How do you see the near-future of extraction in the Bakken region?*

MORGAN HOWRISH: Bakken operators are facing a critical decision: when to lean into redevelopment, with only 1,400 sub-\$50 per barrel breakeven locations remaining. We suggest sooner than later, by executing on multiple strategies: refracs, tight-infills, drill-overs and lease line wells. These options could unlock nearly 3,000 additional locations across the basin, all vying for investment particularly in the play's core where remaining inventory is scarce.

MPT: *How are operators reacting currently?*

MORGAN HOWRISH: Refracs, especially those with high proppant intensity, are emerging as contenders to help supplement basin wide production. Their mid-\$50s breakevens can contend with new drills, albeit with a wider range of outcomes. While long laterals are becoming



more common, they represent just 20 percent of new drilling activity as they are largely being executed in the extensional regions of the basin.

MPT: *Is this consistent in all parts of the Bakken?*

MORGAN HOWRISH: Williston operators have executed about 15 percent more refracs than those in the Eagle Ford. While results vary, EIR finds that average refracs in the Williston produce about 50 percent of new drill estimated ultimate recovery (EUR), outperforming the Eagle Ford's roughly 25 percent.

Co-completing the Three Forks with Middle Bakken results in up to 15 percent better recoveries than lagged equivalents, presenting a strategy best suited for operators in the core of the play where most sub-\$50 per barrel Three Forks locations are held. ■

Enverus Intelligence Research, Inc. (EIR) is a subsidiary of Enverus that publishes energy-sector research focused on the oil, natural gas, power and renewable industries. EIR publishes reports including asset and company valuations, resource assessments, technical evaluations and macro-economic forecasts; and helps make intelligent connections for energy industry participants, service companies and capital providers worldwide. For more information, or to read the full Williston Play Fundamentals, visit www.enverus.com.



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