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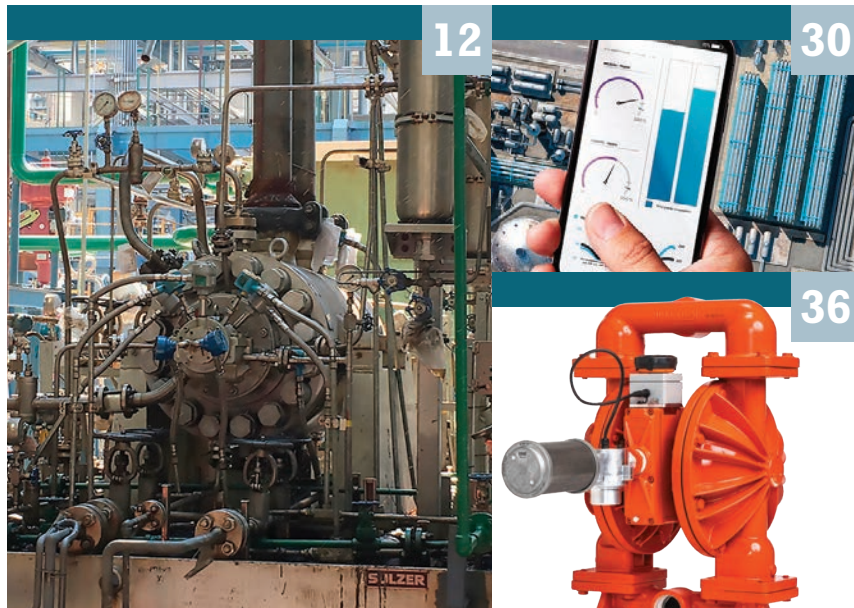


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A NOTE ON THIS ISSUE:

Thank you for picking up the October issue of MPT! Starting things off in our Case Studies section, Ming Kust of Sulzer Pumps shares a success story of how local manufacture of high-performance pumps provided cost, time, and service benefits to a Chinese refinery (pg. 12). It took close collaboration between Sulzer specialists in Asia, Europe, and the United States to complete this complex project and make it a success.

Artificial intelligence (AI) is becoming a larger and larger component in the industrial world. In this month's Motor Solutions section, Bernhard Eschermann of ABB Industrial Automation illustrates how his company's software combines operational data with engineering and IT data to produce meaningful insights for prediction and optimization (pg. 30).

Lastly, on a recent episode of MPT's podcast, The Efficiency Point, Bill Moore the CEO and founder of Xona, shared his thoughts on the growing role of remote access technology (pg. 40). If you enjoyed his article in last month's issue, you'll definitely want to see what he has to say in this interview. Enjoy!



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THORDON BEARINGS EXPANDS INTO NEW INDUSTRIAL SECTORS OF CANADA

Venables Machine Works Ltd., a large manufacturing and machining firm based in Saskatoon, Saskatchewan, Canada, has been appointed as an authorized distributor and service provider for Thordon Bearings' industrial bearings portfolio. The formal agreement follows a ten-year collaboration in which Venables provided sales and engineering support to Thordon's customers across Manitoba, Saskatchewan, and Alberta.

The company, which will focus on Thordon's SXL and XL polymer bearings and engineered thermoplastics, ThorPlas-Blue and ThorPlas-White, has a successful history providing custom pieces for Canada's steel mills, the region's mining industry and generally supporting industrial pump and machinery repairs.

"Venables is adept at machining and engineering Thordon's elastomeric material and, therefore, a logical choice to further develop the area and create new opportunities in new markets that Thordon has not traditionally had access to," says Scott Groves, regional manager, Thordon Bearings.

Axel Swanson, business development manager, Thordon Bearings, concurs, "Non-traditional applications that utilize our family of products can prove lucrative in heavy industries, as the wear rate of traditional materials can be excessive, requiring frequent bearing replacement."

PINNACLEART EMPLOYEE EARNS DISTINGUISHED CAMA CERTIFICATION

PinnacleART, a leader in data optimization for complex processing facilities across multiple industries, announces that Ralph Stevens, principal reliability consultant, recently earned the distinguished Certified Asset Management Assessor (CAMA) certification. The CAMA certification is a global designation given to individuals who have demonstrated their ability to be an auditor of asset management systems. Fewer than 1,000 individuals around the world have the CAMA certification, and only about twenty of those certified are in the United States.

The certification was developed by World Partners in Asset Management (WPiAM), a joint venture of several global organizations including the Society for Maintenance and Reliability Professionals (SMRP). Individuals seeking the certification must meet a rigorous set of requirements and exhibit their expertise in asset management and reliability subject matters.

Certified individuals can help facilities implement and maintain asset management programs that are compliant with the ISO 55000 standard. Facilities with ISO 55000-compliant programs utilize asset strategies based on industry best practices. Additionally, certified individuals can help facilities gain a competitive edge on their peers by identifying performance gaps and areas of improvement.



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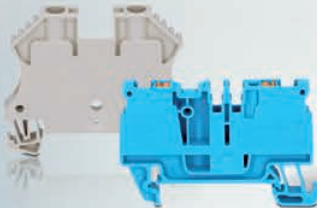


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Brett Bevers

CENTRISYS/CNP PROMOTES NEW DIRECTOR OF SALES AND REGIONAL SALES MANAGER

Centrisys Corporation announces two key employee promotions. Josh Gable, a ten-year industry veteran and most recently regional sales manager at the company, has been promoted to director of sales. Brett Bevers, a five-year industry veteran and most recently application engineer with the company, has been promoted to regional sales manager.



Josh Gable

"I am thrilled to see these two team members grow professionally with our company and know their extensive experience and practical problem-solving skills will continue to be an invaluable resource for our customers," says Michael Kopper, president and chief executive officer of Centrisys. "Both Josh and Brett are

highly committed to helping our customers develop efficient, environmentally-friendly solutions. In addition, our expanded sales and service support roles will allow us to enhance offerings to municipal and industrial customers throughout North America."

GRUNDFOS BREAKS GROUND ON AMERICAS REGIONAL CENTER

Grundfos announces the groundbreaking of its Americas Regional Center, located in Brookshire, Texas. The 45,000 square foot facility is expected to be completed during the spring of 2021. Grundfos is currently seeking to achieve LEED Platinum certification. The new offices will house company sales, operations, engineering, HR, finance, and other support functions.

With its sustainable green building design by PGAL, and construction by Harvey Builders, the structure will be made of locally sourced building materials verified to have been sourced in a responsible manner. Solar photo-voltaic panels mounted on the roof will offset 20 percent or more of the building's energy costs. A chilled water energy storage system will reduce energy consumption. And a rainwater harvesting system will support chillers and gray water use.

Sustainability is a major priority for Grundfos. In addition to manufacturing energy- and water-efficient pumping solutions, the company tightly focuses on making a difference on the United Nations' Sustainable Development Goals, particularly SDG 6 (water) and 13 (climate change). This focus allows the company to help other companies be more sustainable and reach the goals together. ♦



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49th Turbomachinery & 36th Pump Symposia

The tradition continues, in a new way

Due to the ongoing global public health concerns related to COVID-19, the 49th Turbomachinery and 36th Pump Symposia will be now be held virtually December 7-10, 2020. The technical sessions and exhibition will be held online Tuesday through Thursday, December 8-10, with short courses on Monday, December 7. Leadership of the TEES Turbomachinery Laboratory—host of TPS—determined that moving the event online is the best action in order to comply with CDC and government regulations regarding COVID-19.

What will not change is TPS's role as a vital industry event, offering a forum for the exchange of ideas between rotating equipment engineers and technicians worldwide. Now surpassing forty-eight years.

The health and safety of our staff, delegates, and exhibitors always comes first. We determined that a virtual event was the best course of action, and we fully expect that TPS 2020 will be a milestone event. Given the great Turbo Lab staff, advisory committee members, and supporting industry participants, I have no doubt that TPS 2020 will be as successful as originally planned.

—Dr. Eric Petersen,
Director of the Turbo Lab

TECHNICAL PROGRAM

One of the greatest assets of TPS is its professional continuing education program, relied upon by rotating

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A GLANCE**
When:
December 7-10, 2020
Website:
tps.tamu.edu



Ensuring the tradition continues, look for Gus the Turbo Lab's virtual petting booth.

equipment and pump engineers and technicians worldwide, spanning oil and gas, petrochemical, power, aerospace, chemical, and water industries.

The program, which consists of short courses, case studies, discussion groups, lectures, and tutorials, is hand-picked by two advisory committees, made up of recognized leaders in the turbomachinery and pump communities. It is led by highly-respected practitioners and pioneers in their fields. Topics include maintenance, reliability, troubleshooting and instruction on emerging designs, technology, and best practices that include case studies with real-world relevance on problems-solved and lessons-learned.

As this year's technical program will be offered virtually, TPS attendees have a rare opportunity to expand their training opportunities further and explore into their professional development deeper than ever before.

VIRTUAL EXHIBIT HALL

Using the most up-to-date virtual conferencing technology available, the 2020 Turbomachinery and Pump Symposia

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ATPS POSTPONED TO 2021

ATPS 2021 AT A GLANCE

When:
February 23-25, 2021

Website:
atps.tamu.edu

Additionally, after much thought and consideration, the leadership team of the TEES Turbomachinery Laboratory has decided to transition the face-to-face Asia Turbomachinery and Pump Symposium event to a virtual setting. All short courses and technical sessions, as well as the exhibition, will be held online. The symposium dates will continue to be February 23-25, with short courses on February 22, 2021.

At the Turbo Lab, the health and safety of our delegates and exhibitors is of the upmost importance. We look forward to being able to offer the same world-class educational forum and exhibition while working to slow the spread of COVID-19.
— Dag Calafell, chair of ATPS

Due to the many unknowns related to the ongoing global pandemic, COVID-19, the leadership team at the Turbomachinery Laboratory, along with support of ATPS's corporate sponsors and location partners determined, that a virtual event is the best course of action.

Looking toward the future, the Turbo Lab plans to host a face-to-face symposium in 2022 at the Kuala Lumpur Convention Center in Kuala Lumpur, Malaysia, the original location of ATPS 2020. More information on this event will be forthcoming on the ATPS website. ♦

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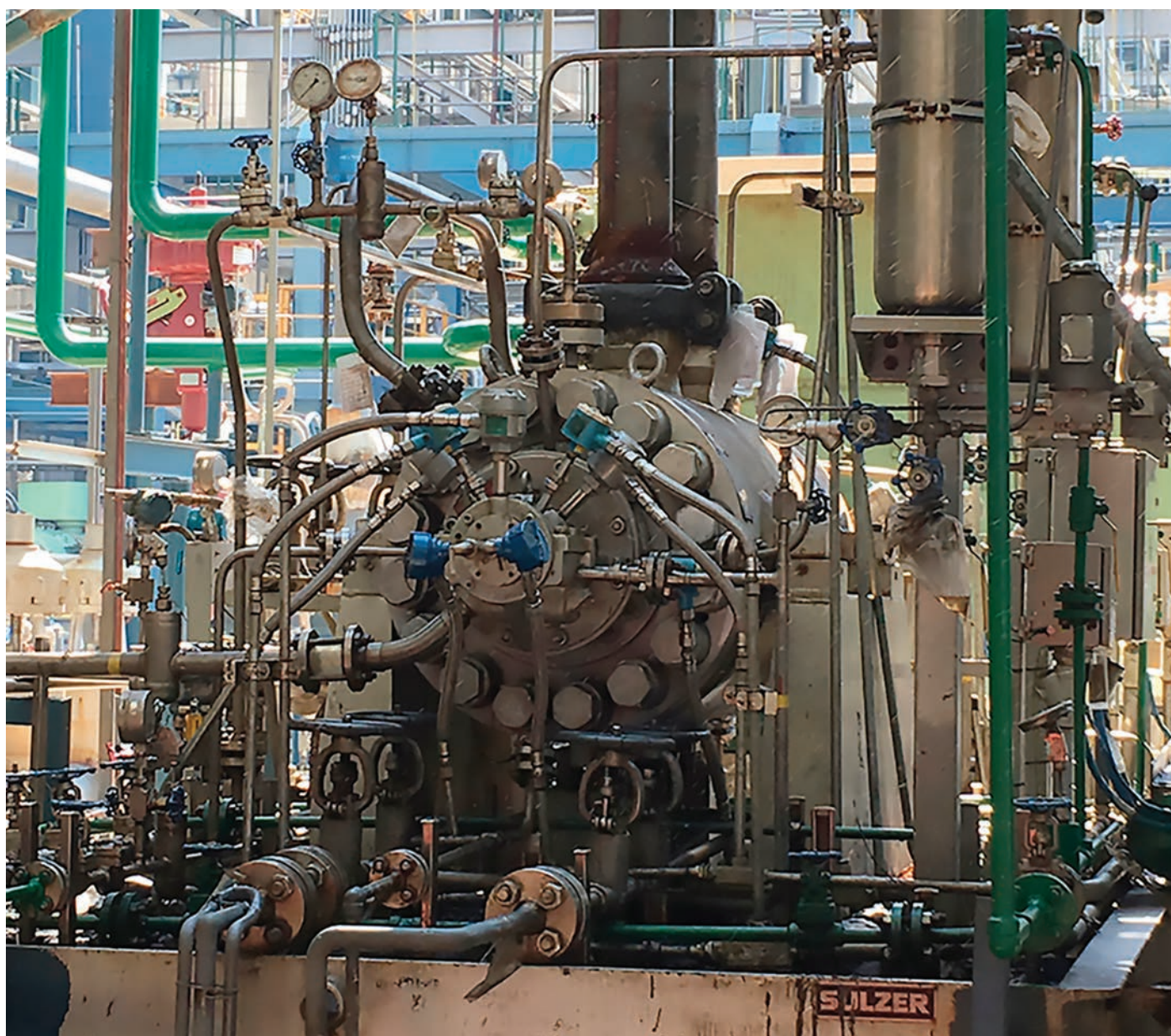
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Twelve Pumps for Chinese Refinery

Local manufacture of high-performance Sulzer pumps provides cost, time, and service benefits

By Ming Kust, Sulzer Pumps



CP feed pump for the ebullated bed residue hydrocracking application.

Close collaboration between Sulzer specialists in Asia, Europe, and the United States was key to a complex project that allowed twelve sophisticated pumps from three individual designs to be manufactured at Sulzer's China plant for the first time. Sulzer's ability to bring the new models into production quickly allowed its customer to meet tight project timelines, as well as demanding technical and commercial goals.

Market demand for fuel and products derived from oil and gas is being met by expanded exploration and the use of new technologies to maximize the potential of existing wells. The introduction of new technology is improving efficiency for the petrochemical sector, which in turn helps to reduce the cost of everyday items, from recycling bins to toothbrushes and the tires on your car.

China's hydrocarbon processing industry is the largest, and fastest growing, in the world. To meet demand and maintain competitiveness, companies across the sector are continually investing in new capacity and advanced technologies. For one refinery, that included a major project to upgrade and optimize its facilities.

CHALLENGING START

In 2016, the refinery took the decision to introduce new equipment across its plant, including a new ebullated bed hydroprocessing system using H-OilRC technology from a French process licensor. This system is designed to add value in the refining process by extracting valuable hydrocarbon products from heavy feedstock residues, which may contain high levels of solids and other contaminants.

When it came to the selection of pumps for the new system, the refinery was aware that the nature of the various feedstocks created demanding operating conditions. The internal components can be exposed

to high levels of wear and there is a significant potential for flow to be disrupted by large solid particles.

The refinery knew that it was possible to obtain pumps designed specifically to perform well in these conditions, but it was unable to find a local source of supply. Using equipment manufactured in China wherever possible is an important part of the refinery's procurement strategy, as it seeks to localize supply chain and ensure ease of maintenance and support.

GLOBAL EXPERTISE, LOCAL PRESENCE

That's where Sulzer was able to help. As a global pump specialist, Sulzer already had a significant presence in China, producing pumps in the Dalian factory since 1999, and at a second plant in Suzhou since 2010. Sulzer also

Just as importantly, they also agreed to manufacture the critical pumps in China.

Like any major facility upgrade project, the ebullated bed system was planned to a tight schedule. So once the agreement was in place, Sulzer moved quickly to bring the new products to life in its China plants.

MAXIMUM PERFORMANCE, MAXIMUM DURABILITY

The first of those products was the CP multistage barrel pump designed to API 610 type BB5 specifications. The Sulzer CP design incorporates an axial-split volute casing, which is less susceptible to wear than alternative designs when a high level of abrasive solids are present. Sulzer's design and manufacturing specialists in China worked closely with their

Sulzer in China also had to qualify suitable local suppliers for key components of the new pumps.

has a long-standing relationship with the parent company of the refinery, supplying and supporting pumps at many of its facilities in the country. After discussing the requirements, oil and gas industry experts at Sulzer recommended two proven technologies from the company's extensive portfolio.

colleagues from the United States, who hold the design responsibility for the CP, to allow for some important design modifications. This particular application required a low flow, high head, high speed solution, so Sulzer had to pay special attention to the surface characteristics of the

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Sulzer has developed a range of pumps with a special “coke crusher” unit at the pump inlet stage.



Top: The coke crusher rotor for the large solids abrasive service. Bottom: ZF pump with the coke crusher for the large solids abrasive service.

fluid channels within the pump in order to minimize losses and achieve the target performance. Problems crushed.

The second key technology was a solution to the problem of pump performance impairment by large solid particles. For applications like these, Sulzer has developed a range of pumps with a special "coke crusher" unit at the pump inlet stage. This technology uses a rugged, bladed rotor that will break up solids to ensure they pass smoothly through the rest of the pump. Sulzer in China worked with colleagues in Germany and the United States to integrate the coke crusher technology into two pump types for the project: the BBT, an API 610 type BB2 centrifugal pump, and the ZF, an API 610 type OH2 centrifugal pump.

DELIVERING UNDER PRESSURE

In addition to building up the necessary in-house manufacturing processes, Sulzer in China also had

to qualify suitable local suppliers for key components of the new pumps. The company's expert sourcing teams conducted detailed supplier audits to ensure that each one met Sulzer's exacting global quality standards, especially when it came to critical parts such as the inner casing of the CP pump and the coke crusher components for the BBT and ZF units.

During the development and manufacturing process, representatives from the refinery made regular visits to Sulzer's plants, giving them the confidence that work was proceeding on schedule and to the highest quality level. They were also present to see all the new pumps successfully meet their performance specifications in testing. In total, twelve of the newly localized pump models were delivered to the customer: three CP units, six BBT units with the coke crusher installed, and three coke crusher-equipped ZF units.

"This project was an important next step for our partnership with the refinery and for our support of China's petrochemical sector as a whole," says Zhang Jianfeng, managing director of Sulzer's Suzhou manufacturing facility. "We have demonstrated that we can provide our customers with all the benefits of local manufacturing combined with Sulzer's excellence in technology, quality and reliability." ♦

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Aeration Record-breaker in Montrose, British Columbia

By Warren Kersten, Lakeside Equipment Corporation



Mike Walsh, the mayor of Montrose (left), with treatment plant operator Greg Parker.



Montrose wastewater treatment plant in Canada, where Lakeside Equipment has been working tirelessly for over half a century.

In a recent issue of the *Trail Times*, a newspaper that covers the Village of Montrose in south-eastern British Columbia (two hours north of Spokane), it was recently reported “the Village of Montrose has been successful in its application for funding under the Infrastructure Canada Grant Program for upgrades to the Village’s wastewater treatment facility—a project that will modernize the fifty-six-year-old plant.”

Not that one should be critical of a local village newspaper—a publication that understandably knows that its readers won’t necessarily require all the finer details of a sewage treatment plant, however, it didn’t mention the fact that Montrose’s original aeration technology, installed by Lakeside Equipment—back in 1963—is still in operation—and is very probably the longest lasting engineering of its type to still be in working order in the whole of Canada, North America, if not the world.

NEED FOR WATER

It was even further back in 1942 that Leon Simmons had the idea of developing what was then known as Woods Flats (an area of about 220 acres) into a retirement village for workers from the nearby Cominco (now Teck) smelter. In 1956, Woods Flats was incorporated as a village, and—consistent with so many historic connections between Canada and

Scotland—was named after the Scottish coastal town of Montrose, which was once razed to the ground by the Danes in the year 980.

In the late 1950s and early 1960s, raw drinking water in Montrose, British Columbia, came from a well that was drilled by the mouth of the Columbia River (that Beaver Valley Creek flows into) but one determined gentleman campaigned for a water treatment facility for his fellow villagers.

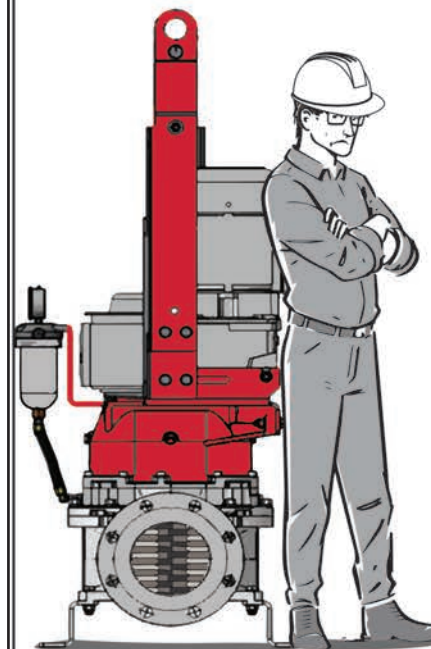
At first his concerns fell on deaf ears, but he formed a committee, then ran for council—eventually becoming mayor—during which time he successfully secured a grant for Montrose to have not only its fresh water treated, but for a sewer system too. The man behind this people power—and the introduction of Lakeside’s oxidation ditches back in 1963 was one Martin Walsh, whose son Mike, nearly six decades later, is now the current mayor of Montrose.

AMAZING FOR HOW OLD IT IS

“At the time, the installation was state-of-the-art,” says Mike Walsh. “All this time later we are going ahead with an upgrade, but the Lakeside equipment is amazing for how old it is—still working fine after all these years. My father pushed very hard for Montrose to have efficient and long-lasting treatment systems. Together with his colleagues, they certainly chose wisely.”

He adds, “When the ‘race-track’ (now known as the Lakeside Closed Loop

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Lakeside Equipment still going strong at Montrose—since 1963.

Reactor (CLR) Process) was installed, it was small of course for our small village, but even then, it was designed with room for expansion, which we took advantage of back in 1980. We've had no major problems at all. It has just kept on working away."

For most wastewater treatment plants, Lakeside's racetrack design with common wall construction has proved the most economical option, but over time, the reactor has been developed to take on several shapes, including the Folded U, Concentric Multichannel—and for small plants, a round packaged design with an internal final clarifier that offers the lowest construction and equipment cost.

The CLR Process from Illinois-based Lakeside consists of one or more reactors with a single feed point for raw wastewater and return sludge. The basic design at Montrose uses a simple racetrack configuration that provides a straight-line flow pattern for

wastewater between the headworks and the final clarifiers. At the core of the CLR Process is the horizontal Magna Rotor, which sustains a high population of microorganisms in the reactor to provide simple process control. The Magna Rotor provides precise oxygen input into the biological process through adjustment of rotor immersion by raising or lowering the level control weir and by adjusting the rotational speed.

It's hard to put into words just how proud Lakeside as a company is with the longevity of this equipment at Montrose. It was the company's first oxidation ditch installation—and remarkably, it still has the very original rotor aerators in use.

INSTALLATION BACK IN 1963

This installation in a beautiful part of British Columbia has actually been in operation much longer than most aeration companies have been in business. Since this inaugural installation back in 1963, more than 2,000 Lakeside systems of this type have been introduced to wastewater treatment plants all over Canada and the United States; equipment designed and made here in America. None are as old as this one from the early sixties, but there are a huge number that have an incredible track record and that are still going strong. Our products are also very low maintenance, but it is still a massive credit to the operators at Montrose that they clearly take very good care of their treatment plant equipment.

With back up in this part of Canada from Lakeside's representative, Promag Enviro of Burnaby, the CLR Process is not surprisingly known for its very stable operation over a wide range of influent flows and organic loadings—designed to minimize the time and effort required to control or adjust the system. Even in cold weather conditions when microorganism activity is decreased, the process operates efficiently without special attention.

The primary component of the CLR Process is its horizontal rotor aerator.

The Lakeside Magna Rotor provides oxygen to the biological mass, mixes microorganisms uniformly, and adds mixing velocity to the channel to prevent solids from settling. With the Lakeside blades die-formed of 10-gauge AISI Type 304 stainless steel to produce greater stiffness and rigidity, it is perhaps no wonder that the original rotors at Montrose—capable of taking a 250-pound impact load (without deformation) are still in working order.

ON THE ROAD TO UPGRADES

The mayor of Montrose, Mike Walsh, continues, "Winning a joint federal and provincial grant through the Investing in Canada infrastructure plan and New Building Canada Fund to upgrade our water and wastewater treatment is great news for our village. It's also welcome news for our operators, because much of the treatment plant operation has been a hands-on job, including the manual cleaning of screens, which isn't the most pleasant.

"Since 1963 when my father helped introduce our treatment plant, the number of homes in Montrose has almost doubled from 250 to 430, so we've had to reinvest—and can't expect the wastewater equipment to last forever. Upgrades to our plant should be completed by the fall of 2021. We know for sure that we have had great service from Lakeside and are pleased to be the owners of the longest serving oxidation ditches." ♦

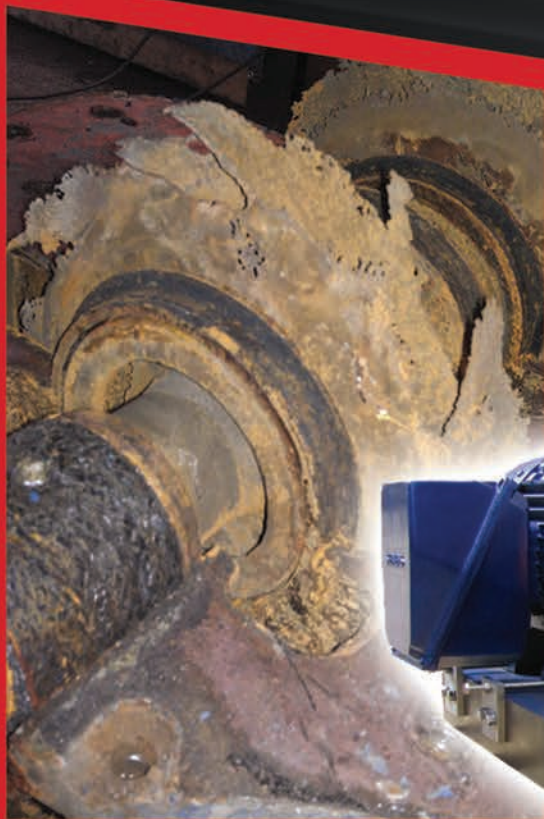
Warren Kersten is vice president of Lakeside Equipment Corporation. Lakeside Equipment Corporation is an engineering and manufacturing company concentrating on helping to improve the quality of our water resources. Lakeside started in the spring of 1928 to engineer, develop, and provide water purification systems to municipalities and companies throughout North America. For more information, visit www.lakeside-equipment.com.

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Simulation and Vibration Analysis of Shaft Cracks

Three shaft experiments at critical speeds

By Lin Liu, Zhuang Li, and Suri Ganeriwala, SpectraQuest, Inc.

A shaft crack is a slowly growing fracture of the rotor. If undetected in an operating machine, as a crack grows, the reduced cross section of the rotor will not be able to withstand the dynamic loads applied to it. When this happens, the rotor will fail in a fast brittle fracture mode. The sudden failure releases a large amount of energy that is stored in the rotating system, and the rotor will fly apart. This kind of failure may cause serious injury or even death to anyone unfortunately standing near the machine at that moment. Obviously, shaft crack detection is a very serious matter, and machines that are suspected of having a crack must be treated with the utmost caution.

Cracks are initiated in the shaft in regions of high local stress. Shafts are subjected to largescale stresses due to bending, torsion, static radial loads, constrained thermal bows, thermal shock, and residual stresses from heat treatment, welding, and machine operations. All of these stresses combine to produce a local stress field that changes periodically. In a small, local region where stresses exceed the maximum that the material can withstand, a crack will form in the material.

If the cyclic stresses are sufficiently high, the leading edge of the crack will slowly propagate so that the plane of the crack is perpendicular to the orientation of the tensile stress field. The orientation of this stress field is determined by the type of stress (bending or torsional) and by geometric factors. If the rotor is subjected only to simple bending stresses, then the stress field will be

oriented along the long axis of the rotor, and the crack will propagate directly into and across the rotor section, forming a transverse crack. The pure torsional stress will produce a tensile stress field that is oriented at 45 degrees relative to the shaft axis. A crack in this stress field will propagate into the rotor and tend to form a spiral on the shaft surface. Figure 1 shows these two types of cracks. In most rotor systems, the stress field contains a mixture of bending and torsional stress. Bending stress, however, is usually the dominant component, thus the crack will usually propagate into the rotor more or less as a transverse crack.

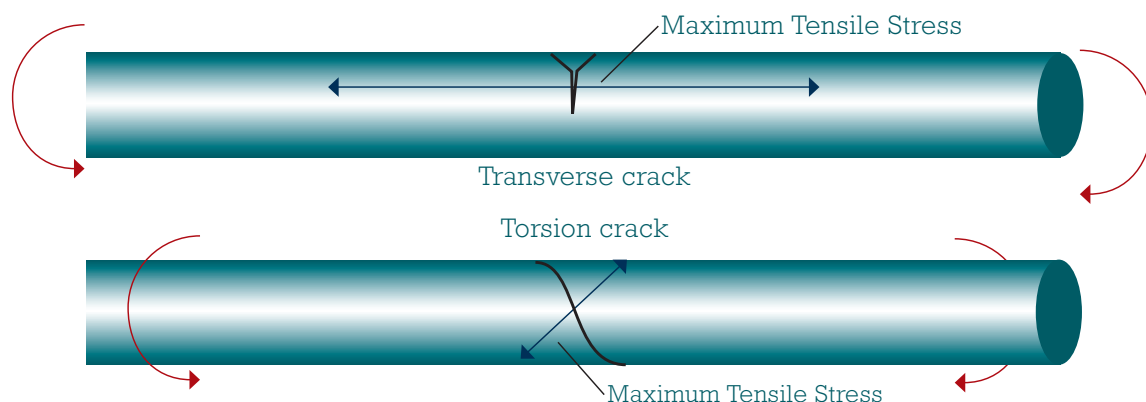


Figure 1

Figure 1: Transverse and torsion cracks.

Shaft bending stiffness is related to the shaft cross-section area. As a crack propagates across the shaft, the remaining cross section becomes smaller, and the bending stiffness of the shaft decreases. This will reduce the resonance frequency as well as the critical speed of the rotor system. The reduction in shaft stiffness also causes the rotor to bow more in response to a static or dynamic load, such as a rotating unbalance. The bow is likely to change over time. As a result, it will change the effective

location and magnitude of the heavy spot, which will consequently change the 1X rotor response.

If a rotor with a crack has a steady, unidirectional radial load, then a strong 2X response may appear when the rotor is turning at half of any resonance speed. As a breathing crack involves both the closing and opening in one revolution, the rotor will respond at the 2X frequency. If a resonance exists at twice running speed, then the 2X vibration will be amplified.

In this study, a series of tests were carried out on a SpectraQuest MFS with cracked shafts to observe their behavioral changes, including the critical speed, 1X and 2X frequency responses, compared with an intact shaft.

EXPERIMENTAL SETUP

Three experiments were designed to approach the objective of this study. They were:

- A. Cracked shaft simulated using Flange
- B. Notched shaft with V-shape crack 1.6 inches from the inboard bearing housing
- C. Notched shaft with V-shape crack 1 inch from the inboard bearing housing

The changes of critical speeds for the intact and cracked shafts were studied in Experiments A and B. The changes of 1X and 2X frequency responses for the intact and cracked shafts were investigated in Experiments B and C. The running speeds were chosen to be 2,000 rpm and 4,000 rpm.

The tests were conducted on the rotor MFS which is illustrated in figure 2. Four accelerometers were mounted on the inboard and outboard bearing housings in the vertical and horizontal direction, respectively. The setup of Experiment A is shown in figure 3.

Figure 2

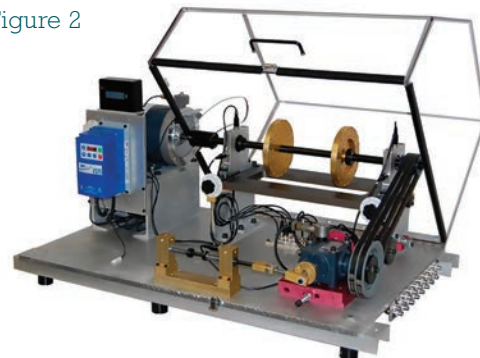


Figure 2: SpectraQuest's Machinery Fault Simulator (MFS).

Figure 3 shows the flange-simulated cracked shaft. It consists of two separable shafts joined at the mating flanges. The four bolts compress Belleville washers that can be loosened or tightened in a pattern to create an unsymmetric time varying stiffness and simulate the opening and closing of a transverse crack. The large disc next to the flanges provides gravity loading and a shaft bending moment. Tests were run with one, two, and three bolts loosened.

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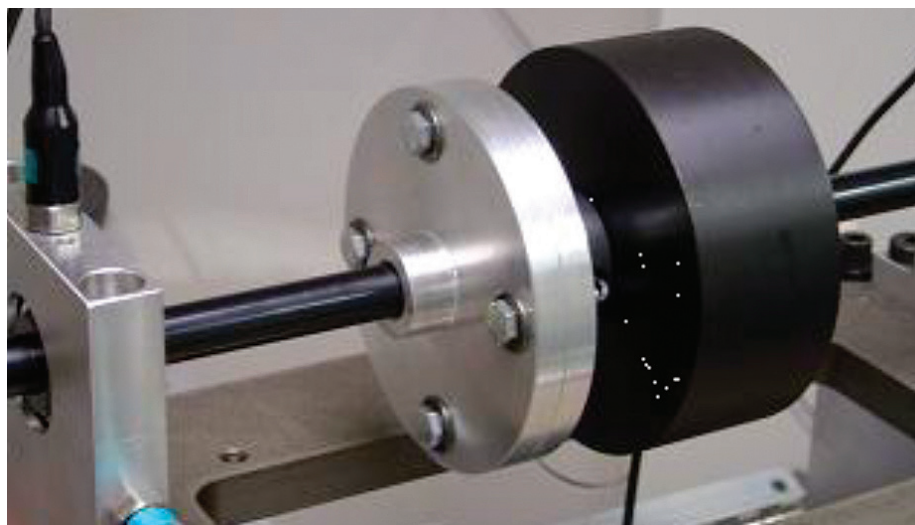


Figure 3: Setup for Experiment A.

The setup for Experiments B and C use a shaft with a simple 90 degree, 0.15 inch deep notch. A small tapped hole in the center allowed a small filler piece to be clamped in the notch to vary the stiffness change due to the notch. Tests were run with the filler piece removed, partially, and fully tightened.

EXPERIMENTAL RESULTS AND ANALYSIS

All experimental data have been collected and analyzed by using SpectraQuest's VibraQuest software package. Transient, Waterfall, and Analysis tools of this software package were mainly used in this study.

Change of Critical Speeds

The critical speed in start-up tests can be identified by using time-frequency spectrogram, time waveform, and waterfall plot of the acceleration signals, shown as figures 4 through 6 respectively. In figure 5, the abscissa is time (second). The red spot where a cursor points represents the first critical. The cursor values indicate that the critical occurs at 21.7 seconds and 65.62 Hz. For Experiment A, the critical speeds for different cracked conditions on the shaft are listed in Table 1, where the "all bolts tight condition" condition simulates no crack on the shaft, and three-loose means the most seriously cracked condition.

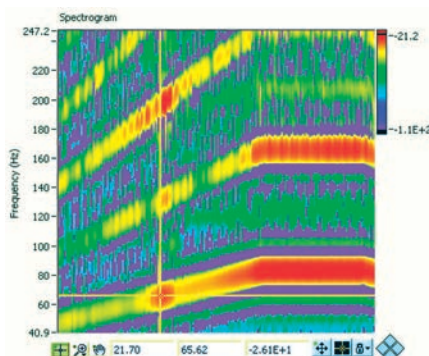


Figure 5: Intensity plot of the start-up in the flange-simulated crack test.

CONDITIONS	CRITICAL SPEED (HZ)
All bolts tight	65.62
One bolt loose	65.00
Two bolts loose	64.37
Three bolts loose	64.37

Table 1: Change of the critical speed in Experiment A.

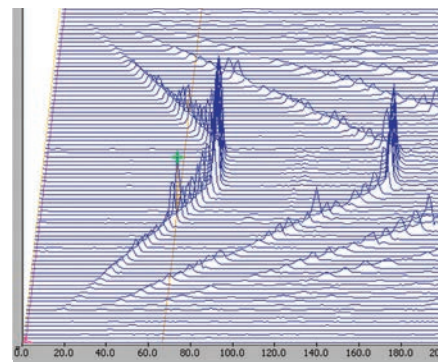


Figure 6: Waterfall plot of the start-up and coast-down in the flange-simulated crack test.

CONDITIONS	CRITICAL SPEED (HZ)
Intact	65.00
Filler fully tightened	62.50
Filler partially tightened	62.50
No-filler	60.00

Table 2: Change of the critical speed in Experiment B.

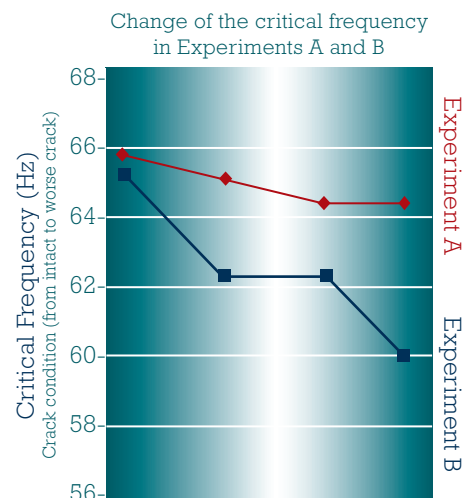


Figure 7: Changes of critical speeds as the crack conditions change.

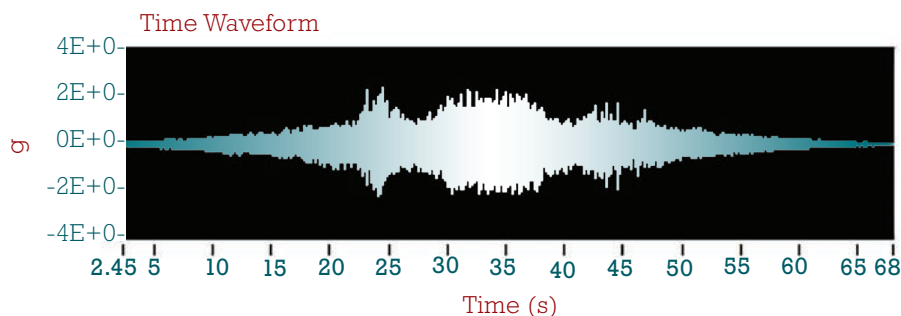


Figure 4: Time waveform of the start-up and cost-down test for "all bolts tight" condition.

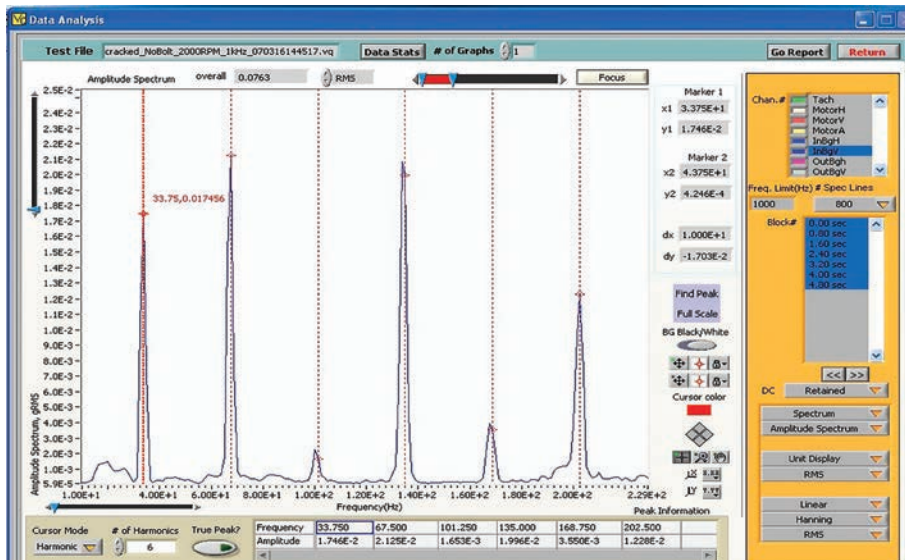


Figure 8: Frequency analysis of 1X and 2X frequency responses.

The critical speeds for different cracked conditions on the shaft in Experiment B are listed in Table 2. Intact means no crack on the shaft and “No-filler” represents the most serious crack condition. Filler fully tightened and Filler partially tightened (more serious than Filler fully tightened) stand for the middle cracked conditions.

Both tables have demonstrated that as the crack grows, the critical speed decreases due to the reduced stiffness. The overall trend of these results matches the theory of shaft crack quite well. Figure 7 clearly shows this trend for the changes of critical speeds in different crack conditions.

1X and 2X Frequency Response

Using the analysis functions in the VibraQuest software package, as shown in figure. 8, it is easy to obtain the 1X and 2X frequency response for each steady-state test in Experiments B and C. Because the critical speeds of the rotor systems were around 60 Hz to 65 Hz, when the running speed is 2,000 rpm (33.33 Hz) in the tests, 2X will be close to the resonance frequency. So both the 1X and 2X components need to be analyzed. When the running speed is 4,000 rpm (66.67 Hz), 1X is close to the resonance frequency and 2X will be far away from it. Therefore, only the 1X frequency response has been analyzed.

Tables 3 through 6 show the results of 1X and 2X frequency response for all cases of Experiments B and C.

EXPERIMENT B, 2,000 RPM	1X (G)	2X (G)
Intact shaft	9.578e-3	1.753e-2
Cracked shaft (No-filler)	1.746e-2	2.125e-2

Table 3: 1X and 2X frequency responses for 2,000 rpm in Experiment B.

EXPERIMENT B, 4,000 RPM	1X (G)
Intact shaft	8.732e-2
Cracked shaft (No-filler)	2.756e-1

Table 4: 1X frequency responses for 4,000 rpm in Experiment B.

EXPERIMENT C, 2,000 RPM	1X (G)	2X (G)
Intact shaft	9.578e-3	1.753e-2
Cracked shaft (No-filler)	2.729e-2	1.471e-2

Table 5: 1X and 2X frequency responses for 2,000 rpm in Experiment C.

EXPERIMENT C, 4,000 RPM	1X (G)
Intact shaft	8.732e-2
Cracked shaft (No-filler)	1.714e-1

Table 6: 1X frequency responses for 4000 rpm in Experiment C.

Comparing these results shows that normally the 1X and 2X frequency responses of the cracked shaft are larger

than that of the intact shaft. This means the crack in the shaft has changed and amplified the 1X and 2X vibration responses. This result is consistent with the theoretical consequence about the shaft crack which has been mentioned before in the introduction.

SUMMARY

A shaft crack is a slowly growing fatigue fracture of the rotor. Damage of a crack failure can cause serious injury and therefore detection of shaft crack is very important. Shaft crack reduced the bending stiffness of the shaft due to the reduced available cross-section area. That will change the critical speed of the rotor system, and its 1X and 2X frequency response when the system is operated at one-half of a resonance frequency. All these provide the diagnosis for shaft cracks.

In this study, shaft cracks were simulated and analyzed using SpectraQuest rotor Machinery Fault Simulator and the VibraQuest software package. A series of experiments were conducted to observe the behavioral changes of the cracked shaft in critical speed, 1X and 2X frequency responses. The results show that the critical speed decreased as the crack increased, and the 1X and 2X frequency response for cracked shaft increased compared with the intact shaft. Those results are consistent with the theoretical consequence of the shaft crack. ♦

SpectraQuest, Inc. is a leading developer and manufacturer of complete turn-key Systems for training and diagnosis in machine vibration analysis, rotor balancing, and shaft/coupling alignment. System includes machinery fault simulators, interactive training program, data acquisition hardware/software, and accessories. To accelerate the learning and design process SpectraQuest offers a series of interactive software CDs on vibration fundamentals and calculations, signal processing, alignment, and balancing. For more information, visit www.spectraquest.com.

Seal-less Magnetic Drive Pumps for Chemical Processing Applications

Part 1 of 2

By Colin Guppy, Sundyne LLC

The chemical industry is an integral part of the global economy—contributing roughly \$6 trillion annually, or almost 10 percent of the world's GDP. Chemical Processing permeates thirty-four industries, and directly or indirectly supports more than 120 million jobs in fifty-eight countries.

The production of chemicals requires high volumes of liquids that need to be pumped around a plant. Most of these raw materials are harsh and hazardous in nature—presenting risks to the health and safety of plant personnel and the environment.

But every day, everyone touches items made from chemical processing. The food we eat, the water we drink, the buildings we live and work in, the vehicles that transport us, the medicines we consume, the energy we use for heating, cooling and lighting, and the packaging products that move goods from point A to B all require chemicals. Ten of the world's most common chemical processing applications are:

1. **Chlor Alkali:** for the production of chlorine and caustic soda
2. **Plastics:** for bottles, packaging and thousands of other uses
3. **Polymers:** for thousands of products, including batteries/fuel cells
4. **Pharmaceuticals:** for drugs and biologics
5. **Purified Terephthalic Acid (PTA):** for polyester and clothing
6. **Acids:** such as sulfuric, phosphoric and nitric
7. **Peroxides:** for bleaching agents
8. **Ammonia and Urea:** for fertilizers and hundreds of other products
9. **Insecticides:** for agriculture
10. **Herbicides:** for consumer products.



WHY SEAL-LESS PUMPS ARE PREFERRED FOR CHEMICAL PROCESSING APPLICATIONS

The Top 10 Advantages that Magnetic Drive Seal-less Pumps Offer Versus Sealed Designs:

1. No seals or seal support systems
2. Complete fluid containment
3. Zero emissions
4. Reduced installation costs
5. Reduced maintenance costs
6. Longer MTBF intervals
7. Maintenance time/skills can be used elsewhere
8. No EPA monitoring/documentation
9. Improved operator safety
10. Protection for the environment

Who should consider switching from sealed pumps to seal-less pumps? The answer includes any of the following:

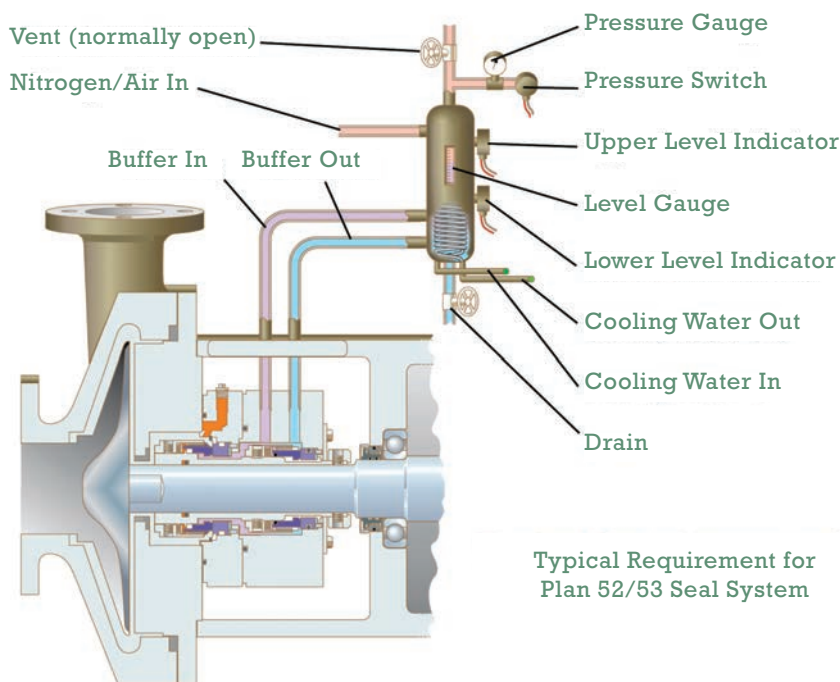
- Applications with legislative and liability risk compliance
- Units needing to improve reliability
- Duties that are hard to seal
- Applications/fluids that react with moisture/air
- Any plant seeking to meet higher MTBF goals.

Operators that switch from sealed to seal-less pumps can realize a number of benefits, such as: eliminating the mechanical seal, which eliminates product leakage; reducing the pump's footprint; minimizing (or eliminating) alignment issues; and each of these items results in a higher MTBF. From a cost perspective, switching to seal-less pumps reduces installation costs—because there are no seal support systems or utilities. It requires less instrumentation and it significantly reduces the amount of maintenance required over the life of the pump, resulting in a lower total cost of ownership.

A LOOK AHEAD

Standards play a key role in the chemical industry. In next month's conclusion, we'll take a closer look at the peace of mind—both within the industry and for customers—that comes from a thorough understanding and implementation of performance and safety requirements throughout a plant. ♦

Colin Guppy is Sundyne's chief commercial officer. He is responsible for developing strategies and tactics for Sundyne's chemical industry sector. He can be reached at colin.guppy@sundyne.com. Sundyne has assembled industry-leading brands that provide customers with a wide range of fluid and gas handling services and solutions. Brands like Ansimag, HMD Kontro, and Marelli have broadened the original Sundyne portfolio for a wider range of markets. Sundyne equipment can be built to most standards, including ANSI, ISO, and API. For more information, visit www.sundyne.com or www.hmdkontro.com.



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Safely Transferring Flammable Materials During a Pandemic

Reopening strategies drive need for safe refilling solutions for sanitizers and disinfectants

By Nancy Westcott, GoatThroat Pumps



As major segments of the economy attempt to formulate and implement effective re-opening strategies that meet state guidelines, many are forced to make critical decisions regarding mandating masks, enforcing social distancing, and improving cleaning and disinfecting procedures.

Although individual strategies for hotels, gyms, restaurants, bars, retailers, casinos, entertainment venues, and corporate offices may differ, re-opening guidelines usually have common, overlapping elements. Temperature checks for patrons and/or employees and better air filtration are good examples. But at the heart of seemingly every list is a dramatic increase in the frequency and thoroughness in cleaning common area surfaces, along with providing a readily available supply of hand sanitizer for employees and patrons.

Given the accelerated cleaning efforts, many businesses are opting to procure disinfectants and hand sanitizer in bulk. However, distributing such products from 275-gallon totes, barrels, drums and even single gallon sized bottles requires transferring or “down packing” to smaller containers or dispensers.

It also means that workers responsible for transferring such products—most of which are identified as potentially flammable or combustible substances—must do so at a dramatically higher rate and frequency. This could lead to a corresponding spike in the number of spills, worker injuries, catastrophic fires, and even explosions that occur.

So, to safely handle the spike in demand and facilitate down packing, businesses have been increasingly installing properly engineered refill stations using groundable, sealed pump systems that will allow employees to reliably and safely transfer from bulk containers to smaller containers.

EPA EASES RESTRICTIONS ON DISINFECTANTS

Coronaviruses like COVID-19 are enveloped viruses (a virus with an outer wrapping or envelope). They are one of the easiest types of viruses to kill with the appropriate disinfectant product. So, in the early stages of the pandemic, the U.S. Environmental Protection Agency (EPA) acted quickly to release a list of disinfectants that could be utilized to combat SARS-CoV-2 (see EPA's List N: Disinfectants for Use Against SARS-CoV-2).

TAs demand for disinfectant and hand sanitizer surges, properly engineered refilling stations with pumps capable of safely transferring flammable materials should be utilized.



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Shortly thereafter, the EPA made announcements that included temporarily allowing manufacturers of the List N disinfectants to obtain certain active ingredients from any source of suppliers without checking with the agency first. In addition, the EPA loosened the restrictions on refilling small containers from larger bulk containers.

However, the problem is that traditional practices of transferring liquid chemicals, including sanitizers and disinfectants on the EPA List N, suffer from a number of drawbacks. To start, common manual techniques, such as the tip-and-pour method, can cause spills and injuries to employees. Tipping heavy barrels or drums can lead to overpouring, but also toppling, so the probability of a spill is high.

This brings us briefly to the subject of personal protection equipment (PPE). Users need to review the safety data sheets (SDS) for correct and safe handling of their fluids and chemicals as well as PPE requirements at the points of use. In this way, worker protection is significantly enhanced.

The bar for safe transfer is even higher for many alcohol-based sanitizers and chemical-based disinfectants, which can pose issues of flammability or combustibility. In a flammable liquids fire, it is the vapors from the liquid that ignite, not the liquid. Fires and explosions are caused when the perfect combination of fuel and oxygen come in contact with heat or an ignition source. Based on their flash points, that being the lowest temperature at which liquids can form an ignitable

mixture in air, flammable liquids are classified as either combustible or flammable.

Both combustible and flammable liquids can easily be ignited by a flame, hot surface, static electricity, or a spark generated by electricity or mechanical work. Consequently, minimizing the dangers of handling flammable and combustible liquid chemicals, including some sanitizers and disinfectants, requires proper training and equipment.

SAFE HANDLING

Without proper ventilation, the handling of flammable substances has a good chance to create an explosive atmosphere. Therefore, it is essential to work only in well ventilated areas or have a local ventilation system that can sufficiently remove any flammable vapors to prevent an explosion risk.

Because two of the three primary elements for a fire or explosion usually exist in the atmosphere inside a vessel containing a flammable liquid (fuel and an oxidant, usually oxygen), it is also critical to eliminate external ignition sources when handling such liquids. Sources of ignition can include static discharge, open flames, frictional heat, radiant heat, lightning, smoking, cutting, welding, and electrical/mechanical sparks.

STATIC ELECTRICITY GROUNDING

When transferring flammable liquids from a large container (greater than a gallon) to a smaller container, the flow of the liquid can create static electricity, which can result in a spark. Static electricity build-up is possible whether using a pump or simply pouring the liquid. If the bulk container and receiving vessel are both metal, it is important to bond the two by firmly attaching a metal bonding strap or wire to both containers as well as to ground, which can help to safely direct the static charge to ground.

When transferring Class 1, 2, or 3 flammable liquids with a flashpoint below 100 degrees Fahrenheit (37.8 degrees Celsius), OSHA mandates that the containers must be grounded or bonded to prevent electrostatic discharge that could act as an ignition source. NFPA 30 Section 18.4.2.2 also requires a means to prevent static electricity during transfer/dispensing operations.

ENGINEERING CONTROLS

Beyond workers wearing proper PPE at a jobsite with proper ventilation, it is absolutely critical to use regulatory compliant, engineered controls to safely transfer potentially flammable and combustible liquids, including bulk sanitizer and disinfectant. Most states and municipalities across the United States have adopted NFPA® 30 Flammable and Combustible Liquids Code and OSHA 29 CFR 1910.106, which address the handling, storage, and use of flammable liquids. With NFPA 30, material is classified as a Class 1 liquid (flammable) and Class 2 and 3 (combustible).

The design of this sealed pump system also prevents liquid vapors from exiting the container when the pump is unused.

The codes account for safeguards to eliminate spills and leakage of Class 1, 2, and 3 liquids in the workplace. This begins with requirements surrounding the integrity of the container, but also extends to the pumps used to safely dispense flammable and combustible liquids.

In most workplaces, supervisors and facility managers have recommended rotary and hand suction pumps to transfer flammable liquids for decades. However, they are increasingly turning to sealed pump systems designed for class 1 and 2 flammable liquids, which are a more effective engineering control tool for protecting employees and operations.

Conventional piston and rotary hand pumps have some inherent vulnerabilities. These pumps are open systems that require one of the bungs holes to be open to the outside atmosphere. The pumps dispense liquids from the containers using suction, so it requires that a bung be open to allow air to enter the containers to replace the liquid removed. Without this opening, either the container will collapse or the liquid will stop coming out.

For isopropyl alcohol based liquids, not only will such a system lead to the evaporation of the sanitizing material—the IPA—but the liquid will also absorb water from the air such that it will be more water than air in short order.

SEALED PUMP SOLUTIONS

As a solution, the industry has developed sealed pump dispensing systems that enhances safety by eliminating spills and enables spill-free, environmentally safe transfer that prevent vapors from escaping the container.

These systems are made of groundable plastic and come complete with bonding and grounding wires. The spring actuation tap handle can be immediately closed to stop liquid flowing, preventing any spills. The design of this sealed pump system also prevents liquid vapors from exiting the container when the pump is unused. These characteristics significantly reduce the chance of an ignition event. The combination of all these features ensure the pump meets both NFPA30-2015.18.4.4 standards and NFPA 77.

GoatThroat Pumps offers refill solutions for dispensing disinfection liquids and sanitizers. In March, GoatThroat fulfilled orders for nearly 1,000 systems from both manufacturers as well as large corporate entities interested in providing hand sanitizer for all employees at all locations.

In two weeks, GoatThroat received a tsunami of calls for an isopropyl alcohol specific pump, which is designed to handle flammable liquids. Companies that just needed to use hand sanitizers in smaller capacities, like filling little bottles from large barrels, would call to order pumps with spout reducers.

The other source of inquiries were breweries switching over to manufacturing hand sanitizer and many manufacturing facilities that use the pumps as refill stations for jugs and bags to dispense product at the point-of-use.

GoatThroat has one prison authority using its pumps with pneumatic adapters reporting that they were repackaging 6,000 gallons a day of hand sanitizer with only two systems for use by the entire state prison population.

A NEW NEED FOR THE NEW NORMAL

The whole subject of personal protection is now being expanded on a broader front. PPE now also applies to those pumps on drums of sanitizers.

With the need for hand sanitizers and disinfectants expected to continue to rise given its central role in most successful reopening strategies, properly engineered refill stations will play a key role in allowing for the safe transfer of disinfectants and hand sanitizer from bulk containers. ♦

GoatThroat Pumps are manufactured exclusively by Westcott Distribution Inc. in Connecticut and are sold worldwide. For more information, call 866.639.4628, email info@goatthroat.com, or visit www.goatthroat.com.

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AI Optimizes Operations in Demanding Market Conditions

ABB analytics software combines operational data with engineering and IT data

By Bernhard Eschermann, ABB Industrial Automation

Analyst studies suggest that industrial companies typically are able to use only 20 percent of the data generated, which severely limits their ability to apply data analytics meaningfully. ABB's new solution operates as a digital data convergence point where streams of information from diverse sources across the plant and enterprise are put into context through a unified analytics model. Application of artificial intelligence on this data produces meaningful insights for prediction and optimization that improve business performance.

The ABB Ability™ Genix Industrial Analytics and AI Suite is a scalable advanced analytics platform with pre-built, easy-to-use applications and services. It collects, contextualizes, and converts operational, engineering and information technology data into actionable insights that help industries improve operations, optimize asset management, and streamline business processes safely and sustainably.

A LIBRARY OF APPLICATIONS AT YOUR FINGERTIPS

"We believe that the place to start a data analytics journey in the process, energy, and hybrid industries is by building on the existing digital technology—the automation that controls the production processes," says Peter Terwiesch, president of ABB Industrial Automation. "We see a huge opportunity for our customers to use their data from operations better, by combining it with

engineering and information technology data for multi-dimensional decision making. This new approach will help our customers make literally billions of better decisions."

ABB Ability Genix is composed of a data analytics platform and applications, supplemented by ABB services, that help customers decide which assets, processes, and risk profiles can be improved, and assists customers in designing and applying those analytics. Featuring a library of applications, customers can subscribe to a variety of analytics on demand, as business needs dictate, speeding up the traditional process of requesting and scheduling support from suppliers.

THE COMBINED POWER OF DATA AND AI

Scalable from plant to enterprise, ABB Ability Genix supports a variety of deployments including cloud, hybrid, and on-premise. ABB Ability Genix leverages Microsoft Azure for integrated cloud connectivity and services through ABB's strategic partnership with Microsoft.

"The ABB Ability Genix Suite brings unique value by unlocking the combined power of diverse data, domain knowledge, technology, and AI," says Rajesh Ramachandran, chief digital officer for ABB Industrial Automation. "ABB Ability Genix helps asset-intensive producers with complex processes to make timely and accurate decisions through deep analytics and optimization across the plant and enterprise."





“We have designed this modular and flexible suite so that customers at different stages in their digitalization journey can adopt ABB Ability Genix to accelerate business outcomes while protecting existing investments.”


MAKING THE MOST OF OPERATIONAL DATA

A key component of ABB Ability Genix is the ABB Ability Edgenius Operations Data Manager that connects, collects, and analyzes operational technology data at the point of production. ABB Ability Edgenius uses data generated by operational technology such as DCS and devices to produce analytics that improve production processes and asset utilization. ABB Ability Edgenius can be deployed on its own, or integrated with ABB Ability Genix so that operational data is combined with other data for strategic business analytics.

There is great value in data generated by automation that

controls real-time production. With ABB Ability Edgenius, we can pull data from these real-time control systems and make it available to predict issues and prescribe actions that help us use assets better and fine-tune production processes. ♦

Bernhard Eschermann is chief technology officer for ABB Industrial Automation. ABB's Industrial Automation business offers a broad range of products, systems, and solutions for customers in the process and hybrid industries. These include industry-specific services, as well as measurement and analytics, marine, and turbocharging offerings. With deep domain knowledge, experience and expertise, ABB Industrial Automation helps customers increase their competitiveness, improve their return on investment, and run safe, smart, and sustainable operations. For more information, visit www.abb.com.




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The Royal Discipline of TIG Welding

Optimization of welding results through the correct selection of high-quality tungsten electrodes

Part 1 of 2

By Xavier Jauregui, Arc Machines Inc., and Matthias Schaffitz, Wolfram Industrie GmbH



Orbital welding is frequently used in the manufacturing trade, for applications ranging from installing cooling and heating pipes in dairies to welding fuel pipes in the aerospace sector.

Quality pays off: For example, nobody would equip a Formula 1 racing car with inexpensive all-weather tires. In order to achieve a competitive speed, the vehicle should lie optimally on the track and be perfectly matched to the respective track conditions. Even with TIG arc welding, the tool used for high-quality welds must be adapted to the respective application—and yet many welders use second-class tungsten electrodes that are not matched to the respective process. This choice leads to a deterioration in the welding results due to low electrode quality. However, efficient orbital welding requires a tungsten electrode with an individually adapted tip geometry and surface roughness to match the correct shielding gas. For optimal weld seams, other factors must also be taken into account that influence the arc start properties, arc stability, total heat input, and correspond to the characteristics of the weld seam.

The adaptation of all parameters to the respective TIG application enables a service life that is up to six times longer and thus resource savings of more than 350 percent compared to the use of non-specific no-name electrodes. However, this can only be achieved with the appropriate know-how, the correct selection, and the use of high-quality tungsten. Three central elements can be optimized in this way: the welding process itself, the chemical properties of the tungsten alloy used, and the grinding process for the electrode tip.

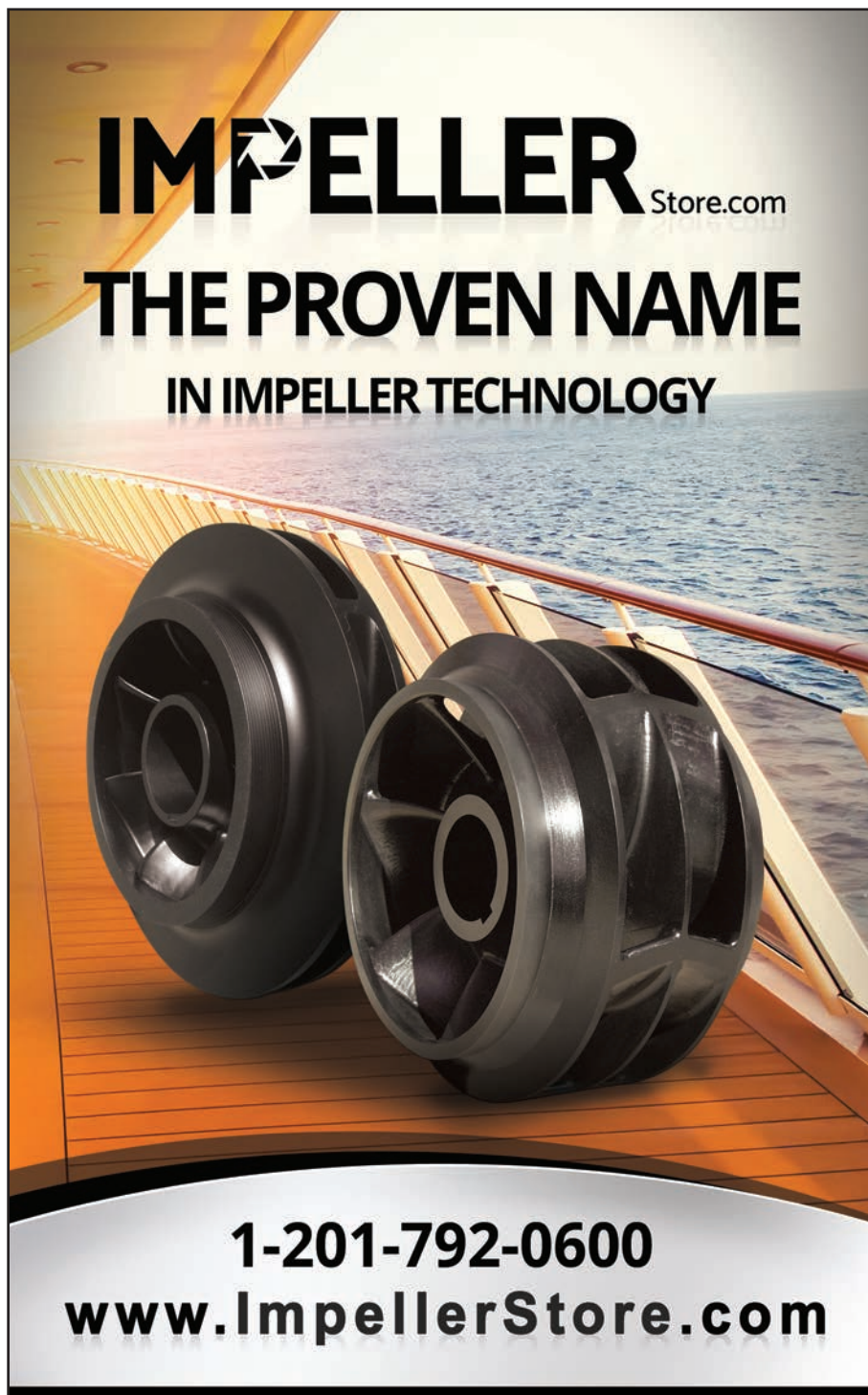
INCREASING DEMANDS ON THE WELDING PROCESS

In today's industrial environment, many manufacturers and processors of metal tubes and pipes are faced with stricter requirements for weld seam properties than was the case in the past. The semiconductor industry, for example, needs narrower weld seams with fine surfaces on the inside of stainless steel pure gas pipes. These tubes transport

high-purity gases that are toxic, flammable, or corrosive, which is why the weld seams produced using the fusion welding process must be corrosion-resistant and cleanly processed in order to enable trouble-free flow. In addition, designers from all technical disciplines are increasingly pushing the limits of

technical feasibility, for example by reducing pipe wall thicknesses to the necessary minimum. The clean processing of the weld seams is, therefore, becoming increasingly important with regard to the safety and service life of the products.

As the industry continues to evolve and adapt its processes,



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welders are also finding that their entire work environment is subject to high competitive pressure. Using FMEA (Failure Mode and Effects Analysis) and data analysis of the process variables, the previously underestimated hidden costs when using orbital systems were identified—for example, the production of scrap, reduction in system availability and frequent replacement of the electrodes. This drives the total cost of ownership up, although at the same time it would save as much money as possible. This includes avoiding premature wear of the tungsten electrode and irregularities in the machining process that can result from the use of different tungsten alloys when using electrodes from different manufacturers.

PROPER CHEMISTRY THROUGH POWDER METALLURGY

Another important element for the quality of an electrode is its chemical composition. To improve electrode performance, dopants in the form of cerium, lanthanum, zirconium, thorium, terbium, and yttrium oxides are often incorporated into tungsten electrodes. Such oxides lower the electron work function—measured in electron volts (eV). For example, pure tungsten has rating of 4.5 eV, whereas a 2 percent seriated tungsten has an eV of 2.8. By lowering the eV value or increasing the ionization potential, the oxides improve arc starting performance and arc stability.

However, the influence of this variable on the welding result is often underestimated and most companies consider the tungsten electrode as a static component. In fact, as soon as the welding current flows, the electrode becomes a dynamic subsystem, the parameters of which influence the properties of the arc significantly. Specifically, the heat of the welding arc causes oxides to migrate from the relatively cooler core of the electrode to the hotter tip. There, the oxides separate (evaporate) from the base element and leave a film on the electrode tip.

Small tolerances in the grain size, the purity of the elements, and the composition ratio are essential to ensure a consistent oxide movement and evaporation rate, which in turn leads to a consistently high ignitability.

Because the melting points of the materials used for the electrodes can vary substantially—tungsten melts at 6,191 degrees Fahrenheit (3,422 degrees Celsius), cerium oxide at 4,352 degrees Fahrenheit (2,400 degrees Celsius)—the electrode manufacturers rely on the powder metallurgy process. Specific, extremely fine tungsten grain sizes are mixed in order to achieve a homogeneous oxide distribution in the matrix. After this process, the tungsten and the oxide powder are pressed together by isostatic pressure, so that a uniform density and microstructure are created. As a result, the brittle and unconsolidated electrodes are sintered for several hours in a high-purity hydrogen environment and at controlled temperatures. After sintering, the electrodes can be forged to their final shape, which further optimizes the grain structure. The complexity of the tungsten electrode manufacturing process offers many opportunities for error, which explains the performance and cost differences between brands. Therefore, extensive know-how about the electrode is

required on the one hand, but also extensive knowledge of the area of application itself, on the other hand, in order to be able to optimally adapt the tool for the respective process.

A LOOK AHEAD

In next month's conclusion, we'll examine the critical role geometry plays in tungsten electrode performance as well as results from newer research that has been conducted under actual orbital welding conditions. ♦

Xavier Jauregui is vice president of the technical area of Arc Machines Inc. and **Matthias Schaffitz** is managing director of Wolfram Industrie GmbH. Founded in 1976, Arc Machines, Inc. is an American company that designs, manufactures and distributes advanced automated orbital welding equipment, systems and services. Wolfram Industrie develops, tests, and produces innovative tungsten and molybdenum products to meet industrial requirements. For more information, visit www.arcmachines.com and www.wolfram-industrie.de.

Since the melting points of the materials can differ considerably – tungsten melts at 6,191 degrees Fahrenheit (3,422 degrees Celsius), cerium oxide at 4,352 degrees Fahrenheit (2,400 degrees Celsius)—the electrode manufacturers trust the powder metallurgy process. Specific, extremely fine tungsten grain sizes are mixed in order to achieve a homogeneous oxide distribution in the matrix.

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Featured Product

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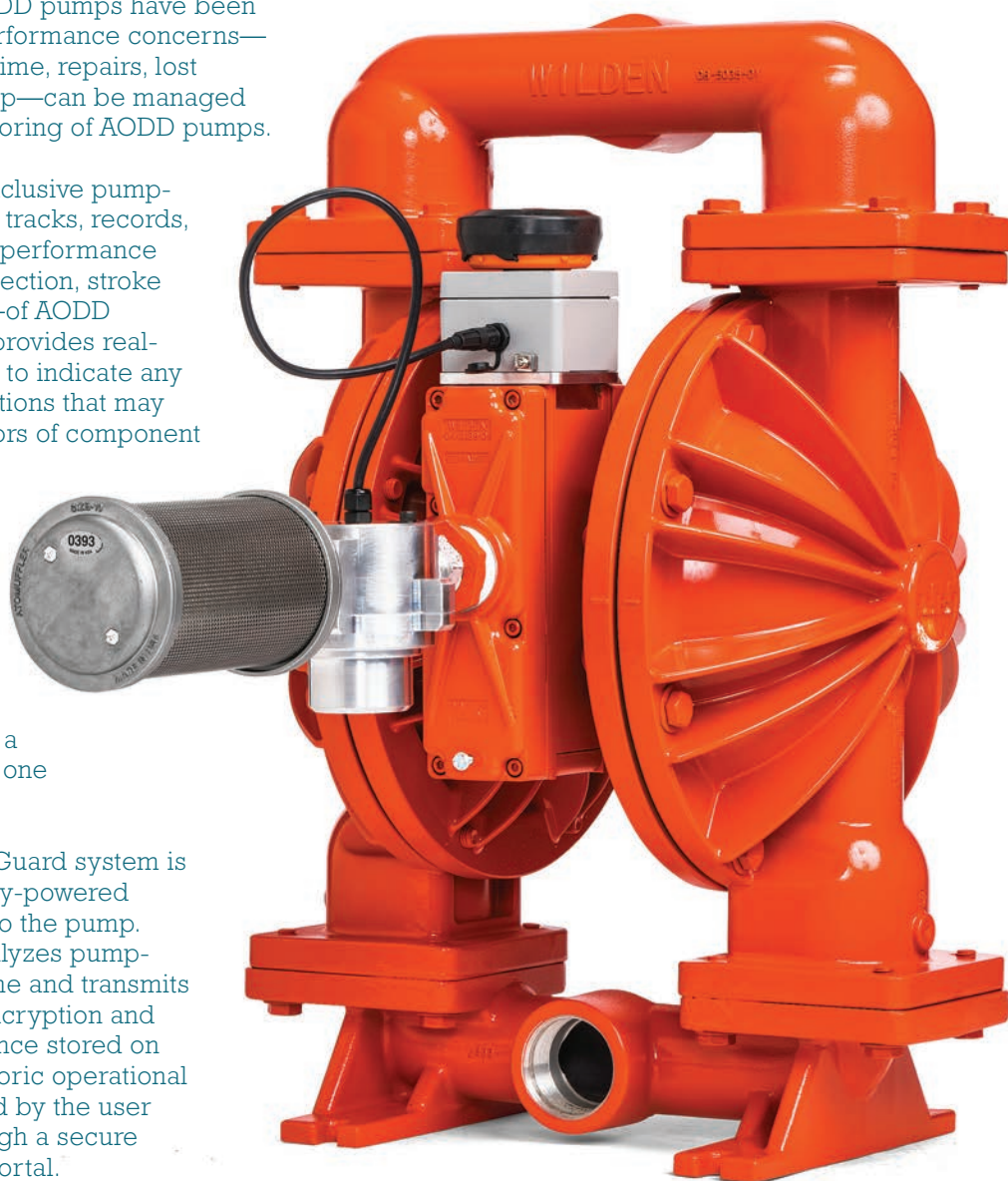
Wilden SafeGuard is the industry's first air-operated double-diaphragm (AODD) pump Internet of Things (IoT) enabled remote performance monitoring and alert system.

No matter how comprehensive the maintenance schedule, pump breakdowns and compromised performance are always possible, making it imperative that operators of manufacturing facilities know how their AODD pumps have been performing. Many pump-performance concerns—including high cost of downtime, repairs, lost product, and product cleanup—can be managed through the advanced monitoring of AODD pumps.

The Wilden SafeGuard all-inclusive pump-monitoring system remotely tracks, records, and alerts customers to key performance indicators—such as leak detection, stroke rate, and total stroke count—of AODD pumps during operation. It provides real-time alerts via SMS or email to indicate any noteworthy change in operations that may be a precursor to or indicators of component failure. Wilden SafeGuard also provides the ability to store maintenance records to help identify patterns to further enhance preventative maintenance plans. The Wilden SafeGuard solution has been designed to monitor a single pump or a fleet of AODD pumps within one dedicated software system.

The connected Wilden SafeGuard system is composed of a single battery-powered sensor mounted directly onto the pump. This sensor collects and analyzes pump-performance data in real-time and transmits it to a central gateway for encryption and transmission to the cloud. Once stored on the cloud, real-time and historic operational information can be accessed by the user anywhere in the world through a secure smartphone app or online portal.

For more information, visit wildenpump.com.



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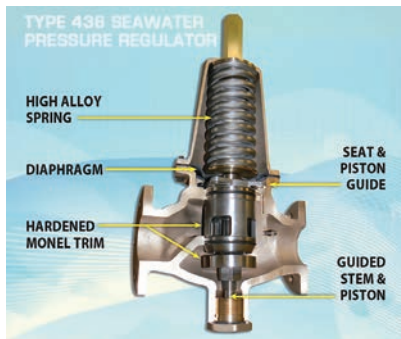
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Leybold expands its EcoDry plus product family of dry multi-stage roots vacuum pumps for laboratory, research and development and analytical applications. The current EcoDry 40 and 65 plus models are now joined by the new, smaller pump sizes EcoDry 25 and 35 plus. A characteristic of EcoDry plus, which is particularly important in research facilities and in analytical laboratories, is its low noise level. A further advantage of the new EcoDry 25 and 35 plus; it emits neither oil vapor, nor particles. For more information, visit www.leyboldproducts.us.

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Gardner Denver High Pressure Solutions (HPS) launches its new GD 250HDD pump to serve as a durable, reliable, American-made pump for a range of horizontal directional drilling (HDD) applications. The GD 250HDD pump expands Gardner Denver's pump offerings into the wider HDD space for the first time, built with quality and efficiency in mind. The pump can be used to tunnel under rivers and roads and help to lay sewerage systems, water pipes, fiber optic lines, and pipelines. For more information, visit www.gardnerdenverpumps.com.



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Working Smart, Wherever You Are

Xona's Bill Moore says remote operations technology will become the new normal



Bill Moore is the CEO and founder of Xona, which provides remote access and operational technology solutions for power generation and distribution customers worldwide. Moore has more than two decades of experience in security and the high-tech industry, and he shared his thoughts on the growing role of remote access technology on a recent episode of MPT's podcast, The Efficiency Point. An excerpt of this conversation appears below.

MPT: The COVID-19 pandemic has necessitated a number of changes, both in business and daily life. What have some of these changes been for utilities and oil and gas producers?

Bill Moore: Obviously, there's been a shift in moving more towards a remote-operations environment. What's kind of precipitated some of this has been to have people in locations to troubleshoot, whether it's in a power plant or at a remote site for power distribution. What we've seen is in many cases, they've quarantined these control rooms, in power gen, in particular. Plus, a lot of times that's been difficult to get senior people to these locations, which obviously can present problems from troubleshooting a situation or just being able to have visibility over what's going on. So, there's definitely been a need for a remote access type of solution. In many cases, a lot of these facilities have never really done remote operations in the past like you see in the IT industry.

MPT: What does remote access look like for many of these industries?

Bill Moore: It's quite a bit different. When you're connecting to control rooms and operational technology in the IT industry, we look at that from a remote access perspective. And, there's been twenty years of IT technology, so people are familiar with VPNs and multi-factor authentication. If you think about using a password, and then you get a code, a text, SMS message on your cell phone to enter code, that's multi-factor authentication. There's a lot of other pieces of that in the industry in terms of being able to secure

file transfers and so forth. So a lot of these are integrated technologies that sit in a data center in the IT world, but in operational technology, or OT, generally, there's just a few of these systems—SCADA systems, for example.

A lot of times, they really haven't had all of that technology available to them, so what we've really done is provided a sort of tailor-made OT user access platform that allows them to be able to access control room screens like SCADA applications and be able to actually operate the systems—whether they be pumping stations or turbines or whatever they may be—and be able to do that from home in a very simple and secure way.

MPT: Are there new opportunities for growth or improved efficiencies hidden in these changes?

Bill Moore: One of our first customers is in a natural gas distribution, and one of the things that they recognized is that they were looking for a better, simpler way to do remote access to applications. They also have an odorant pump at these sites, and they really wanted a way where they can go to the site to be able to access those systems.

One of the things that were able to do from an operational efficiency standpoint was, when they pull up, they can look at an interface to the lot of these control systems, and they could take a tablet and go out and do maintenance checks or calibrations. Typically, that took two technicians, one to go into a control room and the other person out doing the checks and they're on two-way radios communicating that information.

But by being able to remote the screen, beyond just access, but actually remotng the screen itself into a browser on a tablet, that was able to offer some operational efficiencies while also meeting compliance. ♦

To listen to an extended version of this interview, be sure to subscribe to MPT's podcast, The Efficiency Point.



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