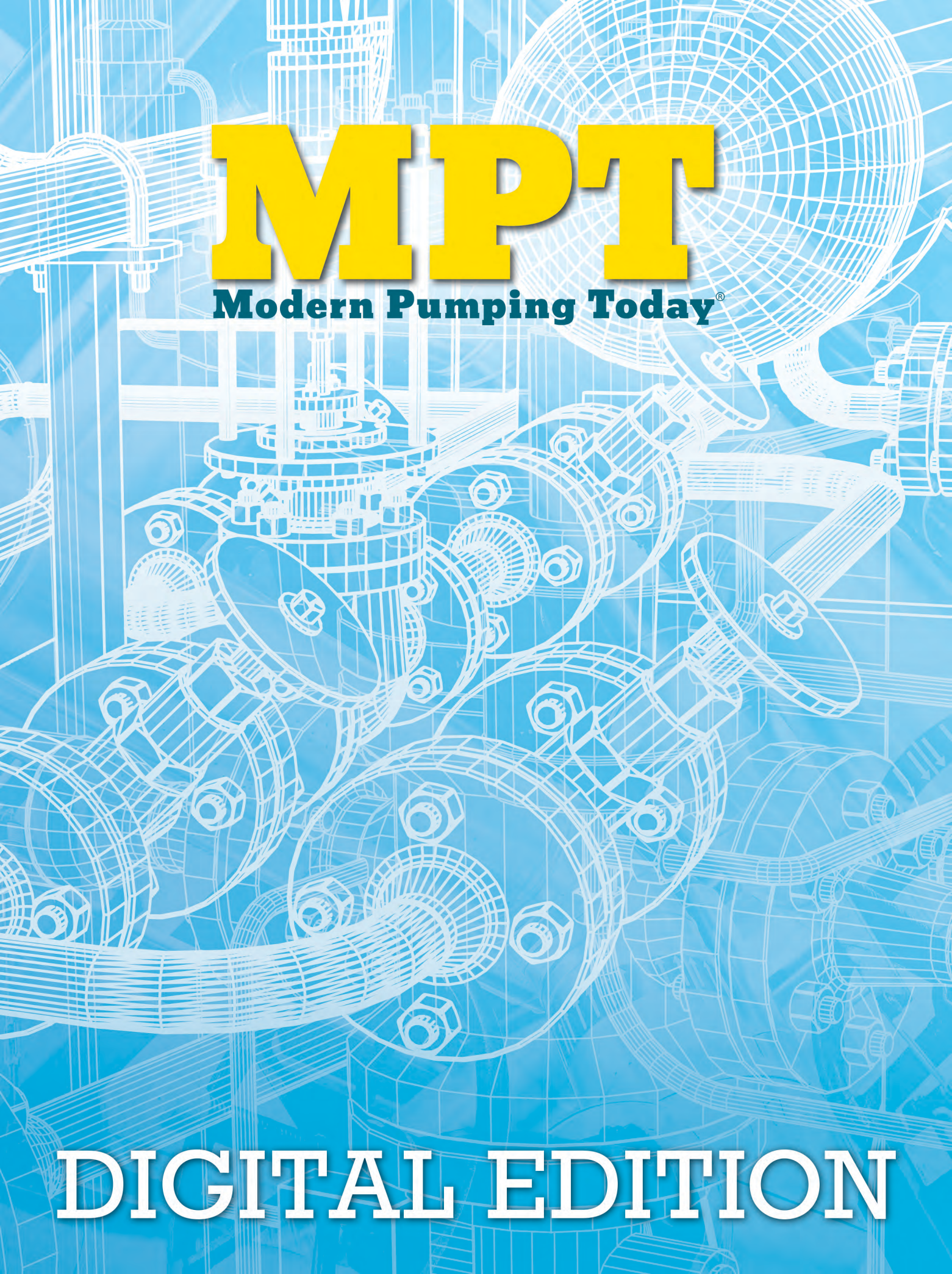
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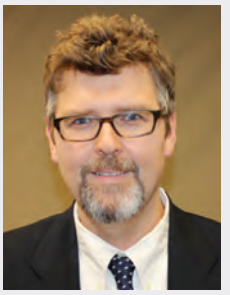

J. Campbell, Editor
Modern Pumping Today

Welcome to the July issue of MPT! We start off our Case Studies section this month with a trip across the pond. Eco Verde Energy is one of the United Kingdom's leading green energy services providers, and in this article, Landia's Soren Rasmussen illustrates how his company's digester mixing system offered a retrofit making maintenance easier and operations smoother (pg. 12).

Next up, infrastructure is a huge concern across the country, nowhere more so than in the American desert, where water scarcity is looming. However, Kalani Portom explains how the town of Queen Creek, Arizona, has committed to providing the highest quality of water and service and how Mueller's cutting-edge storage and pumping solutions have made that possible (pg. 16).

Lastly, we love to share innovations from the field, and in this month's Pump Solutions section, Randy Lewis of Plastics Molding Consulting walks readers through his company's approach to reducing centrifugal pump wear through a deceptively simple design (pg. 34). Once you see these composite components at work, you may never look at your pump the same way again. Enjoy!

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Making it easy to get what you want

Let's face it, there's never a good time for failed equipment, especially when it's preventable. Clogged pumps lead to downtime and downtime leads to frustration, to say the least. With thousands of installations solving clogging issues, the XFP submersible pumps, utilizing the Contrablock Plus system, have proven themselves to prevent problems before they even start. With superior solids and rag handling and lower maintenance costs for long-term reliability, the choice is easy when it comes to replacing your failing equipment.

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SHANGHAI ELECTRIC SHOWCASES SMART MANUFACTURING

Shanghai Electric unveiled its innovative smart energy, smart manufacturing, and digital intelligence integration solutions at the China International Technology Fair 2023 (CSITF) and the inaugural Shanghai International Carbon Neutrality Expo in Technologies, Products, and Achievements (Carbon Neutrality Expo) held in Shanghai this June.

Liu Ping, president of Shanghai Electric, says, "Shanghai Electric will continue to focus on business areas such as smart energy, smart manufacturing, and digital intelligence integration, implement the development path of 'technology promotion, transformation, and upgrading,' and join hands with creators around the world to jointly promote human progress and sustainable social development."

At the event, Shanghai Electric showcased its groundbreaking "deep-sea energy island" solution while introducing the new development concept of "4+2+X," focusing on smart energy, smart manufacturing, and digital intelligence integration. Shanghai Electric also unveiled the SMR-300iA composite mobile robot, an innovative solution that combines manual labor processes effectively. This solution addresses the challenges of labor shortages and the high risks of work-related injuries in enterprises. Shanghai Electric is actively contributing to the development of a new energy system.

VAL-MATIC WELCOMES NEW DIRECTOR OF PLANNING AND FORECASTING

Val-Matic Valve and Manufacturing Corporation has named Sandra Diaz director of planning and forecasting. Diaz began her career on the customer service side and eventually crossed into inventory and supply chain management. Over the years, she has held positions such as director of purchasing and director of manufacturing in the PPE manufacturing industry. Diaz has lived in the Chicagoland area most of her life. She entered the supply chain side twelve years ago and has grown her skillset in that area, gaining responsibility in each role.

In this role, Diaz aims to give clear direction to the existing planning and purchasing teams. She will provide leadership to improve supply chain and planning processes, expanding on the strengths of current co-workers in both areas.

Jason Maciejewski, senior vice president of sales for Val-Matic Valve and Mfg. Corp, adds, ''Sandra is a great addition to the team. I am confident that her experience and knowledge will enhance our customer centric business culture. We are delighted to have her as part of the leadership team.''

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PATTI ENGINEERING TEAM ACHIEVES SIEMENS SINAMICS S120 CERTIFICATION

Patti Engineering, Inc., a leading control system integration company with offices in Michigan, Texas, and Indiana, announces that four engineers have achieved Siemens SINAMICS S120 Motion Control Partner Academy Certification. Patti Engineering's director of Michigan operations, Terrance Brinkley; John Shipley, P.E., CAP, director of Indiana operations; Senior Electrical Engineer John Jowski; and Senior Controls Engineer Dan Ragozzino have completed training and testing required for the Siemens certification.

"At Siemens, we take great pride in establishing a robust standard for our partners to certify to. This is crucial because our Siemens Solution Partners serve as an extension of Siemens' technical and commercial support for our valued customers. When our customers engage with a Siemens certified partner, such as Patti Engineering, they can have complete confidence in working with professionals who possess the same skillset, knowledge, and experience as our own esteemed Siemens technical resources," says Andrew Miller, partner manager for drives and motion, at Siemens.

Through their successful completion of the Siemens SINAMICS S120 Motion Control class, these Patti Engineering team members have acquired a comprehensive understanding of the intricacies and nuances of Siemens' advanced motion control systems.

HUBBELL INCORPORATED ADDS TO BOARD OF DIRECTORS

The board of directors of Hubbell Incorporated announces the election of Debra L. Dial as a director of the company effective July 1, 2023. Dial brings over twenty-five years of experience in financial reporting and strategy with a Fortune 20 global telecommunications company. Hubbell has added three new independent directors in the last three years as part of its ongoing Board succession program.

Hubbell's Chairman, president and CEO, Gerben Bakker says, "We value the deep experience and perspectives in finance and accounting that Debbie Dial will bring to the Hubbell Board as well as her proven leadership skills in areas such as mergers and acquisitions, business strategy, and risk management. Debbie further strengthens Hubbell's focus on these key areas, and we are excited to welcome her to Hubbell's board of directors."

Dial served as the senior vice president, chief accounting officer, and controller of AT&T Inc., a global telecommunications company, where she recently retired on June 1, 2023. She served as senior vice president and controller of AT&T since 2016.

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MOTION + POWER TECHNOLOGY EXPO

Every gear is here

Formerly known as Gear Expo, the 2023 Motion + Power Technology (MPT) Expo—a biennial American Gear Manufacturers Association (AGMA) event that connects top manufacturers, suppliers, buyers, and experts in the mechanical, gear, electric, and fluid power industries—will be held in Detroit, Michigan, on October 17 through 19, 2023.

Detroit is host to many manufacturing sectors, including automotive, aviation, defense, off-highway, food and beverage manufacturing, refining, research, and many more. The city's manufacturing base makes it an excellent place for attendees to expand their networks within and outside of their respective fields.

SEE THE BREADTH OF THE INDUSTRY UP CLOSE

Over three action-packed days in Detroit, end-users can shop the latest technology, gear products, and services, and compare benefits side-by-side. Prominent exhibitors will conduct demos and host information-rich seminars as well as offer-up technical expertise.

There will be more than 300 exhibitors at the 2023 MPT Expo, including EMAG LLC, Gleason Corporation, Kapp Group, and Reishauer, to name a few. Other key players from gear companies, machine tool suppliers, materials companies, lubrication suppliers, and electric drive solutions will also be in attendance.

The entire power transmission supply chain is all under one roof. With the latest demands for efficiency and power density, the solution for your company is often a choice that combines mechanical, fluid power, electric, and hybrid technologies.

THE FOUNDATIONS OF LEARNING

The Motion + Power Technology Expo will offer expert-taught technical classes from AGMA and the National Fluid Power Association (NFPA) in several education courses. Attendees can also learn directly from industry experts on the hottest topics. Speakers will address common technical issues, creative solutions, business applications, and more.

At the event's several live demonstrations, attendees can watch manufacturing processes and experience products firsthand. Motion + Power Technology Expo is the place to find new ideas to bring back to any attendee's business and shop face to face before making any buying decisions.

NETWORKING WITH PEERS FOR GEARS

At Motion + Power Technology Expo, attendees exchange insights and get to know colleagues from across the mechanical power transmission, fluid power, and electric drive industries during events throughout the show. These include receptions,

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—JENNY BLACKFORD | VICE PRESIDENT, BUSINESS MANAGEMENT DIVISION, AGMA

private meetings, one-on-one time with suppliers, exchanges in the education sessions, and mingling with colleagues on the show floor.

PREPARED FOR THE FUTURE

Motion + Power Technology Expo is a one-of-a-kind, three-day event for manufacturers, suppliers, buyers, and experts in the mechanical power transmission, fluid power, and electric drive industries.

Unmatched opportunities to make connections and shop the latest products, services, and technologies for the highly focused motion and power system audiences are what make this event so unique. Just a few days spent meeting with experts will keep attendees' businesses ahead of the curve for years to come.

RETROFIT OFFERS MUCH EASIER MAINTENANCE

New digester mixing system delivers better yields for Eco Verde Energy

BY SOREN RASMUSSEN, LANDIA, INC.

Online, one can find no end of advice on mixing systems for biogas digesters, often going into great detail about impeller designs, speeds, and angles, However, away from the office desk, speak to a plant manager or AD operator, and they'll soon tell you that even the best mixing system in the world isn't something that they want… inside the tank.

Yet, around fifteen years ago when the United Kingdom was falling over itself in the rush to create seemingly easy, lucrative biogas, and funding was often only possible for what was considered proven technology, numerous Continental-style package plants were invested in—lock, stock, and mixers, as it were. As with all equipment types, you get what you pay for. There are some extremely well-designed submersible mixers out there that will provide long-lasting service, but the feedstock in the United Kingdom wasn't automatically going to consist of manure and maize. Therfore, no surprise, perhaps, that with lower grade mixers installed during the biogas goldrush, there were going to be some casualties.

PARTNER PROFILE: ECO VERDE ENERGY (EVE)

Eco Verde Energy (EVE) was created in 2020 with the vision of being the best green energy services provider, leading the drive for a renewable circular economy and global carbon neutrality, for a sustainable future. They provide class-leading operational and management consultancy services for anaerobic digestion plants. The company also serves the wider community and the planet by educating, advising, and managing green energy production within the agricultural and waste industries. For more information, visit **www.ecoverde.energy**.

Eco Verde Energy is pushing hard to achieve maximum output for its clients.

DOWNTIME IS THE ENEMY

A biological process doesn't take too kindly of course to the huge amount of downtime caused by taking the dome off of a digester to retrieve failed mixers, or ones that simply needed repair. Being offline means weeks of loss-making recovery time for the all-important bugs in the crucial microbial community.

It is unrealistic to think that the new wave of biogas plants wouldn't require upgrading at some point, but it remains a mystery as to why the risk of such very damaging downtime through wrongly specified mixers was (and sometimes still is) so overlooked. Even now, you'll find no shortage of manufacturers wanting to sell you some type of agitator for use inside a tank that may have worked just fine in a different industry, but that just isn't designed for the demands, for example, of a food waste biogas feedstock.

Given the huge disruption and the cost of a retrofit, some of these original mixing systems plod on, with output not achieving anywhere near like the headline-grabbing promises that were made amid all the excitement of a plant's opening.

In the now, much more mature U.K. biogas industry though, replacement of unsuitable mixers is increasingly

common, as new operators look to optimize their plants with equipment that is truly designed for purpose. One of the companies that is leading the way is Eco Verde Energy (EVE) (established in 2020), which says it has the vision of being the very best green energy services provider. It now has eight fast-improving sites, which after what could be described as an eventful history, are all now firmly heading in the right direction.

STRAIGHTFORWARD RETROFIT TO PRODUCE BETTER YIELDS

At Brigg Lane on South Humberside in England, Plant Manager Liam Hughes has been doggedly steering the plant towards optimum efficiency and output.

"Solving some of the fundamental design issues of the original package plant isn't something that can be achieved overnight with a biological process to protect," he says. "On one of the tanks, the original Landia mixers were still working very well. Upgrading them to Landia's externally-mounted GasMix system was a straightforward retrofit that made perfect sense for better yields and much easier maintenance. On the other tank though, the paddle design top-mounted mixer with its 65-foot shaft was totally inadequate for what we need. We're having to continue with it just for now, but at one point it broke, meaning that we had to take the tank off-line. Inside the drained digester there was a large cone-shaped mound of dropped-out solids, that

Eco Verde Energy's Liam Hughes (right), with Paul Davies from Landia.

Landia worked very closely with Eco Verde Energy to find the right mixing solution for the lagoon at Brigg Lane.

Part of the biogas plant at Brigg Lane, where Eco Verde Energy has introduced a digester mixing system from Landia.

clearly showed that the mixing was inadequate. The flawed design of the paddle mixer set-up that we inherited also had water leaks, which then set off an alarm to shut down the mixing system. As AD operators know, these problems have a habit of occurring at the worst possible times (overnight or at weekends), so it could sometimes take two hours to get the liquid moving again, after having lost lots of valuable gas. The old paddle mixer is also a very heavy user of energy, so it will be replaced when the time is right."

He adds, "Biogas yields are very important of course, but with the Landia digester mixing system there is no working at height, which is much safer for our team. Everything is at ground level. None of us are going to miss carrying over 5 gallons of oil up those staircases!

"We no longer have to worry about the major consequences of downtime from having to empty a tank, which is always the case with mixers that are trapped inside. The engineers from Landia took a lot of pride in the installation, and they haven't walked away. I can always pick up the phone to Landia to run something by them."

For its two 1.5 million-gallon digesters, EVE's Brigg Lane Biogas Plant currently receives approximately 140 tons per day of blended, de-packaged food waste from its next-door neighbor, Bioganix, who process food and beverage waste for delivery into anaerobic digestion and organic agricultural fertilizers. Dry solids are at around 16 to 25 percent, with iron hydroxide dosing in place for retention times of around ninety days for the primary tank and thirty days for the secondary.

BEST POSSIBLE, STREAMLINED OPERATION

Flavio Ascenco, area manager for Eco Verde Energy, says, "Liam and his team continue to work hard to iron out the original design issues at Brigg Lane so that we can achieve the best possible, streamlined operation.

"At first, the main reception tank was affected by high levels of hydrogen sulfide, and the CHP that was chosen for the site is oversized, but with our investment, including the Landia digester mixing system, we are on course to bring about greatly improved performance from the plant."

Eco Verde Energy has also been working with Landia to overcome the challenges of the site's lagoon, as Hughes explains, "Before we took over the site, the need for more storage for separated liquor had become apparent, which typically sees the most cost-effective solution of a lagoon being created. But, at over three million gallons, it was undersized, yet at the same time, it was made too deep. At more than seven meters in depth, it actually comes up against the laws of physics, making it challenging to mix and difficult to extract from. Landia could have easily argued that this wasn't their problem, but they've done everything they can to help, creating two separate mixing patterns (with four mixers and a pump) to cope with the differing heights of the liquid and ensure that a crust doesn't form."

MAXIMUM OUTPUT

Chris Waters, operations director for Eco Verde Energy, continues, "The difference between the then-and-now in the operation at Brigg Lane is like night and day, with a biogas plant that through our operational expertise and experience is running so much better. There's more investment ahead too. We are looking at a new bioscrubber to help better control hydrogen sulfide levels, and the possibility of a new holding tank next to the lagoon. The first-class equipment and back-up we get from Landia shows them to be the type of supplier we want to work with to help us meet the crucial goal of achieving maximum output for our clients."

SOREN RASMUSSEN is the director of Landia, Inc. Landia uses its nearly ninety years of experience to continue to develop new and efficient products and solutions. Together with its customers, Landia is aiming for new heights. Customers get a partner with a strong team of happy employees who focus on what matters most to them: good solutions that solve the task at the lowest possible cost. For more information, call 919.466.0603, email info@landiainc.com, visit **www.landiainc.com**.

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THE FUTURE OF WATER IS BRIGHT IN THE DESERT

Growth in Queen Creek, Arizona, spurs water infrastructure advancements

BY KALANI PORTOM, MUELLER

Incorporated in 1989, the town of Queen Creek is a vibrant community just outside of the Phoenix metro area, in both Maricopa and Pinal counties. With a population of approximately 72,000, Queen Creek covers nearly 42 square miles in its incorporated area and 72 square miles in its planning area. The town's water service area extends beyond the town's boundary, serving a total of 120,000 customers.

SOURCE OF WATER FOR NOW AND THE FUTURE

Thirty-three years ago, Queen Creek was a farming and agricultural community. Today, Queen Creek is one of the fastest-growing communities in the southwestern United States. The town has adopted several award-winning plans designed to guide future growth. In its current budget, the town dedicated 66 percent ($323.2 million) toward building and expanding infrastructure for its growing community.

Queen Creek's drinking water comes primarily from groundwater that is pumped from a combination of twenty-two active drinking water wells, located throughout the water distribution system. The town maintains the statutory 100-year water supply as required in the Phoenix Active Management Area. Additionally, the town is working on a multifaceted approach to diversify its water portfolio in an effort to reduce groundwater pumping.

FROM SOURCE TO PRODUCTION

In 2017, Queen Creek established a Water System Master Plan as a framework for water infrastructure improvements including wells, reservoirs/storage tanks, and booster pump stations.

In 2018, Queen Creek began construction on a 3-million-gallon pre-stressed concrete storage tank, booster pump stations, and related piping electrical equipment. To meet specifications set by Queen Creek, the restraint products needed to be able to withstand 1,500 to 2,000 gallons of groundwater discharging from the wells directly to the storage tanks for treatment.

The HYMAX® Grip Large Diameter (LD) 16-inch restraint coupling was a clear contender due to the installation

The HYMAX® Grip Large Diameter (LD) 16-inch restraint coupling installed at Queen Creek's new water storage facility.

Queen Creek's new three-million-gallon pre-stressed concrete storage tank.

process improving worker safety, the durability, and the design features—specifically the closing mechanism and GRIP chain.

"The HYMAX Grip LD was an easy installation. It has now been in service for about two years, and we haven't had any issues such as leaks, or repairs needed," says Queen Creek Utility Director Paul Gardner.

THE FUTURE AHEAD

Queen Creek is committed to providing the highest quality of water and service in the most economical, safe, reliable, and timely manner. And with the continued interest in the area, more storage facilities and wells are underway.

"We have an additional five or six wells coming online, along with facilities that support them," shares Gardner. "We have developed an equipment list to standardize inventory for well maintenance and repairs in the future and will continue to ensure we have the best product to ensure safety and efficiency."

KALANI PORTOM is territory sales manager for Mueller. Mueller Water Products is a leading manufacturer and marketer of products and services used in the transmission, distribution, and measurement of water in North America. The company's broad product and service portfolio includes engineered valves, fire hydrants, metering products and systems, leak detection, and pipe condition assessment. It helps municipalities increase operational efficiencies, improve customer service, and prioritize capital spending, demonstrating why Mueller Water Products is "Where Intelligence Meets Infrastructure." For more information, visit **www.muellerwaterproducts.com**.

THE RIGHT MATERIAL MAKES ALL THE DIFFERENCE

Simpler aeration pump design reduces maintenance requirements

BY DEBORAH SPICER, VESCONITE BEARINGS

There are times when a simple pump design and less maintenance are preferred by pump users, especially in messy dirty wastewater applications. Such was the case with one wastewater plant operator in South Africa, which was being called in every couple of weeks to remove, disassemble and clean wastewater pumps at one or other of the facilities that the company maintains.

DIRTY BUSINESS

Aeration pumps float on wastewater treatment dams and ensure that chemical decomposition of the dirty water occurs before the wastewater gets treated further. The pumps ensure that the water remains oxygenated and that there is aerobic decomposition rather than anaerobic decomposition, which usually results in volatile and poisonous gases such as methane.

The pump design that was in place was a standard vertical shaft pump design with an output of between 5 kW and 10 kW. However, the bearing design was complex and prone to failure before the introduction of Vesconite materials.

TACKLING A CORROSIVE PROBLEM

The main shaft bearing design consisted of a ball bearing with carbon mechanical seals on either side of it and the ball bearing was lubricated by oil that was pressure fed into the system so the pressure of the oil was higher than the pressure of the water on either side of the carbon seals, describes Pertrus Fourie, an engineer with Vesconite Bearings.

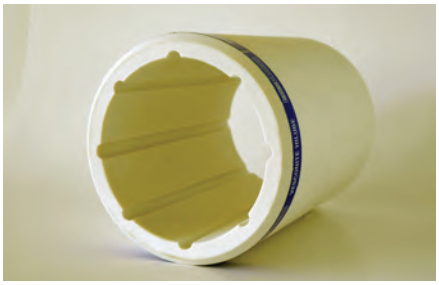
The main problem was that the carbon seals would pick up the dirt and grime that was in the naturally abrasive water and would erode. The seals would then fail and the wastewater would enter into the ball bearing.

"Anyone who has worked with ball bearings would know that ball bearings and water are not friends," describes Fourie. "If you get water anywhere near them, they corrode very fast, especially if it is abrasive water," he says.

TIME-CONSUMING MAINTENANCE

It is this problem that resulted in the pumps seizing or shutting down because the ball bearings failed, and this resulted in the aerator pump company being called out every two to three weeks for pump maintenance.

The maintenance then required fishing the pump out of the wastewater, opening it up, cleaning out all the water and dirt that was trapped inside, and replacing the ball bearings.



Vesconite Hilube was one of the initial materials proposed for the application.

A SOLUTION BY DESIGN

The aeration pump company then approached Vesconite Bearings in search of a solution and Vesconite Bearings and the pump original equipment manufacturer (OEM) went through several design iterations before an appropriate and effective design was finalized.

The first design involved the replacement of the ball bearing, two carbon seals and the lubrication system with a no-swell wear-resistant Vesconite Hilube bushing in the existing housing. The design was a combined thrust bearing and radial guide bearing—a combined main shaft bearing and thrust bearing so it has both axial and radial running faces.

"We proposed a flange bearing design where a step on the shaft would sit on the flange," states Fourie. "The vertical shaft would sit on top of the flange to absorb the vertical forces, the axial forces, and then you would have the bushing that would absorb lateral forces, or radial forces," he says.

"In a pump that uses plain bearings from the start, you have a separate thrust washer or wear ring and a main shaft bearing," Fourie notes. "But here we hybridized the two parts," noting that, because the ball bearings absorbed the axial force, Vesconite Bearings designed a plain bushing also to take on the axial force.

Vesconite Superlube possesses one of the lowest coefficients of friction of any bearing material available—even lower than virgin PTFE (polytetrafluoroethylene). Shown here is a load pad used in the rail industry.

TESTING FOR IMPROVEMENT

However, the first design proved inadequate in testing on a test bench with dirty water in the OEM company's workshop. None of the water that followed through the pump got to the flange face and this resulted in that particular face overhearing and melting.

"I suggested that the pump company cut some grooves on the flange face to allow the water to flush through," notes Fourie. "I also suggested that they add a stainless-steel collar to the shaft, which would increase the area on to which the axial force applied," he says, adding that, if you increase the area, you would decrease the pressure and decrease the overall load on the bearing so it is less likely that it would overheat.

UPGRADING FOR SUCCESS

This second design worked better, but a couple of the grooves got blocked up on the axial face because of the dirty water and, again, that resulted in the bearing overheating.

Fourie further altered the design and suggested that the pump OEM switch its bearing material to Vesconite Bearings' highest-grade bearing material, Vesconite Superlube, which is known for its ultra-low friction and extreme wear resistance. His design also included additional grooves, increased groove

The much simpler bearing-component pump design includes Vesconite Bearings' premier bearing material known as Vesconite Superlube.

sizes and holes through the stainless-steel flange that rests on the axial face of the bearing to allow more water flow through the bearing.

The third design iteration has proven to be a charm and the South African wastewater company is happy with its pump's performance. The exact lifetime improvement has yet to be quantified, as the pumps that were installed with the latest bearing design are still operating, having been installed in October 2023.

ADVANTAGES ACROSS THE BOARD

Other advantages include that the company has reduced oil lubrication which, prior to the introduction of Vesconite Superlube, took place every four to six weeks depending on the water quality and currently takes place between four to six months with Vesconite Superlube, says the wastewater company's operations director, who adds that the company is still deciding on a final acceptable maintenance schedule for the Vesconite Superlube application.

In addition, Vesconite Bearings' solution resulted in the elimination of the carbon seals and the ball bearings, making the system much less complex and allowing for fewer problem areas while making the bearing system cheaper due to the reduction in the number of components.

The wastewater company's operations director notes that he estimates that the Vesconite Superlube solution costs two third's the cost of the replaced bearings and seals, with additional savings for the end user since they have reduced downtime, labor, and service costs.

The company increased the bearing lifetime and decreased its running costs. The company has also indicated it is easier to do maintenance because it is simpler to replace a plain bushing than to replace the carbon seals and ball bearings that were present in the earlier design.

Vesconite Bearings' highest-grade bearing material, Vesconite Superlube, is known for its ultra-low friction and extreme wear resistance. Shown here is the Vesconite Superlube 3D printer bushing.

"There are much fewer places for the dirt to accumulate so the engineer's job is a little bit less messy," states Fourie.

Vesconite's premier bearing material, Vesconite Superlube, is a niche product which is made for niche applications such as this one, which is characterized by extremely abrasive and dirty water. The material's low friction, which is lower than virgin PTFE, is directly proportional to the material's low wear rate.

"The low friction also has the advantage that it generates less heat," describes Fourie. "If you have any application that has a tendency to overheat and is wearing too fast, Vesconite Superlube is the ideal replacement because it generates less heat and it wears less quickly," he adds.

Vesconite Bearings is a world-leading manufacturer of low-friction, low-wear bearing materials for a wide range of industries. Selling to over 100 countries, these include the pump, agriculture, railways, mining, heavy transport, hydro, renewable-energy, earthmoving, marine, and construction industries. For more information, visit **www.vesconite.com**.

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INNOVATION DRIVES END-TO-END SOLUTIONS IN NORWAY

GE and Northern Lights explore carbon capture and storage opportunities

BY LAURA ARESI, GE GAS POWER

GE Vernova, a dynamic accelerator comprised of GE's Power, Renewable Energy, Digital, and Energy Financial Services businesses, recently signed a memorandum of understanding with Northern Lights JV DA, a Norwegian company developing infrastructure for cross-border carbon dioxide transport and storage in Europe. The plan aligns with GE's goal of supporting customers' transformations during the coming global energy transition.

Specifically, GE Vernova's gas power business and Northern Lights will cooperate to explore end-to-end carbon capture and storage (CCS) opportunities with a mutual goal of reducing carbon emissions from the power generation sector. Joint feasibility studies examine possible innovative technical and logistical approaches which are crucial to the development of an effective CCS supply chain. The agreement will enable acceleration and development of technologies for carbon dioxide capture, transportation, and storage applied to power plants powered by GE gas turbines.

WORKING BETTER TOGETHER

According to the MOU, both companies will develop technical and logistical solutions to capture, transport, and

store carbon dioxide which will be crucial to the development of an effective CCS supply chain.

"At GE we are continually advancing our power generation technologies towards near zero-carbon emissions, and this evolution includes the use of carbon capture and sequestration in order to drastically reduce carbon dioxide emissions in the critical effort to mitigate climate change," says Martin

PARTNER PROFILE: NORTHERN LIGHTS

Northern Lights is developing the world's first open source and flexible infrastructure to transport carbon dioxide from industrial emitters in Europe. The carbon dioxide will be transported by ship to the receiving terminal at Øygarden, west of Bergen in Norway, then transported from the terminal by pipeline for permanent storage in a geological reservoir 2,600 meters under the seabed. Operations are scheduled to start in 2024. Northern Lights JV DA is a registered, incorporated General Partnership with Shared Liability (DA) owned equally by Equinor, Shell, and TotalEnergies.

For more information, visit **www.norlights.com**.

O'Neill, vice president of strategy for GE Gas Power. "We look forward to collaborating with Northern Lights on the development of compatible carbon dioxide transfer systems, in support of our mutual goal of reducing carbon emissions from gas-fired power plants, which provide crucially reliable, affordable, and resilient electricity for homes and businesses worldwide."

"CCS is a necessary solution to reduce emissions from the power and heat market in the EU. While green energy solutions such as solar and wind power are being developed, CCS contributes to reducing or removing emissions from hard-to-abate industries where limited alternatives are available. The collaboration between Northern Lights and GE seeks to reduce emissions from the power generation sector," adds Martijn Smit, business development director at Northern Lights.

PART OF A BIGGER PLAN

GE believes carbon capture and sequestration (CCS) technologies will play a crucial role in reducing carbon emissions in the power generation sector and has developed relationships with providers and customers to advance innovation including agreements with Linde, Technip, NetZero Teesside, and Southern Company.

In 2022, GE's front-end engineering design (FEED) study "Retrofittable Advanced Combined Cycle Integration for Flexible Decarbonized Generation" received funding from the U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management to develop a detailed plan for integrating carbon capture technologies with a natural gas combined cycle plant to capture approximately 95 percent of carbon dioxide emissions with a goal of commercial deployment by 2030.

In March of this year, GE announced a collaboration with Svante to develop and evaluate innovative solid sorbent technologies for carbon capture from natural gas power generation. In addition, GE successfully tested its first Direct Air Capture (DAC) prototype unit in GE's CAGE, or Climate Action@GE, Lab in Niskayuna, New York.

GE Gas Power, an integral part of GE Vernova, is a world leader in natural gas power technology, services, and solutions. Through relentless innovation and continuous collaboration with customers, GE Gas Power is providing more advanced, cleaner, and efficient power that people depend on today and building the energy technologies of the future. With the world's largest installed base of gas turbines and more than 670 million operating hours across GE's installed fleet, the company offers advanced technology and a level of experience that's unmatched in the industry to build, operate, and maintain leading gas power plants. For more information, visit **www.gepower.com**.

COME HAIL OR HIGH WATER

Extreme weather's impact on utility production and revenue Part 1 of 2

BY JAMIE ALEXANDER, DEPCOM POWER

Whether it's wildfires, hurricanes, or hail, natural disasters devastate solar power infrastructure. Particularly for asset owners of utility PV, extreme weather can cause significant downtime, repair costs, and revenue loss.

Last summer was the worst on record for natural catastrophe claims, with far more damaging unmodeled extreme weather events. Hail losses in Texas alone last year caused about $300 million in solar damage, nearly ten times the estimated losses from Hurricane Hanna in 2020. These weather events are causing some insurance firms to stop underwriting renewable projects, while others are increasing premiums to far higher levels.

KEY TAKEAWAYS

This guide offers a roadmap to natural disaster plant restoration, with actionable strategies to keep plant revenue loss under control. Our step-by-step approach details a refined process that:

- **Balances production with restoration**
- **Mitigates component risks**
- **Manages insurance claims**
- **Blends original and new solar technologies**
- **Optimizes plant performance post-recovery**

When floods recede and winds die down, owners of solar assets need fast mobilization, plant recovery experience, and repowering expertise to get crucial assets back online rapidly.

BEST PRACTICES FOR EFFICIENT RESTORATION

ASSESS AND DOCUMENT DAMAGE

First impressions can be misleading. What appears as minimal damage may conceal more significant issues. Document and take pictures of everything that may require attention. Note components that are obsolete and determine which OEMs will play significant roles moving forward. Consider a high-resolution aerial scan to map the destruction, including infrared views to identify thermal problems. Insurance often covers this because they want to know what they're dealing with just as much as you do.

SAVE WITH SALVAGE

Before work begins, establish standards for testing damaged equipment and criteria for what warrants repair and what needs replacement. The right restoration partner will have the expertise required to implement these procedures. Salvaging components requires flexibility. Maintain quality, but watch for opportunities to continue using viable parts. For instance, instead of replacing an

entire inverter, explore options to re-energize the equipment. Successful salvage can save hundreds of thousands of dollars over replacement

BALANCE PRODUCTION WITH RESTORATION

It's critical to get portions of the plant operational to restore revenue streams while restoration continues elsewhere on the site. When possible, stagger the work to prioritize production; if one inverter is down simply because of a ground fault, but the rest of the array is in good shape, prioritize restoration there to get that section of the plant back online.

REPAIR AND REPLACE OLD WITH NEW

Ever-improving technology helps move the industry forward, but it also means that new equipment is not always backward compatible. It's tricky to blend legacy equipment that's no longer available with modern components. Creative engineering solutions that blend older units with state-of-the-art technologies can keep costs in check. Look for a partner with the expertise required to weave still-functional older parts in with newer PV technology.

MITIGATE EQUIPMENT SUPPLY RISKS

Today's 'perfect storm' of supply chain and inflation challenges exacerbates the complexity of extreme weather claims. A partner with EPC capabilities can streamline the wait for parts, ensuring availability through Tier 1 procurement agreements. Especially with today's supply constraints, you need experts with a deep supplier network and, ideally, an extensive inventory of spare parts on hand at regional warehouses.

MAKE INSURANCE A RECOVERY PARTNER

Insurance adjusters often are brought in too late. Instead, establish a relationship with your carrier early to ensure familiarity with PV best practices and align all stakeholders throughout the project. Getting insurance up to speed from the project's genesis makes it easier to streamline the claims process and support fast, optimal insurance coverage. Select an experienced recovery partner that can help save valuable time by managing insurance claims.

GUARANTEEING PROFITABILITY AFTER THE CRISIS

Ensure strong post-recovery performance with in-house engineering teams, designers, construction management, and supply networks all under one umbrella. It's not enough to meet energy production guarantees after restoration. Partners with O&M capabilities bring additional plant operation solutions for long-term maintenance, repair, and energy optimization. Repowering expertise can weed out unreliable equipment that diminish plant performance, while recertification programs can extend maintenance to salvage usable equipment and source parts faster than OEMs.

WHAT TO LOOK FOR IN A RECOVERY PARTNER

It pays to bring a restoration expert on board early. Combating force majeure damage requires extensive experience to make swift decisions as well as skilled partner management to secure insurance and warranty support.

PROVEN RECOVERY KNOW-HOW

Recovery after an extreme weather event is complex, often more so than initial plant construction. Unlike new builds, restoration involves balancing current production needs against deconstruction and replacement demands. Screen partners for expertise in damage assessment, equipment salvage, and insurance claims management.

Rampant ground fire destroyed more than 100,000 solar modules, making nearly 200 acres of PV unproductive and unsafe.

SOLAR CONSTRUCTION EXPERIENCE

Things rarely go exactly to plan. That's where PV experience is critical. Your partner should be able to troubleshoot and course-correct challenging construction issues before they metastasize. In-house capabilities and a capital equipment fleet can minimize risk and maximize safety, quality, and schedule control.

ADVANCED PV ENGINEERING

Close collaboration between construction and engineering teams can ensure project success. Demand detailed attention to permitting, civil and structural engineering, plant layout and design, energy modeling and analysis, inverter sizing, and substation size and layout.

PROCUREMENT STRENGTH

PV was not spared when the pandemic created supply chain challenges. While that squeeze is easing, the industry is still seeing solar module shortages and logistical constraints that increase supply risk. Look for EPCs with established partnerships with Tier 1 equipment manufacturers.

O&M AND REPOWERING EXPERTISE

Look for cost-effective solutions for short- and long-term maintenance, repair, and energy optimization. A partner with deep repowering expertise can help address diminished plant performance caused by unreliable equipment such as underperforming, damaged, or tough to-source modules and inverters.

CASE STUDY: RAISING PV PLANT FROM ASHES

In 2020, the Western United States experienced one of the most severe wildfire seasons in its history. Fanned by gusty winds and fueled by hot, dry terrain, the fires burned more than ten million acres and caused $19 billion in damage. Solar plants were not spared.

Depcom's client in Kern County, California, faced catastrophic damage that shut down its 20-MW system. Rampant ground fire destroyed more than 100,000 solar modules, making nearly 200 acres of PV unproductive and unsafe. To tame the flames, helicopters dumped volumes of water on the site, flooding central inverters and other equipment.

Depcom quickly deployed its restoration team to assess the damage on-site, after months offline. With unique plant recovery expertise, Depcom surveyors thoroughly evaluated and documented rows of equipment and swiftly recommended a course of action to salvage, repair, and replace components.

Depcom worked alongside the asset owner and its insurers to prioritize getting a portion of the plant back online quickly. It consolidated salvageable parts to restore segments of the facility while it procured new equipment to replace damaged parts. Unfortunately, the original bill of material and some of the equipment was no longer manufactured. As a result, Depcom had to source, engineer, permit, construct, and commission a hybrid system that wove in older equipment with state-of-the-art PV technologies.

Performing this restoration during the COVID-19 pandemic required extra safety protocols to keep both Depcom and partners safe. Depcom leveraged its deep supply network to overcome pandemic-related supply delays.

Depcom merged in-house EPC capabilities with recovery expertise to balance production demands with deconstruction and replacement plans. This level of collaboration saved the asset owner a total of $2.6 million in restoration and production losses.

Depcom's extensive restoration experience allowed it to work closely with insurers. The team streamlined the claims process by providing detailed documentation and cost explanations throughout the process, supporting rapid and optimal insurance coverage.

Keeping everyone on the same page was critical. Depcom's proactive communication between the owner, the insurance providers, and partners wove the team together for an efficient collaboration.

A LOOK AHEAD

This is just the beginning. In next month's conclusion to this piece, we'll examine more case studies highlighting not only fire but also flood and storm damage. Plus, we lay out the case that, although no one can control the weather, what operators and facility managers can control is their level of preparedness.

JAMIE ALEXANDER is senior vice-president of services at Depcom Power, which serves the solar and energy storage market by providing traditional O&M services, restoration of sites impacted by natural disasters, repowering of sites underperforming or experiencing catastrophic failures, and specialized services focused on inverter commissioning and repair. Alexander's twenty-five years of industry experience includes OEM equipment design and manufacture, project development, construction, and operations and maintenance. Having worked exclusively in the solar and energy storage sector for the past twelve years, Alexander has been involved in the deployment of almost 3 GWs of assets. For more information, visit **www.depcompower.com**.

When Dunn-Edwards began experiencing a shortened diaphragm lifespan in its Wilden AODD pumps that were tasked with handling titanium dioxide, it was recommended that they switch to Wilden's new Chem-Fuse Integral Piston Diaphragm (IPD) models.

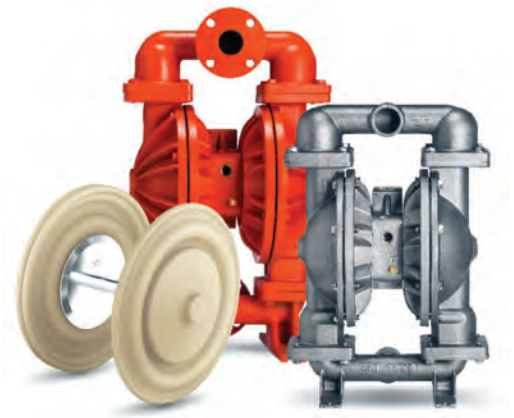
PERFECTING PAINT PRODUCTION AT DUNN-EDWARDS

Chem-Fuse diaphragms optimize eco-efficient paint-manufacturing operation

BY ROB JACK, WILDEN

A house needs many things: floors, windows, doors, appliances, furniture, decor, and a strong foundation with walls that provide the people inside with security and warmth. But a house only becomes a home once the people living inside have chosen the perfect paint colors. Since 1925, as Phoenix, Arizona's largest manufacturer of architectural paints and coatings, Dunn-Edwards has provided people with every paint color imaginable for every part of their home.

The Dunn-Edwards facility in Phoenix continues that legacy. The state-of-the-art, eco-efficient production and distribution facility manufactures more than fifteen million gallons of paint annually. By transporting and mixing in excess of 150 unique ingredients, including resins and additives, the Dunn-Edwards facility upholds its high industry standards for reliable and environmentally conscious paint formulation and production.



Chem-Fuse IPDs are constructed of Wil-Flex, which enables Wilden AODD Pumps to produce safe, clean, leak-free, and efficient product transfer, even when handling the many abrasive liquids that are a staple of paints and coating production.

THE PROBLEM WITH PAINT PRODUCTION

Producing these high-quality paints and coatings requires efficient and safe equipment that can handle abrasive fluids in a shear-sensitive manner. To ensure the safety of plant personnel and the efficiency of the operation, these critical applications require pumping technology that is leak-free and reliable. This is especially true when latex—a complex emulsion consisting of polymer microparticles contained in an aqueous medium—is involved.

Latex is created in a process called "emulsion polymerization," where droplets of simple emulsion are added to water. Additives are injected into the latex to provide important characteristics, such as color, reflectivity and anti-bacterial qualities. Many of these additives, such as titanium dioxide

For the Dunn-Edwards facility, the pump of choice for ensuring its production operations meet the company's reliability and environmental-sensibility requirements are air-operated double diaphragm (AODD) pumps from Wilden®, a brand of PSG®. Wilden AODD pumps have been proven to excel when handling paint components, thanks to a unique design that offers the highest degree of flexibility and performance in terms of reliability, product-loss prevention, environmental protection and energy efficiency. In addition, Wilden AODD pumps are easy to maintain, self-priming, dry-run capable, and deliver a shear-sensitive operation that is mandatory when working with these components.

In August 2020, Phoenix Pumps, a long-time distributor for Wilden, offered Dunn-Edwards an opportunity to explore operational cost savings by assessing alternative AODD pump diaphragm options. Dunn-Edwards was using Wilden's EZ-Install diaphragms, which offer great benefits in terms of chemical compatibility as well as safe and easy installation. However, due to the aggressive nature of latex, these diaphragms were still being replaced every six to eight months.

With nearly 200 AODD pumps, divided between 1-, 2-, and 3-inch variants, Bill Murphy, technical field

After seeing how Wilden Chem-Fuse IPDs can improve service life and pump performance, Dunn-Edwards will begin standardizing the use of Chem-Fuse diaphragms on all of the 3-inch Wilden AODD Pump models in use at its Phoenix, Arizona, manufacturing plant.

specialist for Phoenix Pumps, knew Wilden had an alternative to increase the mean time between repair (MTBR) for Dunn-Edwards' operations.

INTRODUCING CHEM-FUSE

Bill Murphy's relationship with Steve Chapin, the maintenance manager of Dunn-Edwards Paint Arizona facility, and collaboration with the regional sales team from Wilden, allowed them to assess the installation and recommend Wilden's Chem-Fuse Integral Piston Diaphragms (IPDs). As a performance comparison, Chapin outfitted a few 3-inch pumps with Chem-Fuse IPDs and corresponding shafts and inner pistons.

The one-piece, zero-adhesive design of the Chem-Fuse Diaphragm perfectly complements the high demand of the facility's AODD pumps because they have been engineered to hold up against acids, caustics and other aggressive fluids, such as latex. Chem-Fuse Diaphragms feature a one-piece design that eliminates the need for an outer piston that is a common leak point in traditional pie-shaped diaphragms that create a trap area for product buildup that can wear over time, especially when pumping abrasive fluids. Chem-Fuse offers safe, clean and reliable product transfer with no product entrapment areas to minimize product contamination, risk liabilities, and ultimately increase diaphragm life. Available in Wil-Flex material in 1-, 1-1/2-, 2-, 3-, and 4-inch sizes, Chem-Fuse also offers up to 100 percent increased flow and suction lift compared to other reduced-stroke IPDs. It also is easy to install and easy to clean for faster changeovers.

The test pumps outfitted with Chem-Fuse exceeded one year of operation (eight hours per day, five days per week). Operating relatively trouble-free, the pumps equipped with Chem-Fuse have improved Dunn-Edwards' operation by increasing the service life of the pumps, requiring fewer service hours, minimal maintenance downtime and costly draining cycles.

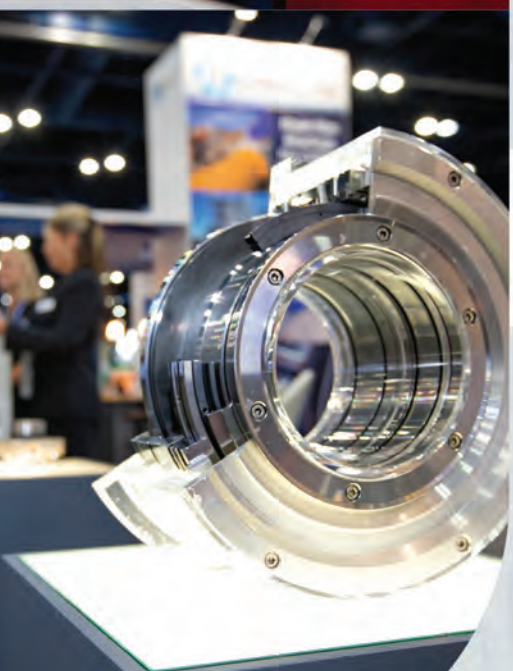
"The two main takeaways from having seen them in operation is that they are lasting longer and the reduction in mating surfaces makes them easier to rebuild and naturally more resilient as a result," Chapin says. "There are basically three parts to assemble versus the old setup, which was seven."

CONCLUSION

With the elimination of potential leak areas, extended flex life, and easy cleanability for efficient product changing, the Chem-Fuse design was ideal for the aggressive latex-handling applications inside the Dunn-Edwards facility.

Because of the success of the AODD pumps outfitted with Chem-Fuse, the Dunn-Edwards facility will install Chem-Fuse diaphragms into every 3-inch pump it uses for latex-handling applications, ensuring a pump fleet with an operational life measured in years instead of months. Doing so will allow the Dunn-Edwards facility to continue upholding its reputation of providing an array of high-quality paints and coatings in a safe and eco-friendly manner.

ROB JACK is the business development manager for Wilden®, a leading brand of air-operated double-diaphragm (AODD) pumps. He can be reached at 909.422.1700 or rob.jack@psgdover.com. Wilden is a brand of PSG®, a Dover company. PSG is comprised of several leading pump companies, including Abaque®, All-Flo™, Almatec®, Blackmer®, Ebsray®, em-tec®, Griswold®, Hydro™, Malema, Mouvex®, Neptune®, Quantex™, Quattroflow®, RedScrew™, and Wilden. For more information, visit **www.psgdover.com/wilden**.



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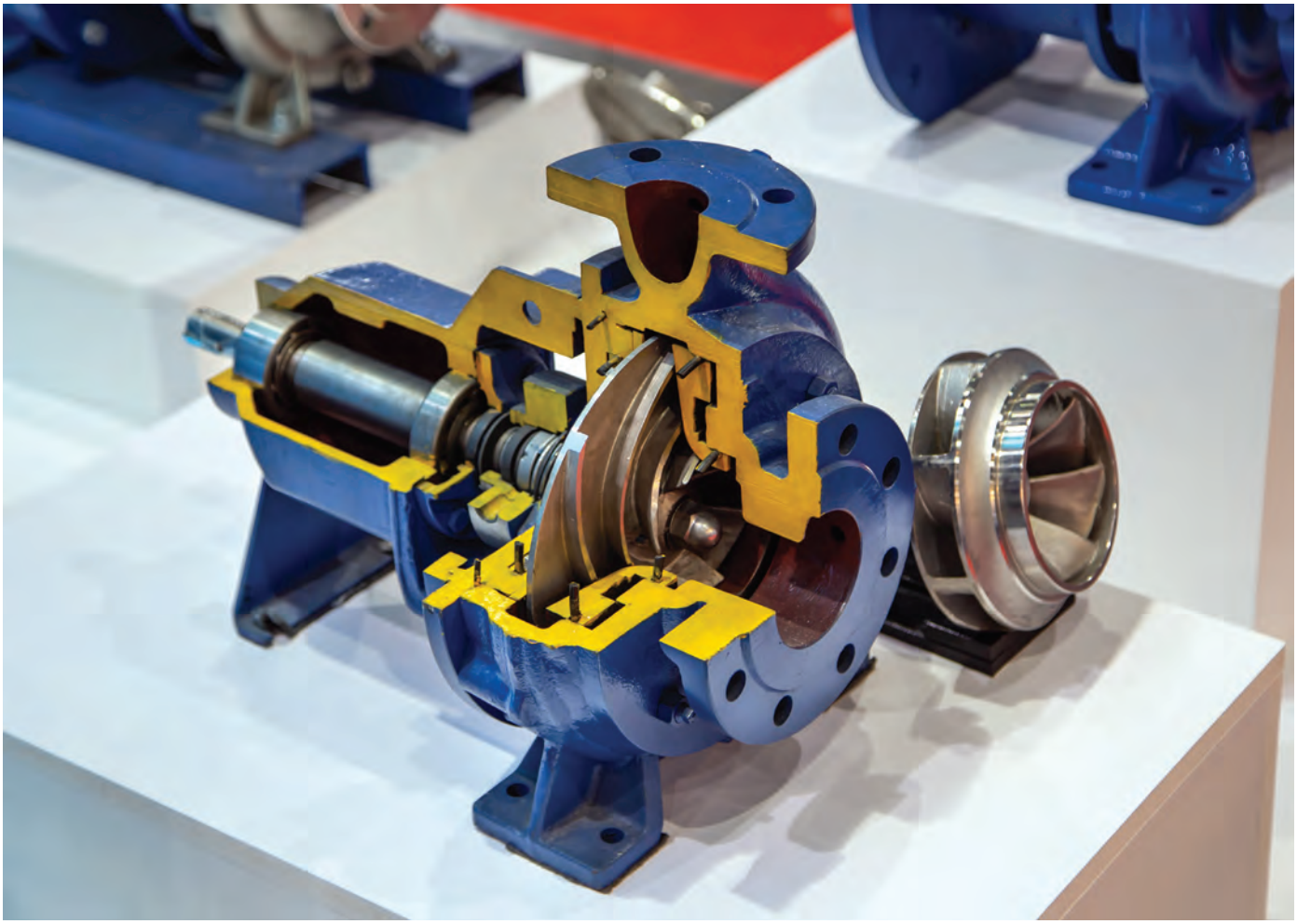


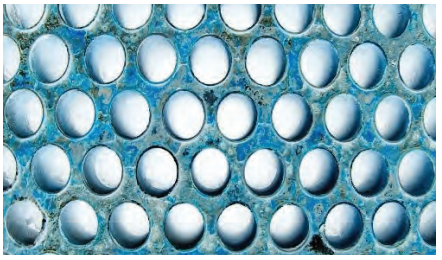
A DIFFERENT WAY TO DRASTICALLY REDUCE FRICTION

Composite product eliminates or prevents wear and downtime

BY RANDY LEWIS, PLASTICS MOLDING CONSULTING, LLC

Imagine if you will, wear components that do not rely on low coefficient of friction or lubrication to extend the components' life, but by reducing the contact area between the rotating and non-rotating surfaces. Basically, you reduce the contact area between the wear component by the diameter minus the apex of the curve. Assume millions of tiny spheres and, thus, the contact area of the part is reduced by the diameter minus the apex of the curve of two round smooth surfaces.

This design is accomplished by using a high temperature / low coefficient of expansion resin that has impressive adhesion to fillers. This



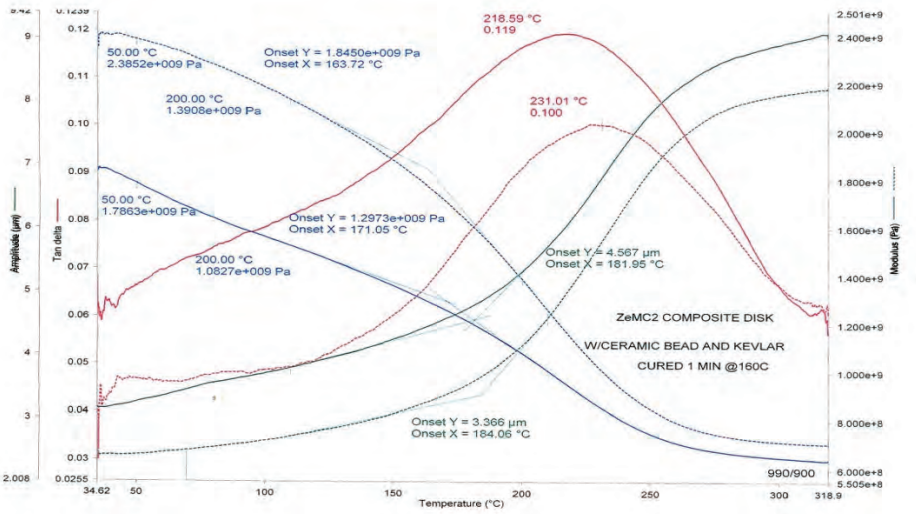
allows the resin to be filled with micro spheres that only contact the tip of the round shaft at the apex of two curves. This adhesion to filler is the key to the function of the wear-resistant parts. The parts adhere to the filler so that the tiny spheres do not dislodge. We have now had wear parts in the field for fifteen years without failure or wear on the shaft.

HIGH TEMPERATURE PERFORMANCE

Let's look at the following example: glass transition temperature (Tg) increases with post baking. Please note in the DMA seen in this graph, the first pass to 572 degrees Fahrenheit (300 degrees Celsius) has a Tg as a of 424 degrees Fahrenheit (218 degrees Celsius), the second has a Tg of 447 degrees Fahrenheit (231 degrees Celsius), and the third has no definable Tg and the temperature capacity extends beyond the limits of the DMA.

ADHESION

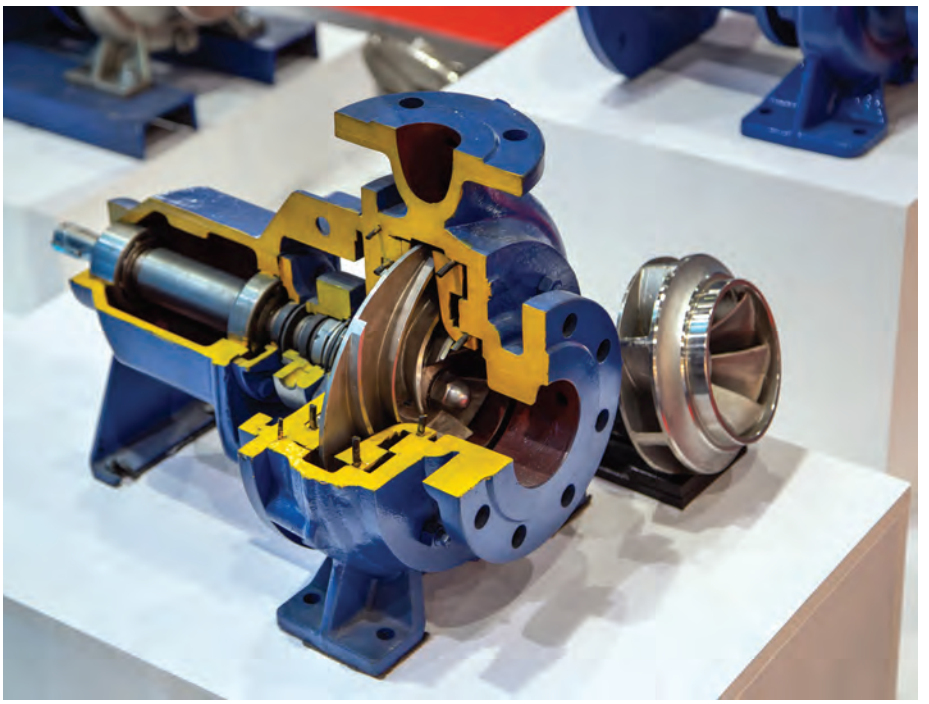
Myriad materials have been tried and all save this one released the spheres. Loose ceramic spheres in a pump have been the result of all others. Aaron Rutin, CEO of R3 Composites, had this to say in a report from our



The contact area reduction for each sphere is the area in red.

first try with our wear components: ''Carver Pump has been working with a potential new customer who is an OEM to sell them high-pressure pumps (Carver Ring Section RS pump) for inclusion in their product. Each ring section in one of these pumps contains multiple wear rings and bushings made of PRLC components molded and machined by R3 Composites.''

Rutin continues, ''Carver Pump supplied one typical pump to this customer for their evaluation before placing orders. They ran this test pump through performance, endurance and accelerated usage test and returned it to Carver pump for inspection. The customer reported the pump ran beautifully no matter what they through at it. On inspection, it appears they ran everything but the kitchen sink through the pump without problems or loss of performance. Metal parts and hose fittings were found lodged inside the pump



Centrifugal pumps, from the original (200 BC) to today's modern version.

along with other discarded floor debris. All of the rings and bushings appear to be in good shape with minimal dimensional change except for scars on the working surfaces where the foreign materials worked their way through the tight clearances on the pump during operation."

HISTORY

Archimedes invented the first centrifugal pump about 200 BC in Ancient Greece. Since then, pumps, centrifugal and otherwise, have had the same continuous problem—wear. One part must turn while the other remains stationary. Centrifugal pumps have changed little since then—an impeller turns and liquid is pumped in the desired direction. The first wear bushing was probably soft wood to protect the hard wood. Therefore, wear equals downtime to change the soft wood.

New materials, sophisticated impeller angles, and propulsion are the only differences in 2,200 years. Wear between the stationary and rotating components is still the main cause of downtime. It has always occurred at the interface between moving and stationary surfaces and has been an accepted, unavoidable drawback.

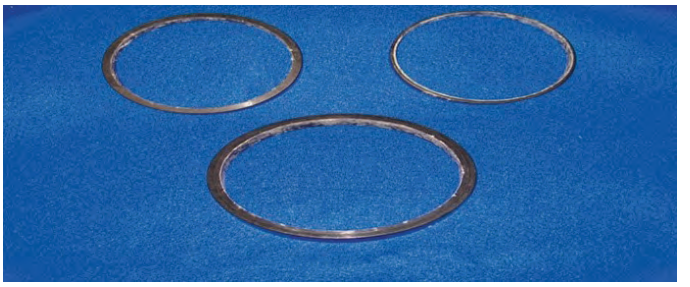
The industry practice for pump manufacturers is to design a cheap sacrificial bushing, just like the soft wood of the very first pumps, to abrade away and spare the more expensive shaft. To replace the shaft or the bushings requires downtime, which is the most expensive factor. Pump users need multiple pumps so that one can be taken offline for rebuild of the wear components while another is serviced. Increasing uptime is an advantage of parts molded from the new bulk molding compound.

THERMOSET RESIN

A proprietary thermoset resin is the key to the functionality of this new product because of its high glass transition temperature (Tg), chemical resistance, and unsurpassed adhesion to fillers. Excursion temperatures to 572 degrees Fahrenheit (300 degrees Celsius) are not uncommon. In one application, a pump was returned from the field for rebuild with the epoxy paint on the outside of the housing scorched from friction heat generated internally by abuse. The rebuild manufacturer reported that the new BMC wear bushing and the shaft under the wear bushing looked like new.

The ability of this resin to adhere to fillers is the reason Kevlar and ceramic beads can be used to hold them in place for machining. The fiber reinforcement is similar to rebar in concrete—without it there is little strength. Nothing adheres to Kevlar, according to the manufacturer, but adhesion to Kevlar was achieved with this resin that was equal to epoxy resin to glass. This is why parts manufactured from this composite are the first long-fiber, Kevlar-filled parts that can be machined cleanly and hold tolerance.

Kevlar also makes it free from the possibility of galvanic corrosion. Dimensional creep with temperature is another reason that other resins do not adhere to their fillers. Adhesion and exceptionally-low creep are the reason this resin is vital to the product.



Conductive carbon fiber and combined graphite has been introduced to improve the chemical resistance over the Kevlar. This also provides thermal conductivity. The composite BMC has passed house testing by several customers and have been in the field for fifteen years with no wear on the components or the shaft.

SYNOPSIS

Kevlar is attacked by strong bases while the carbon fiber is affected by galvanic corrosion in seawater. It appears each has challenges, but new fillers are constantly being tested in research and development. The new resin appears impervious to temperatures below 392 degrees Fahrenheit (200 degrees Celsius). The latest effort is to test a special glass fiber combined with the ceramic spheres for seawater applications. It is known that the wear component will not wear, but it is not yet known if the new glass will wear the shaft or if the ceramic beads will maintain the needed separation and prevent wear.

The concept of using ceramic beads to reduce the surface contact area is new. The function of the molded part is totally dependent on the adhesion and dimensional stability found in the new resin. Because this BMC composite is new, addressing any failure mode is the focus. The goal is to define and recommend a product for each application and cover the widest possible temperature and chemical range with zero wear to the bushing or shaft. The resin seems to adhere to everything, so fillers that were never successfully used, such as Kevlar, can now be tested. Adhesion to polytetrafluoroethylene (PTFE) has even been successful.

RANDY LEWIS has a degree in industrial engineering from Gaston College and over four decades in the business. He has published several papers and set up five plant wide thermoset recycling operations. Plastics Molding Consulting, LLC is a collection of experts in different fields of plastics. They design customer products, make 3D printings for inspection, research and specify molding compounds, modify plastic to specification, and prototype, build, and manufacture myriad plastic parts. For more information, visit **www.plasticsmoldingconsulting.com**.

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THE WORLD'S LARGEST UNTAPPED RESOURCE: EXCESS HEAT

American industry is sitting on a potential gold mine
Part 3 of 3

BY ASTRID MOZES, DANFOSS

See Pts 1&2 www.mptmag.com

Recycling heat is not only an overlooked measure in the current energy crisis, but also the next frontier of the green transition. As we conclude this series, it's time to step into the future with concrete recommendations that meet the needs of the moment.

Many countries and cities are ripe to take advantage of the energy wasted in their backyard. Not least those with an energy demand intensity, a district energy system, and large sources of excess heat. In a time of exploding energy prices, gas shortages, and climate crisis, it would be a policy failure of immense proportion if decision makers across the continent fail to take advantage of excess heat. Adding to this, the role of excess heat in the future energy system will only grow. The technology for using low temperature excess heat is maturing and, in the future energy system, excess heat sources such as Power to X facilities will grow significantly.

It is crucial that decision makers are aware of this potential when conducting urban planning and designing the financial and regulatory framework for the future energy market. With that in mind, we present the following policy recommendations.

REGULATE

In general, excess heat must be considered as an energy resource instead of waste to be disposed of. Today, there are a number of market barriers that prevent market players from leveraging the potential of reusing excess heat. Regulation can remove these barriers, for instance by supporting an equal treatment of waste heat and renewable energy sources used in heat networks. Regulation can also push for greater use of excess energy by making it mandatory for entities such as data centers or industries to make a plan for exploiting the excess heat.

In general, mandatory heat planning will enable cities across Europe to assess the potential and make the best use of locally available resources. For instance, in Denmark, municipalities were asked to map existing heat demand, the existing heat supply method and the amounts of energy used. They also estimated future demand and supply possibilities. Based on this information, overall energy plans were prepared to show the priority of heat supply options in any given area and identify locations for future heat supply units and networks. Depending on the existing energy system, energy planning can both

reveal small-scale potential (such as forming the right incentives for heat recovery or the potential of co-generation of heating and electricity) or it can reveal the potential of larger-scale opportunities such as the rollout of district heating.

It is crucial that the scope of the heat planning is wide and detailed, and also includes potential future sources of excess heat, such as Power to X facilities.

ADDRESS ECONOMIC INCENTIVES

To further improve energy efficiency by using wasted energy, it is essential to remove both financial and legislative barriers. The current design of the energy market is, in many places, a barrier to sector integration technologies. It either hinders the participation of sector integration technologies in specific markets, or it fails to internalize all positive and negative externalities of respectively low- and carbon-intensive technologies.

It is crucial that tax legislation is in favor of using surplus heat and that appropriate network tariff structures should be considered. Additionally, administrative barriers need to be removed to incentivize users to connect to district heating networks, which will also encourage district heating utilities to boost their efficiency.

ESTABLISH PARTNERSHIPS

More systematic use of excess heat is, at its core, an exercise that spans sectors and stakeholders. Partnerships between local authorities, energy suppliers and energy sources such as supermarkets, data centers, wastewater facilities, and industries can help to maximize excess heat's full potential.

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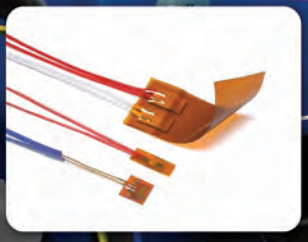

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REAL-WORLD LEARNING FOR INDUSTRY 4.0

Patti Engineering and Kettering University collaborate to bring the future to the classroom


Scott Grasman


Scott Grasman

In March of this year, Patti Engineering and Kettering University announced they will create an Industry 4.0-enabled collaborative robotic cell for a new classroom lab. The goal of which is to teach engineering and computer science students about real-world situations with manufacturing automation technologies they may experience during their co-ops and future careers. Below, Scott Grasman, Kettering's dean of the college of engineering, and Sam Hoff, Patti Engineering's founder and CEO—and proud Kettering University alumnus—discuss what this means for the future of engineering and software development services.

MPT: ***How did this partnership take shape and what are some of the goals of the new lab?***

SCOTT GRASMAN: Patti Engineering has been a longtime supporter of Kettering University and has generously helped us design this new lab and develop related coursework. We are thrilled to incorporate real-world applications into a single robotic cell for our students to learn industrial robotics, control systems, the internet of things, wireless communications, and data analytics.

SAM HOFF: We are excited for the opportunity to develop a new lab for the students at Kettering. The lab's real-world challenges of collaboration across all disciplines will provide an excellent space for students to put their classroom knowledge into practice, preparing them for the obstacles they may face in their careers. By solving these challenges while still in school, students will be better equipped to navigate and solve problems in their future endeavors.

MPT: ***How would you describe the main focus of the project?***

SAM HOFF: Patti Engineering was involved with the design of the new classroom lab, along with developing the baseline program. The new robotic cell incorporates technology from some of the university's corporate sponsors including Mitsubishi Electric for the PLC, HMI, and collaborative pick-and-place robot, and Keyence for the vision systems and area scanners.

SCOTT GRASMAN: Together with our industrial manufacturing, electrical, and computer engineering students, computer science students will work side-by-side on the different learning opportunities presented by the robotic cell. We will even integrate our 3D printing course into developing the end-of-arm actuators for the collaborative robot. It's a comprehensive system designed to be utilized by all of our engineering and computer science programs.

MPT: ***How does the lab simulate real-world experiences students could expect in the field?***

SAM HOFF: To facilitate learning and experimentation throughout the semester, the robotic cell was specifically designed to enable students to work with and modify the code. At the end of the term, the staff resets the code to the baseline program, ensuring the same opportunities to the next group of students. This thoughtful approach ensures that every student who utilizes the robotic cell is able to delve deeply into the material and achieve the cell's full potential.

MPT: ***How will the lab be integrated into these students' overall education?***

SCOTT GRASMAN: Currently, the university has separate labs to correspond with different courses. The new lab will be integrated into existing courses and will be available for use in future courses. The Kettering University faculty is creating additional curricula including capstone experiences centered around the new lab, which is scheduled to open during the summer of 2023. ■

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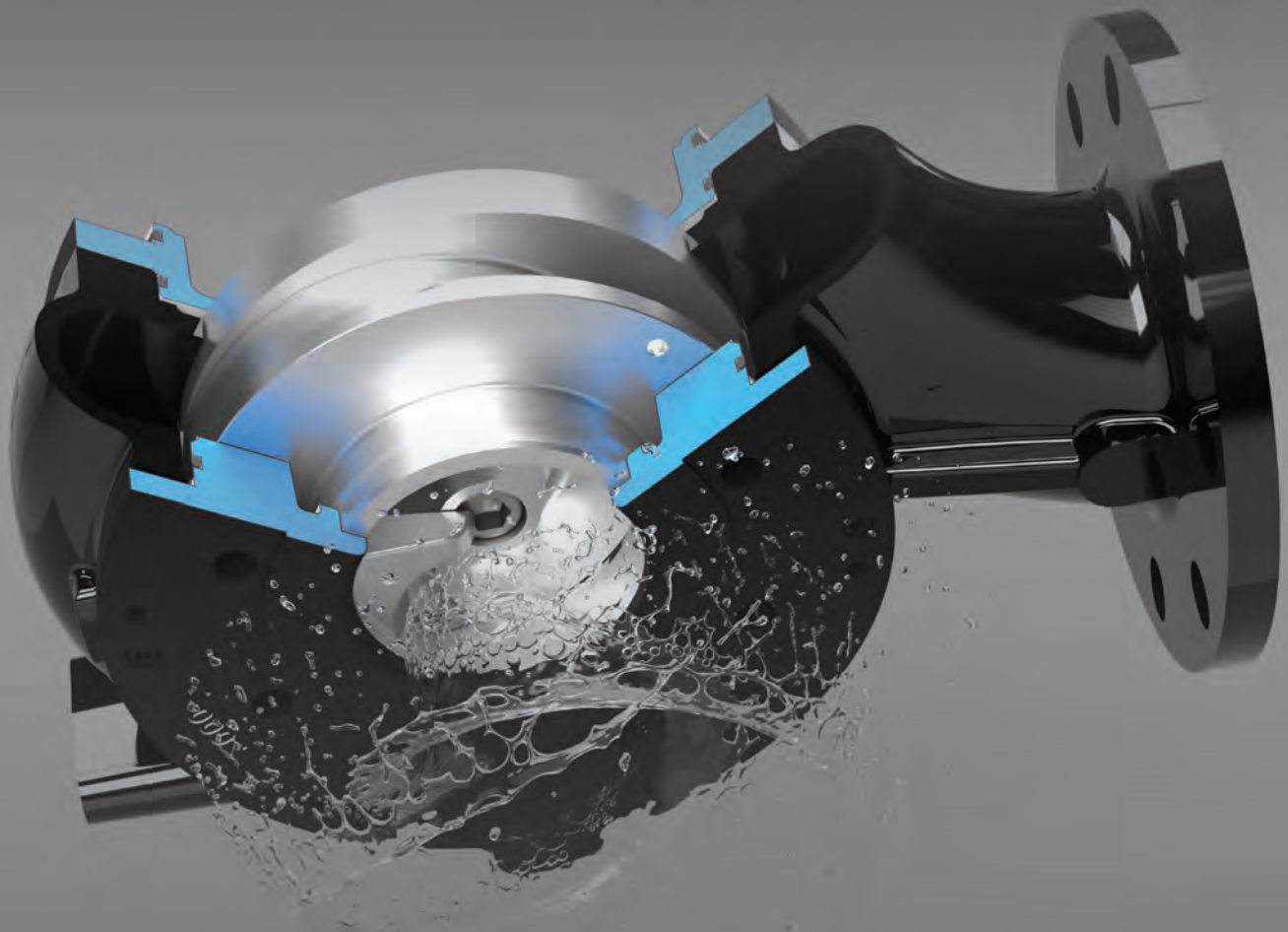

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