

The background is a light blue technical drawing or wireframe illustration of various industrial components, including pipes, valves, flanges, and a large spherical tank, all rendered in white lines.

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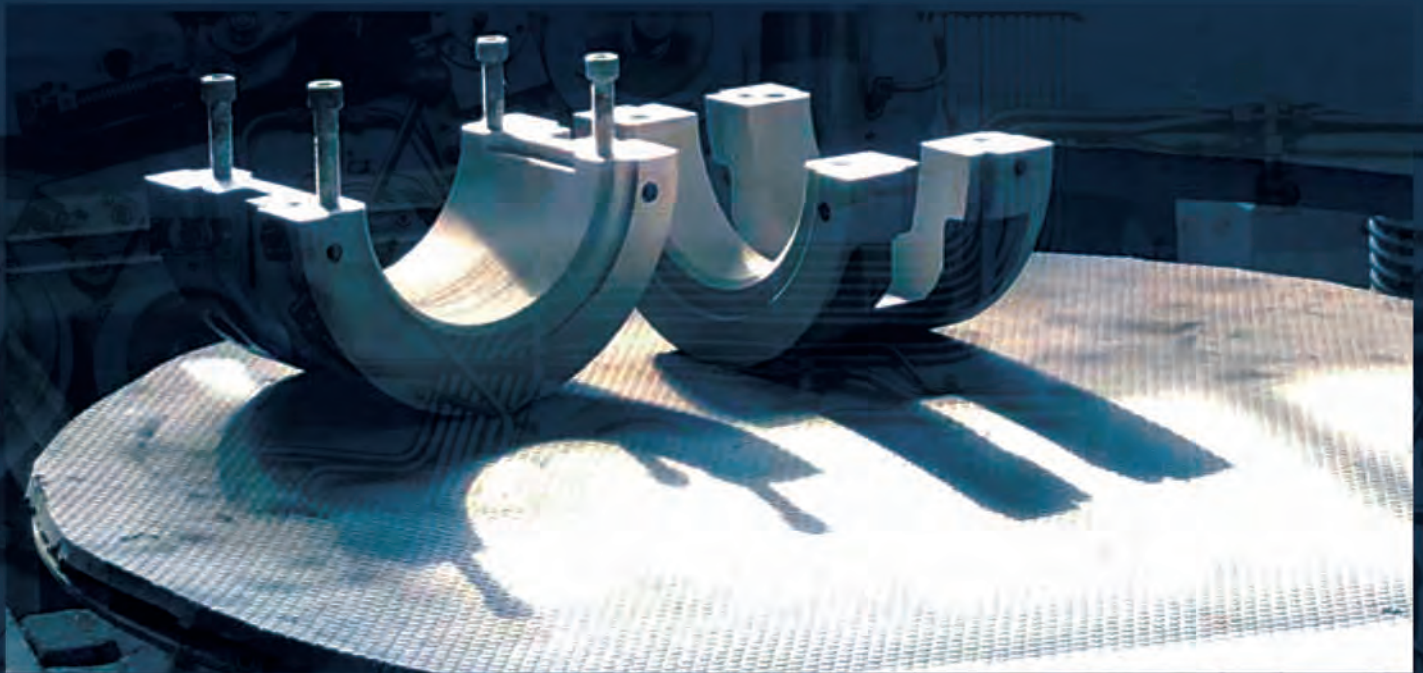
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COVER PHOTO
Courtesy of Crane Pumps and Systems

Welcome to the June issue of MPT, and much like the weather outside, it's a hot one! Therefore, it's appropriate with start off with a trip to the beach in our Case Studies section (pg. 14). Laguna Beach County Water District provides water services to around 25,000 residents within 8.5 square miles of Southern Orange County, and as Trent Kamins of Aquatic Informatics explains, streamlining their maintenance programs required versatility, dependability, and no small amount of innovation.

A different kind of heat is on display in our Water & Wastewater Focus section, as Yenni Maelianawati of HRS Heat Exchangers illustrates how upgrades will benefit a Tasmanian sewage plant for decades to come (pg. 22). This important technology ensures potable drinking water and collecting and treating sewage for over half a million people.

Lastly, Sulzer's Jan Lüder shares some best practices advice on how to address some of the challenges in thermal power generation (pg. 34). The rapid growth of renewable energy in Asia is presenting the grid with a challenge: how to flexibly accommodate changing demands with existing thermal power plants, and, as this article shows, a sustainable future requires a multivalent approach. Enjoy!



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Modern Pumping Today

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THE INTERNATIONAL CODE COUNCIL JOINS THE TIC COUNCIL

The International Code Council was recognized as a new member of the TIC Council, a global organization that engages governments and key stakeholders to advocate for effective solutions that protect the public, support innovation, and facilitate trade.

Experts from the Code Council family of solutions companies ICC-ES, ICC NTA, and ICC Credentialing, will collaborate with other TIC Council members such as Bureau Veritas and CSA Group to promote best practices in safety, quality, health, ethics, and sustainability.

"Membership in the TIC Council aligns with our own mission to provide information, tools, and resources that building safety professionals, manufacturers, and the public can trust," says International Code Council Chief Executive Officer Dominic Sims. "Our membership is a tremendous opportunity to collaborate with like-minded organizations to help balance public safety while accelerating innovation in TIC solutions and services."

"We are pleased to announce that the ICC Conformity Assessment Group has become a member of the TIC Council, joining other industry leaders," adds Shahin Moinian, P.E., executive vice president of the International Code Council's Conformity Assessment Group.

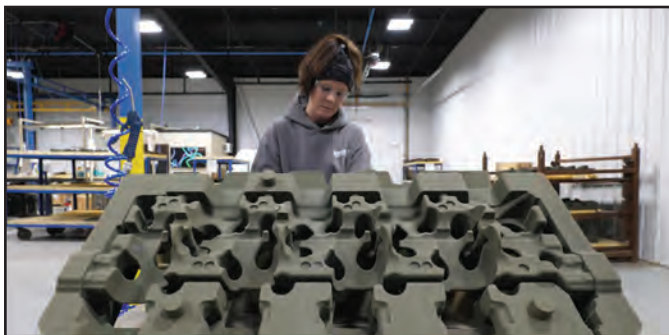
THORDON WINS COMPOSITE BEARING DEAL FOR EGYPTIAN IRRIGATION PROJECTS

Sigma Group, one of Europe's leading industrial pump manufacturers, has specified Thordon Bearings' grease-free bearings for installation to the specialized pumping sets destined for flood defense and irrigation projects across Egypt.

In total, Thordon is supplying sixty-four of its water-lubricated Composite bearings for use in forty-nine Sigma BQBV vertical diagonal pumps specified for projects along the Nile River and the Sinai Peninsula.

Sigma has already delivered nine 800-BQBV pumps for projects in North Sinai, while twelve 1400-BQBV pumps are scheduled for installation at the El-Hammam agricultural wastewater treatment facility. Twenty-eight 1500-BQBV pumps are also being built for the mammoth Mostakbal Misr project (a project for agricultural production in the Western Desert) with deliveries taking place from June 2023 through to April 2024.

"Pumps installed on the river Nile operate in very abrasive water. As a result of these harsh operating conditions, the bronze bearings these pumps are typically fitted with last only one to two years. Sigma wanted a much more robust, abrasion-resistant solution," says Josef Hozák, managing director, Eribos, Thordon's authorized distributor in Czech Republic.



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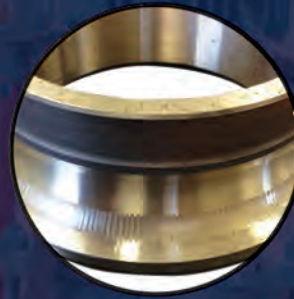
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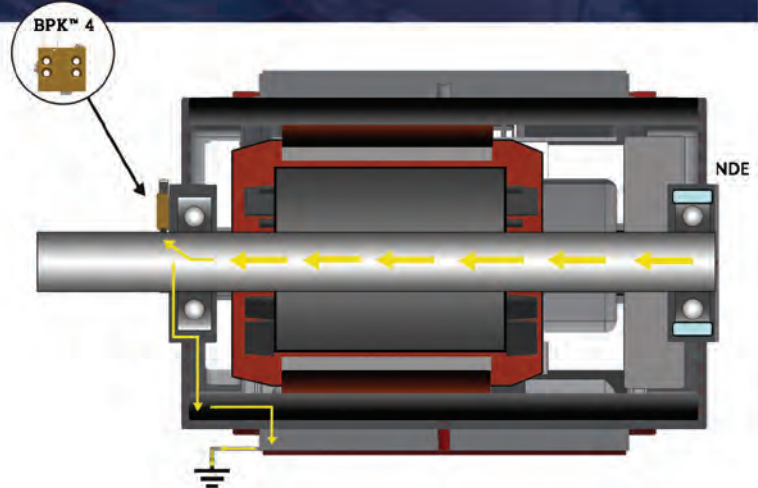
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Belt Technologies, Inc. recently helped researchers at ETH Zurich in Switzerland, one of the world's preeminent universities in the field of technical science, develop a faster and more cost-effective way to apply liquid coatings during battery production.

Working alongside the researchers, experts from Belt were able to provide a stainless-steel belt conveyor that could withstand the caustic chemicals and high temperatures while evenly applying a liquid "curtain coating" during the production of batteries.

"One of the biggest challenges the researchers faced was whether they could find a hygienic conveyor belt that operated smoothly, was easy to clean and able to withstand high heat and harsh chemicals," says Denis Gagnon, CEO of Belt Technologies. "Our PureSteel endless metal belts checked all those boxes."

Researchers wanted to leverage curtain coating during battery production to overcome the slower production speed necessary for alternative coating processes. Conventional flat belts were not an option because of their particle generation and poor corrosion resistance when exposed to chemicals. Belt's team provided drive and deflection rollers for the conveyor system as well as the desired belt.

GLOBAL WATER AND WASTEWATER UTILITIES TAKE AIM AT CLIMATE CHANGE

Water and wastewater utilities are executing ambitious decarbonization goals, according to a new survey of 100 utilities in North America and Europe. Sponsored by global water technology leader Xylem, the survey finds that 75 percent of respondents intend to achieve greenhouse gas (GHG) reduction goals by 2040 or earlier, 48 percent of respondents have set a net-zero emissions goal, and 42 percent have set an emissions reduction goal.

"The water sector has an important role in the global effort to reduce GHG emissions," says Patrick Decker, president and CEO at Xylem. "Our sector is energy intensive. However, smart application of technology makes it possible to manage water far more efficiently and affordably. Increasingly, utilities are finding ways to deploy technology to become more resilient and reduce emissions, while also addressing many of their operational concerns."

The implementation of new and innovative products and solutions can help utilities advance their decarbonization strategies. As highlighted in its recently launched 2022 Sustainability Report, Xylem's cutting-edge technologies have enabled customers to reduce their carbon footprint by more than 2.8 million metric tons since 2019.

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EQUIPMENT FINANCE INDUSTRY CONFIDENCE DECREASES AGAIN IN MAY

The Equipment Leasing and Finance Foundation released the May 2023 Monthly Confidence Index for the Equipment Finance Industry earlier this month. The index reports a qualitative assessment of both the prevailing business conditions and expectations for the future as reported by key executives from the one-trillion-dollar equipment finance sector. Overall, confidence in the equipment finance market is 40.6, a decrease from the April index of 47.0.

When asked about the outlook for the future, MCI-EFI survey respondent James D. Jenks, CEO, Global Finance and Leasing Services, LLC, adds, "Until we get back to energy independence, I don't see an uptick in the economy in the foreseeable future."

When asked to assess their business conditions over the next four months, none of the executives responding said they believe business conditions will improve over the next four months, a decrease from 11.1 percent in April.

Also, 51.9 percent believe business conditions will remain the same over the next four months, down from 70.4 percent the previous month, and 48.2 percent believe business conditions will worsen, an increase from 18.5 percent in April.

INSTITUTE FOR ENERGY RESEARCH ADDS TO ITS LEADERSHIP TEAM

The Institute for Energy Research (IER) announces the addition of Dr. David E. Dismukes as a distinguished fellow and senior economist and Smythe Anderson as director of government relations and external affairs. Anderson will also serve in the same role at the American Energy Alliance, IER's sister advocacy organization.

IER also promoted Kenny Stein from policy director to vice president for policy and Dustin DeBerry from director of donor relations to vice president for development. Stein has been with IER since 2017 and DeBerry since 2008.

"I'm excited to announce the additions of Dr. Dismukes and Smythe Anderson to our staff and to also promote two outstanding members of the IER team," adds Thomas Pyle, president of the Institute for Energy Research. "David has had a distinguished career in academia having led the Center for Energy Studies at LSU. His expertise will contribute greatly to the policy discussion here in Washington on a more permanent basis. Smythe Anderson comes to us with a strong background in policy formulation, federal relations, and communications having worked in both the public and private sectors." Pyle also notes that the promotions of Stein and DeBerry mark deserved recognition for the value they bring to the organization. ■



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Technology and materials solutions have changed a lot in the last year, and Pack Expo 2023—held September 11 through 13 in Las Vegas—is the first opportunity to see these solutions in person, all in one place. Attendees across myriad industries will leave convinced that this event is well worth the investment in that it will enable them to get up to date on current technologies and trends, identify more efficient and effective production solutions, and ultimately help their companies stay ahead of the curve.

From front-of-the-line through packaging and distribution, Pack Expo offers more solutions in one location than anywhere else. Attending will allow professionals to accomplish more during this three-day event than a year's worth of product research. A few highlights include over 2,000 packaging and processing solutions suppliers; seven solutions-driven, targeted pavilions—The Processing Zone, The Containers and Materials Pavilion, The Logistics Pavilion, The Package Printing Pavilion, The Healthcare Packaging Pavilion, The Confectionery Pavilion, and The Reusable Packaging Pavilion; as well as over 100 free sessions focused on newly available technologies, best practices, e-commerce, safety, sustainability, and other topics.



EMERGING BRANDS SUMMIT RETURNS

The Emerging Brands Summit is back! The one-day event-before-the-event will take place on September 10, just prior to the official Pack Expo kick-off. The Summit is designed for fast-growing brands seeking to scale their manufacturing operations and includes new additions to enhance the attendee experience.

The Emerging Brands Summit connects consumer packaged goods professionals with industry experts; contract manufacturing and packaging providers; and leading packaging and processing suppliers. The program features educational sessions and panel discussions, tabletop exhibits, and networking, with content designed for founders and decision makers of high-growth brands who are scaling operations, or leaders of product development, operations, or finance.

In addition to the main-stage presentations, attendees will have

access to concurrent breakout sessions throughout the day, providing additional educational programming. These sessions will cover a range of topics relevant to emerging brands, such as incorporating automation, financing capital requirements, and planning operations with the intention to be acquired.

The Summit will also offer a digital marketplace where attendees can browse and discover resources before, during, and after the event. This marketplace will include suppliers, vendors, and service providers specifically geared towards supporting emerging brands.

FOCUS ON NETWORKING

There's nothing like getting together with thousands of fellow professionals who "get" the industry and speak the same language. With 30,000 packaging and processing professionals gathered in one place, attendees can look forward to amazing networking opportunities



AT A GLANCE

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and special events at Pack Expo Las Vegas.

Simply being at the show together provides a natural ice breaker to make connections with people from every kind of company and vertical industry. Casual chats on the show floor can turn into partnerships. And at special networking events, the energy is even better.

Target networking events on the 2023 schedule include the Packaging and Processing Women's Leadership Network Breakfast, the First-Time Attendee Networking Reception, the Young Professionals Networking Event, and the ever-popular Confectionery Industry Networking Reception—which promises a sweet time for all.

THE VALUE OF EDUCATION

Pack Expo 2023 offers free access to over 100 innovation-defining sessions that explore a huge variety of packaging and processing topics through knowledge sharing opportunities. Attendees can

learn about best practices, new technologies, trends, common issues, and more. All sessions are free and right on the show floor, making it convenient for any attendee to catch a presentation or participate in a roundtable discussion.

Interactive sessions in The Forum at Pack Expo Las Vegas provide the opportunity to discuss new ideas and collaborate on solutions to widespread issues and trends such as digitalization, cyber security, sustainability, and automation. Each forty-five-minute session begins with a presentation before participants are invited to discuss the issue further in small roundtables.

Meanwhile, at the Innovation Stage, attendees can get up to speed on new technologies, best practices, and more during fast-paced, thirty-minute presentations by suppliers and topic experts. With over seventy sessions on various stages, attendees have numerous opportunities to expand their knowledge base.



BUILDING THE FUTURE TODAY

While at the show, attendees can meet with nearly every type of vendor for every kind of product, production line, and supply chain—which makes Pack Expo ground zero for the next wave of processing and packaging innovation. ■

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WORK CREWS SEE REAL BENEFIT IN USING TECHNOLOGY IN THE FIELD

Laguna Beach streamlines migration to new operational management platform

BY TRENT KAMINS, AQUATIC INFORMATICS

Laguna Beach County Water District (LBCWD) provides water services to around 25,000 residents within 8.5 square miles of Southern Orange County. The district receives approximately 1.14 billion gallons of water per year from the Colorado River and Northern California which is stored in twenty-one reservoirs. To deliver safe reliable water to its customers, the district operates and maintains thirty-six pumps; fourteen pumping stations; 3,500 valves; 900 hydrants; 8,000 customer meters; and over 135 miles of distribution pipeline.

While LBCWD is a relatively small operation with forty staff—twenty of whom are working as field crews, it is a forward-thinking water utility that has been moving from paper to digital over the last several years. Bobby Young, engineering manager at Laguna Beach County Water District, says, “More recently, in the last six

months we have moved most of our operational management to Sedaru and rolled out Fieldforce to manage our day-to-day operations. With real-time mobile work management and network intelligence for pipes, valves, hydrants, customer meters, pumps, and so on, our work crews can do their job better with information at their fingertips and have the ability to complete work records before they leave a site.”

INFORMATION DRIVEN MAINTENANCE

LBCWD uses the new platform for its maintenance programs including hydrant, valves, meters, sample stations, backflow, pumps, water mains, laterals, water leaks, and emergency pumps. Work orders get assigned to a field crew who can see the work location on a GIS map and layer in assets that may affect or be affected by the work that needs to

be done. The geographical display gives crews a holistic view of the work area so they can see where the water is coming from and where it is going. Crews can update progress in real time in the field and schedule additional work if needed and move on to the next job.

Having records of past work often helps field crews to resolve issues, so they see the value in record keeping which motivates them to add more data. LBCWD is working on building a strong historical baseline. “The more data we can collect, the better we can plan and predict situations before they become an issue,” says Young.

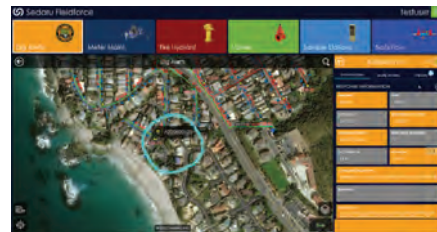
As more utilities are finding, when they replace one manual process with a technology solution, it accelerates additional advancements. In 2016 LBCWD switched to advanced meter infrastructure (AMI) that ended manual meter reading, but

inadvertently lead to ending meter box inspections. This resulted in the need for a new metering maintenance program to check the 8,000 meter boxes every year or so, as they were no longer being monitored during their billing cycle.

The new program is run efficiently through Sedaru tracking the progress of the two-person field crew as they record findings in the field. If needed they can write a ticket for construction in the field if the job is outside of their scope, before moving on to the next box. Young says, "This used to be done with paper, amounting to potentially 8,000 slips, and as you can imagine it was not uncommon for a slip to be misfiled, or not make it to inventory ordering, or the work order to not get into the right hands. Now all of this is tracked in real time, and most valuable is the building of a historical baseline that will allow us to see trends, such as certain meters that need checking more often than others."



Sedaru remotely operates the Wachs valve machine, while automating field data collection and updating the valve status in real time.



Sedaru manages DigAlerts, giving crews all they need to know in the area.

INTEGRATION WITH EXISTING SOFTWARE

LBCWD uses Wachs valve machine in support of its valve exercise program. Using an advanced application integration (API), Sedaru now remotely operates the Wachs valve machine, while automating field data collection, eliminating the need for manual data entry to be completed in the office and automatically updating the valve status in real-time.

811/Utility Locates service, or DigAlert as it is known in California, is also integrated into the platform saving LBCWD time by automating

the process. When a DigAlert ticket comes in, Sedaru parses the ticket information into the utility's GIS, digitizes each ticket's attributes, and presents the location on a map. The program reports all tickets and prioritizes those qualified as an emergency. If a ticket falls within the utility's service area, the program automatically creates a work order.

Work orders can be automatically assigned based on location or an administrator can assign field personnel based on current location, expertise, or workload, and add any special instructions before sending

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Laguna Beach County crews use Sedaru alongside their Valve Exerciser.

to the field locator's mobile device. Assigned tickets can be seen on a map and details can be drilled down in Field Force. The App has a tape measure feature that allows the field crew to determine the distance of the area, record information such as field status, pictures, and comments, and then automatically submit the Positive Response to DigAlert. By digitizing the process, LBCWD also gains an accessible historical record that provides defensibility in the event damage occurs.

IMPROVED VISIBILITY INTO LEAK MONITORING

LBCWD is fortunate to not have a lot of leaks, but the old way of tracking on paper meant repair work was sometimes missed. The new platform

allows work crews to monitor leaks when they are on-site, and instantly add or mark a change in a leak. Young adds, "Layering of information helps us to track and repair leaks when we are next in the area before it becomes a bigger issue."

ACTIONABLE DATA

Having data on all assets organized both visually and in detail in one place, makes it easy to use. For example, in a redevelopment situation, LBCWD can look at a map and see what assets will be affected when a building gets torn down and rebuilt. The new build may require a different pressure zone, or a larger house may need a bigger meter etc. If a new development is going in, LBCWD can quickly see if

there is water to the lot or if system improvements need to be made. The more information that is gathered into the operational management system the more likely it is to become valuable throughout the utility. "Recording maintenance helps us budget for capital planning," says Young. "As we build strong historical baselines, we expect to be able to be more proactive and plan for new challenges such as extreme weather events and measuring the benefit of new technologies and infrastructure improvements."

IMPRESSIVE TECHNOLOGY ADOPTION BY THE WHOLE TEAM

"Staff are building trust in the data stored in the management platform



Fieldforce gives crews all the information they need in the field, and the ability to record and complete work orders on site, and create a new ticket if more work is required.

and so they are using it on a more frequent basis," says Young. "Having a user-friendly experience for field crews to enter information is more appealing than scratching an instruction on a napkin or making a note on the back of a sheet and then remembering what to do with it when you get back to the office. That said, we are asking our workforce to do things differently and there are times when an iPad is hard to see in the sun, and it needs to be handled with care, which is not always easy to do in the rain or mud. So, we are asking people to do the best they can, and we are really pleased with the results."

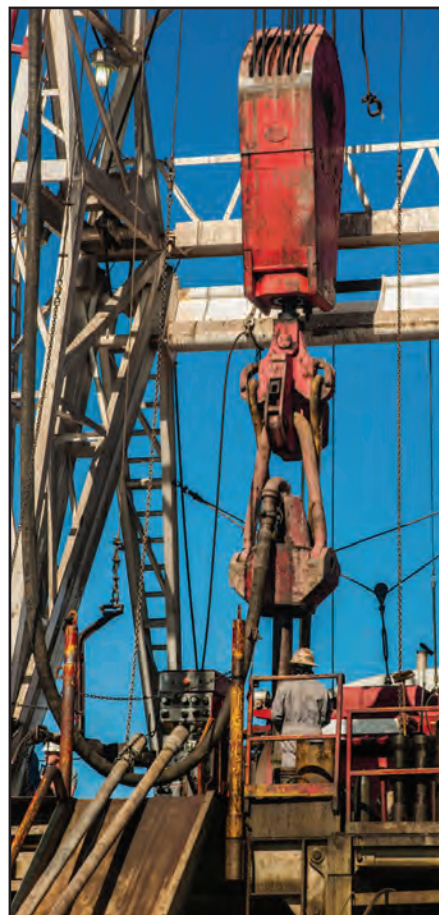
Overall, the benefits of having real time data in the field help crews to understand how decisions are being made, and how they can find efficiency. As water utilities are being asked to do more with less, these efficiencies, wherever realized, are helpful and crews know it.

Eric Callahan, engineering technician and GIS specialist for Laguna Beach County Water District adds, "I have been with the County Water District for twenty-six years and have gained a lot of knowledge during this time that has given me the ability to problem solve quickly and plan based on experience. However, as we hire new people, we need this knowledge to be transferable.

Building our historical records is a valuable educational resource for new hires. On the flip side, our long-time employees have been asking for a better way to record and centralize information so it can

be easily accessed, for quite awhile. We have tried a few programs over this digital journey, but the team has taken to Sedaru, in part because it's extremely user friendly and customizable, and because it has become instrumental in running our everyday operations." 📱

TRENT KAMINS is account manager for Aquatic Informatics. He and his team help utilities become more proactive and improve operations, maintenance, and asset management with digital solutions. Aquatic Informatics provide ongoing support and training for newly released features through regular software updates, ensuring that utilities get the most out of their data with the constant evolution of technology. For more information, visit www.aquaticinformatics.com.



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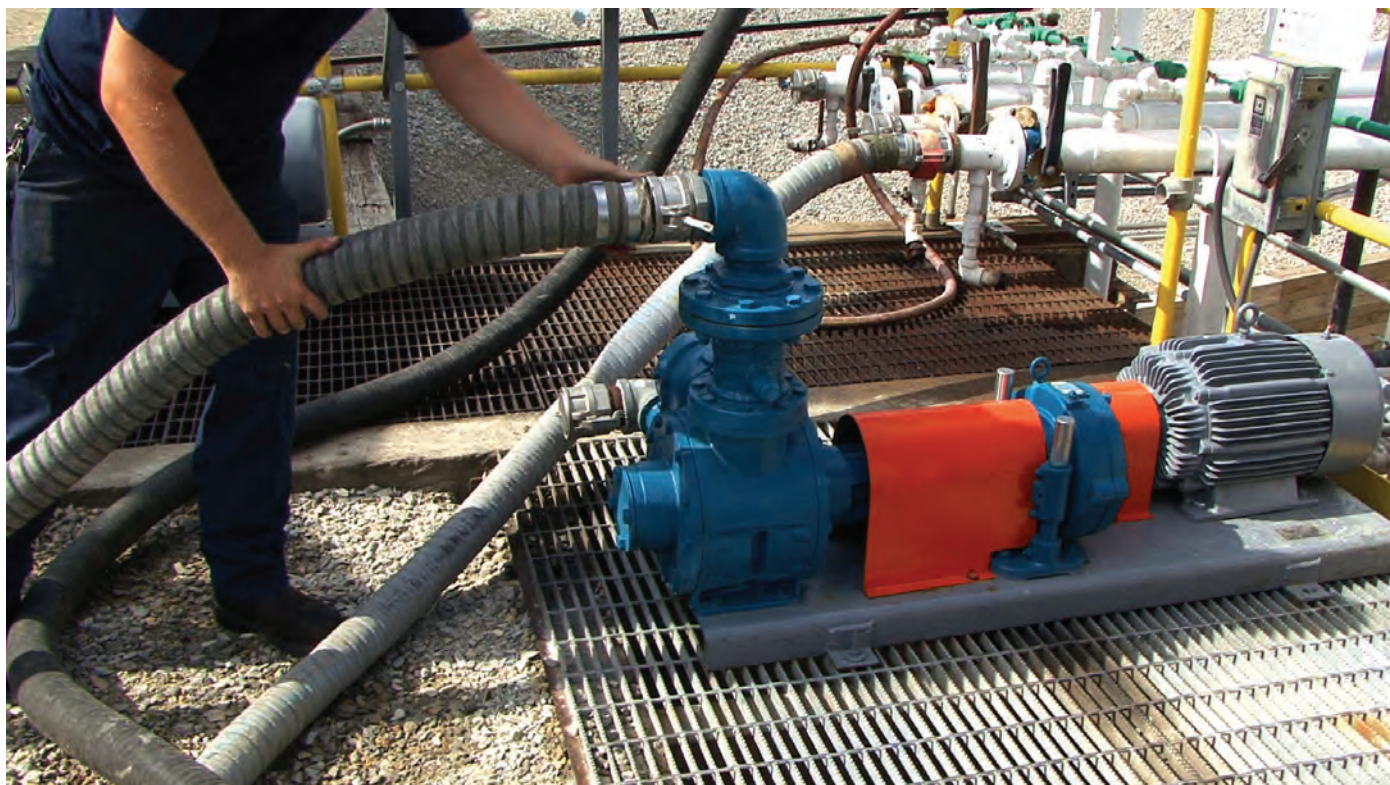
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KEEPING IT CLEAN

Why sliding vane pumps work well in soap manufacturing

BY MARK PYK, BLACKMER

Soaps and detergents serve as an imperative part of our lives, one that would make life much more challenging without modern advances. Before the days of stacked shelves with a wide variety of cleaning choices, soaps were simply a combination of boiled fats, oils, and ashes.

During World War I, however, a shortage of fats led to the invention of synthetic detergents, which evolved into manufacturers producing the varieties we see today. Soap and detergent production now consists of merging fatty acids with alkali, glycerin, or sulfuric acid. While that sounds straightforward, the production process is anything but.

The soap and detergent market has four segments—laundry and

fabric washing, household cleaners, personal cleansing products, and dishwashing cleaners. With this variety of cleaners, manufacturers need equipment that can process a wide range of raw materials, each with its own complexities.

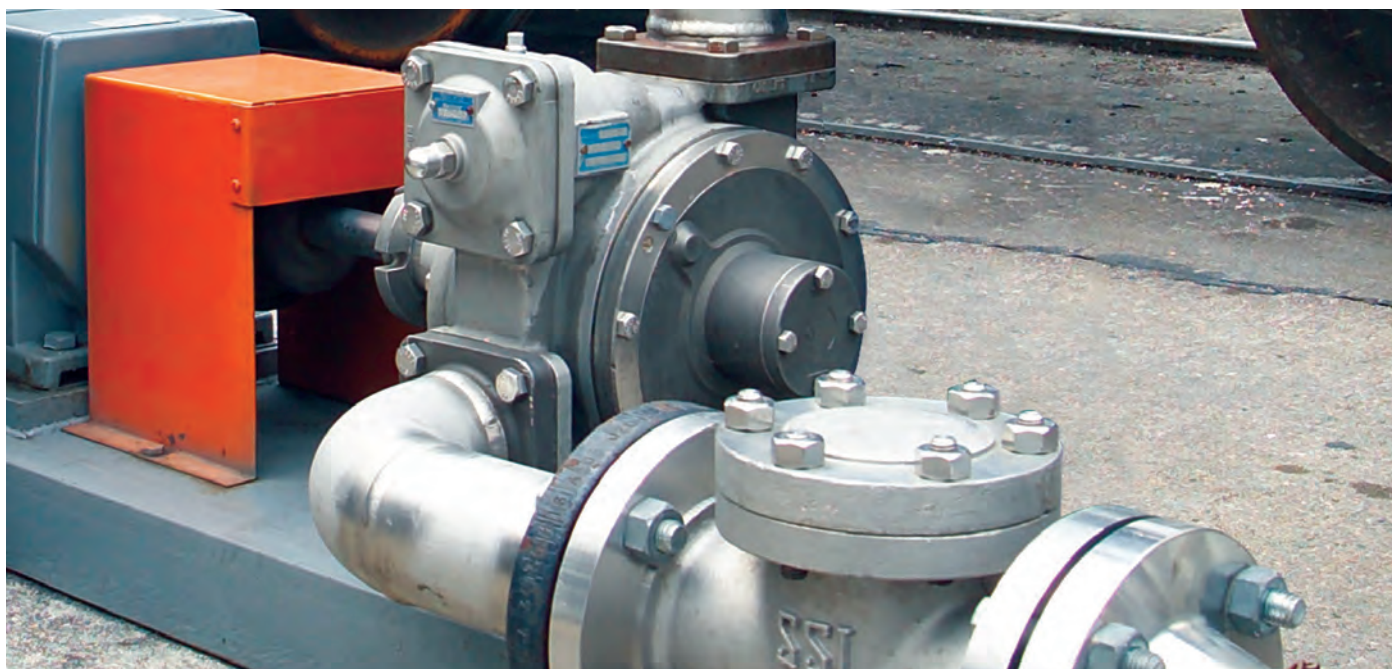
If manufacturers want a reliable way to handle the varying materials in soap and detergent processing, then their best bet is to use positive displacement sliding-vane pumps. This article will review why sliding vane pumps are well suited in this application.

BRING ON THE SOAP

The composition of sliding vane pumps makes them ideal for soap and detergent manufacturing,

especially over comparable pumping technologies. Sliding vane pumps feature a rotor with retractable vanes that protrude and retract as the rotor operates. This setup creates chambers for liquid to pool into, while the next vane pushes it to the discharge side of the pump.

Its composition alone makes sliding vane pumps useful in soap and detergent processing. The self-adjusting sliding vanes sustain the pump's volumetric performance, making the pump energy efficient while also preventing product slip. While vanes do wear over time, a worn vane simply protrudes further out of its rotor slot, ensuring that tight internal clearances remain consistent. The pump's ability to sustain



volumetric consistency ensures that it will run effectively and efficiently over its lifetime.

Another feature of the sliding vane pump is the lack of metal-to-metal contact, commonly found in other pumping technologies, such as gear pumps. When metal-to-metal contact occurs frequently, the possibility of pump friction and galling increases. Sliding vane pumps don't suffer from these problems due to their construction, which also aids in the pump's longevity.

Sliding vane pumps are also known for their ability to handle a wide range of liquid viscosities. This attribute is useful in soap and detergent processing because of the variety of raw materials with varying viscosities. Sliding vane pumps can handle liquids with viscosities as low as 0.2 cP and as high as 22,500 cP, while also experiencing no adverse performance effects when processing liquids between 3 to 100 cP and 100 to 5,000 cP.

EXPANSIVE APPLICATIONS

Sliding vane pumps also can handle liquids with small particulates up to 25 percent concentrations, a useful attribute when disposing of waste fats after manufacturing soap. This ability stems from shear-sensitive open

flow paths within the pump chamber and slow internal flow velocities that gently pass solids through the internal flow stages. The particles are

not moved violently through the pump casing, as is the case with pump styles that rely on high internal flow velocities to operate effectively.





Another attribute beneficial to sliding vane pumps is their self-priming ability and their suction lift capabilities. This pump technology can create an internal vacuum strong enough to strip and lift valuable soap and detergent materials out of the lines, pumps, and tanks. Operators don't have to worry about losing raw materials and processed ingredients inside their equipment.

Sliding vane pumps also are available in materials that work well with the soap and detergent manufacturing process. Housings are available in stainless steel or ductile iron, while the vanes themselves can be made from a variety of materials that pair well with soaps and detergents.

CONCLUSION

Soap and detergent manufacturing is not a simple process, but sliding vane pumps are one of the most compatible pumping technologies in these applications. Their ability

to handle multiple liquids with different viscosities, as well as their volumetric efficiency and consistency with several raw materials, make them a reliable choice for manufacturers. ■

MARK PYK is the product marketing manager for Blackmer®. He can be reached at mark.pyk@psgdover.com. Blackmer is a brand of PSG®, a Dover company. PSG is comprised of several leading pump brands, including Abaque®, All-Flo™, Almatec®, Blackmer, Ebsray®, em-tec, Griswold®, Hydro™, Malema, Mouvet®, Neptune®, PSG® Biotech, Quantex™, Quattroflow®, RedScrew™, and Wilden®. For more information, visit www.psgdover.com/blackmer or www.psgdover.com.



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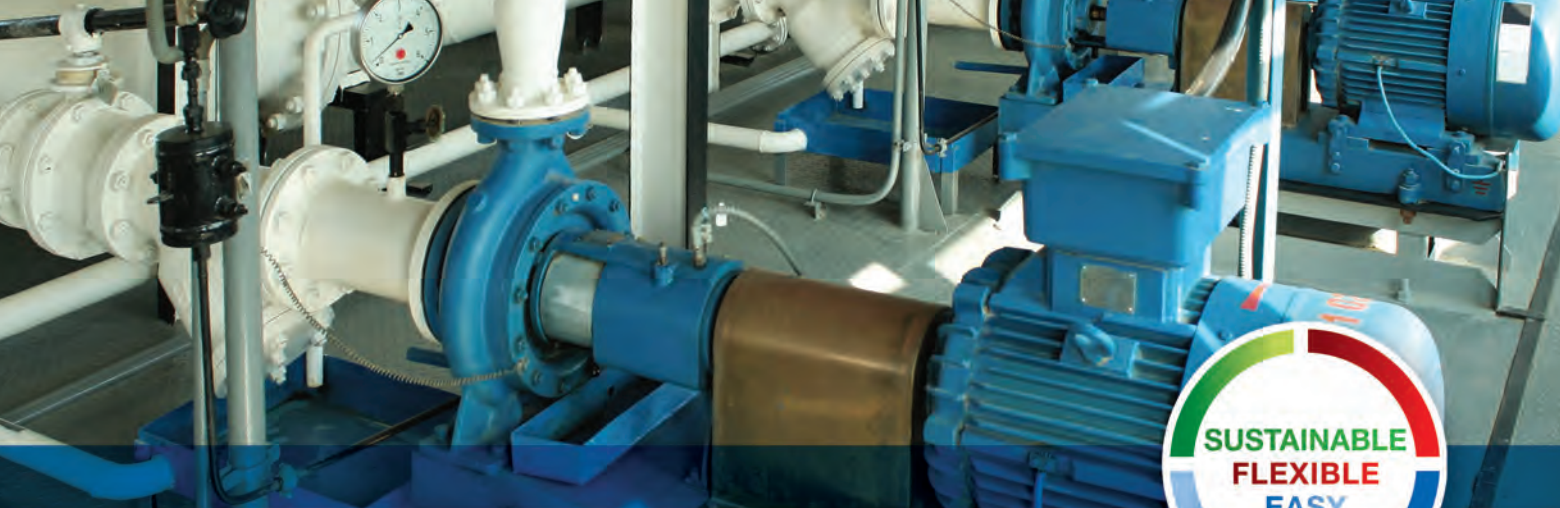
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The HRS DTI Series heat exchanger supplied to TasWater's Prince of Wales Bay Sewage Treatment Plant.

EXTERNAL HEATING UNITS UPGRADE WASTEWATER TREATMENT

A new sludge heater improves important plant, ensuring success for forty years

BY MATT HALE, HRS HEAT EXCHANGERS

TasWater is the water and sewage utility for the island state of Tasmania in Australia. Owned by Tasmania's twenty-nine local councils and the state government, TasWater is responsible for providing drinking water and collecting and treating sewage to the 540,000 people who live across the state. In 2020, TasWater and main contractor Aquatec Maxcon undertook a multi-million-dollar upgrade of the Prince of Wales Bay Sewage Treatment Plant in Hobart.

IN NEED OF AN UPGRADE

The Prince of Wales Bay Sewage Treatment Plant is one of the oldest sewage plants in Tasmania and the refurbishments, which included a new roof for the main anaerobic digester, will allow the facility to cope with the growing demand for wastewater treatment in the region. These improvements will ensure its operational suitability until 2060 as part of TasWater's ten-year investment program.

In addition to the new roof, the upgrade included a new control

system, new biogas waste flares, and an improved heating system, all of which will help to reduce the greenhouse gas emissions associated with the operation of the facility.

As part of the upgrade package, HRS Heat Exchangers supplied Aquatec Maxcon with a corrugated tube heat exchanger to warm the recirculating sludge and maintain optimum operating temperatures in the main digester. As Tasmania is the southernmost and coldest state in Australia, maintaining digester temperature is crucial to efficient



The HRS DTI Series heat exchanger raises sludge temperature to 97 degrees Fahrenheit (36 degrees Celsius), with a capacity of 19,000 gallons per hour.

operation, particularly in the winter months when there is an increase in heat loss from the liquid sludge nearer the top of the tank.

CHOOSING THE RIGHT PARTNER

Jim Foley, project engineer for Aquatec Maxcon, explains why the company chose HRS to supply the new digester heating unit: "There were a number of heat exchanger suppliers that we could have chosen, but one of the issues we faced was a limit of the space available for the heat exchanger, and the HRS unit had slightly smaller dimensions than some others for the same thermal performance. HRS provided me a with a reference, and after that and a performance test, we were happy to go with the HRS product."

The supplied unit consists of a six-module HRS DTI Series heat exchanger to raise the sludge temperature from 91 to 97 degrees Fahrenheit (32 to 36 degrees Celsius), with a capacity to process 19,000 gallons of sludge every hour using hot water supplied by a separate boiler. To facilitate routine maintenance and cleaning, the heating unit has been installed outside the digester; a design that is rapidly becoming the norm for biogas plants due to the benefits it provides over internal designs.

OVERCOMING CHALLENGES

Despite the challenges of a global pandemic, the heat exchanger, which was manufactured at HRS's factory in Spain, was delivered well ahead of

the required installation date. Since operation, the unit has performed according to specification, dealing with a range of feedstocks and sludges, including sewerage sludge and as fats and oils from trade wastes.

"As an engineer on a project such as this, you tend to focus on areas where you have problems," concludes Foley. "I'm happy to say there were no problems with the heat exchanger."

Now installed, the units should provide one of Tasmania's most important wastewater treatment plants with a sure foothold for many decades into the future. ■



The upgrade work at the Prince of Wales Bay Sewage Treatment Plant was carried out by Aquatec Maxcon and included a new roof for the main digester.

MATT HALE is the international sales and marketing director with HRS Heat Exchangers. Located in Atlanta, Georgia, HRS Heat Exchangers is part of the HRS Group, which operates at the forefront of thermal technology, offering innovative heat transfer solutions worldwide across a diverse range of industries. With forty years' experience in the food and beverage sector, specializing in the design and manufacture of an extensive range of turnkey systems and components, incorporating corrugated tubular, and scraped surface heat exchanger technology, HRS units are compliant with global design and industry standards. For more information, visit www.hrs-heatexchangers.com.



SUPPLY CHAIN RESILIENCE

What it means and why it matters Part 3 of 3

BY MERRITT GURLEY AND CHANDRAKANT ISI, HUBS

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We've spent a large part of this series detailing the challenges to maintaining an effective supply chain. However, in this concluding section, we'll turn our gaze to the here-and-now as well as the future—not only identifying industries facing supply chain disruptions in the current year but also suggesting a path forward for building greater supply chain resilience.

SIX INDUSTRIES THAT WILL FACE SUPPLY CHAIN DISRUPTIONS IN 2023

1

AUTOMOBILE

The European automobile industry is facing significant challenges due to the energy crisis in the region. French and German carmakers, including Mercedes, BMW, and Renault, have been among the hardest hit. This is mirrored in

Hubs' survey, which identified rising energy costs as the top concern for the automotive industry. European automakers are also dealing with the closure of steel and aluminum plants, leading to reduced output predictions by hundreds of thousands of vehicles. According to Europe's metal trade association, 50 percent of the European Union's aluminum production capacity is now offline

due to the ongoing power crisis. It is expected that these challenges will continue to impact the automobile industry through 2023.

2 AVIATION AND AEROSPACE
Russia's airspace plays a crucial role in global air travel, serving as a link between Europe and Asia. However, Russian airspace restrictions have forced international carriers to take longer, more expensive detours, reducing the profitability of an industry already struggling in the wake of the COVID-19 pandemic. Furthermore, the ongoing Russia-Ukraine war has disrupted the aircraft manufacturing industry by causing a shortage of titanium, which is a key component in the production of modern commercial aircraft. These events highlight the need for increased supply chain resilience in the aviation industry.

3 MEDICAL
The Ukraine war is leaving a significant impact on the medical industry as well. In its latest survey, Hubs found that raw material shortages were the top concern for the pharmaceutical industry. This is in part due to the rising cost of metals and plastics used in medical devices, which has been exacerbated by the Ukraine war. Furthermore, the U.S. Food and Drug Administration's clinical trial database indicates that many research sites in Ukraine, which were previously conducting over 250 active trials, are now under threat.

4 ELECTRONICS
The Russia-Ukraine conflict has also disrupted the global supply of semiconductor-grade neon, a crucial inert gas essential in chip production. As Ukraine supplies about half the world's supply of neon gas, electronics companies are facing difficulties in obtaining it. Additionally, the hostilities between Russia and the international community have disrupted the supply of rare metals, leading to reduced manufacturing output for companies such as

Apple. The impact of this situation on the electronics industry in 2023 remains uncertain.

5 FOOD AND BEVERAGE
Ukraine and Russia are the two major players in the global fertilizer market, making them a crucial part of the global food supply chain. The ongoing conflict between the two countries has disrupted the supply of fertilizers, leading to a sharp rise in global food prices. With farmers struggling to secure the necessary resources to grow crops. This could lead to further food shortages and price increases in 2023.

6 CONSUMER GOODS
The ripple effects of supply chain disruptions are further exacerbating the situation. Many consumer companies are struggling to maintain their operations and are facing financial difficulties. Revlon and Hakle have already filed for bankruptcy.

GLOBAL ONLINE MANUFACTURING SUPPLY CAPACITY

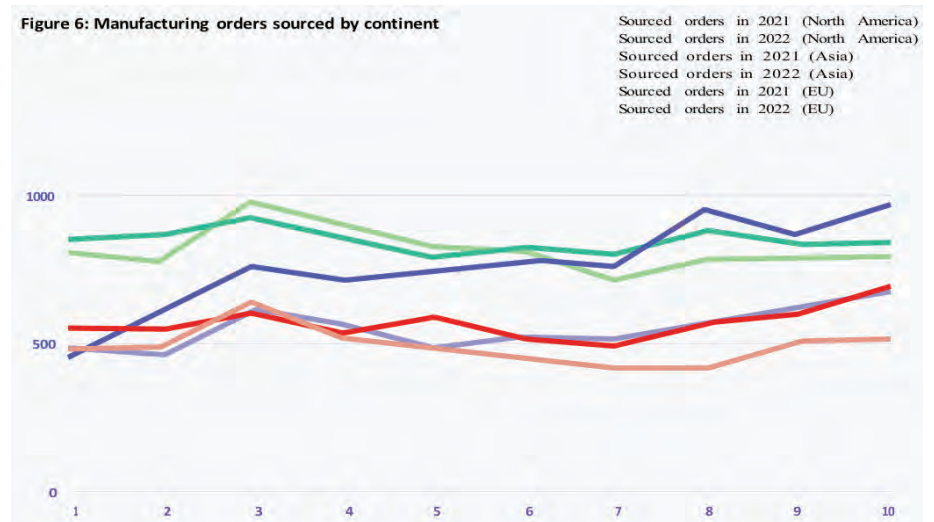
China's supply capacity in 2022 underperformed year-on-year, especially for the first half of the year. Meanwhile, North America experienced a significant increase

in manufacturing capacity starting in July. Europe saw the most significant growth, surpassing Asia towards the end of the year. The growth in Europe and North America can likely be attributed to businesses choosing local sourcing and the effects of China's zero-COVID policy, which led to lockdowns in the country.

FIVE SOLUTIONS FOR STRENGTHENING SUPPLY CHAINS IN 2023

As the complexity of supply chains continues to grow and the number of unforeseeable disruptions increases, it is essential for businesses to develop a risk management strategy to address future disruptions. These strategies can help organizations identify potential risks and vulnerabilities in their supply chain and develop plans to mitigate those risks before they become major problems. Unfortunately, despite facing significant supply chain disruptions in recent years, many organizations remain unprepared for future risks.

Our survey found that approximately 30 percent of respondents had not taken any steps to improve the resilience of their supply chain. This is surprising given that 76.6 percent of surveyed companies experienced disruptions caused by external factors in 2022.



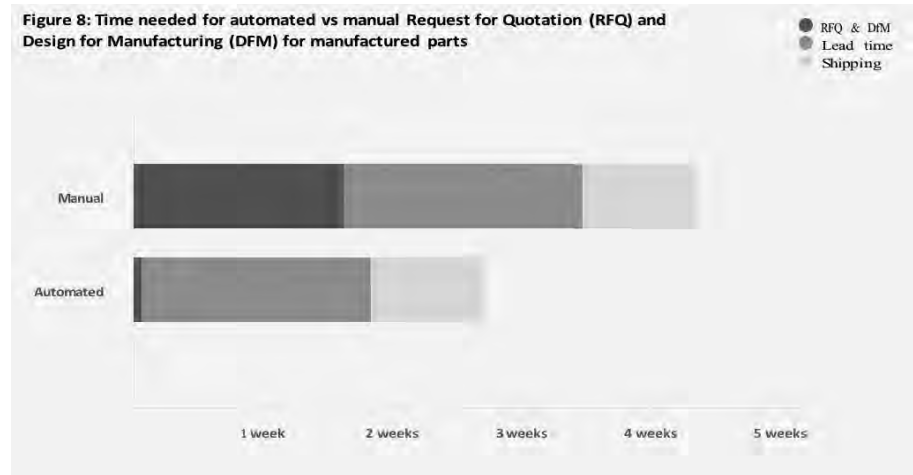
It is clear that more needs to be done to ensure that businesses are able to withstand future supply chain disruptions.

For organizations looking to build a resilient supply chain, this chapter focuses on the key elements necessary for preparing for future disruptions, including Black Swan events:

1. Automation
2. Reserve inventory
3. Geographical diversification
4. Agile internal processes
5. Supply chain monitoring

These solutions were echoed by respondents to our recent survey when they listed measures they thought would be the most effective in reducing future disruptions, shown in figure 7.

1 AUTOMATION Automation can improve supply chains by increasing productivity and efficiency. These processes can mitigate the effects of certain supply chain risks, particularly those related to labor shortages and lockdowns. With robotic process automation, many repetitive manual tasks can be digitized and streamlined, reducing supply chain complexity and reducing reliance on manual labor. In 2021, 78 percent of organizations



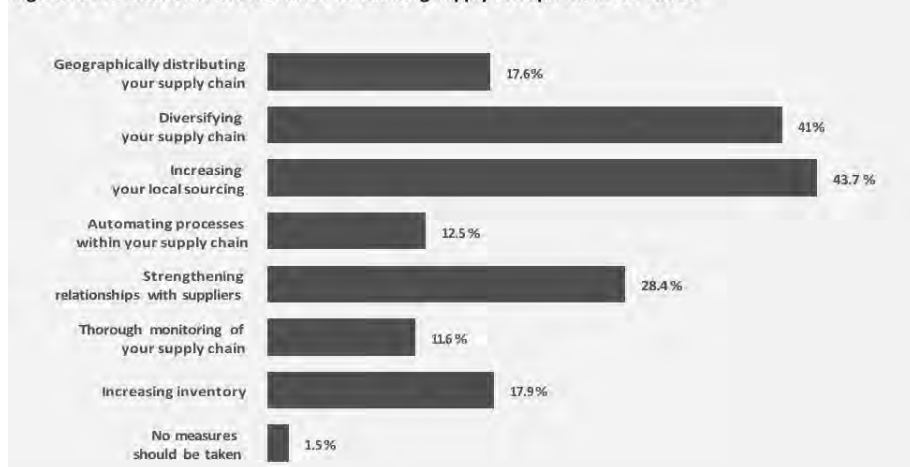
were already using RPA technologies, while only 6 percent had no plans to implement it.

Automation is particularly advantageous for its ability to speed up processes that can slow down supply chains if done manually. RFQ and DFM processes can be automated, providing clients with accurate quotes within seconds, rather than days or even weeks. Instead of using traditional, rules-based quoting, Hubs uses machine learning algorithms to provide instant quotes once a customer uploads a CAD file. The process involves comparing the customer's design to millions of previously manufactured parts. The algorithms use millions of data points collected on part-specific factors such as geometric complexity,

volume, material costs, tolerances, secondary processes, and quality control. This is combined with data points on market-specific factors such as global production capacity and the supply and demand of shipping.

Automation across the supply chain also enables businesses to break down silos and streamline the sharing and access of data between supply chain links. Digital process automation (DPA) creates greater efficiency by integrating various platforms used in the supply chain, effectively bridging processes and creating greater transparency and visibility. This in turn empowers suppliers to monitor processes and identify inventory needs as well as supply chain bottlenecks and weaknesses.

Figure 7: The most effective measures to reducing supply disruptions in the future



2 RESERVE INVENTORY Though it goes against lean manufacturing strategies, building a reserve inventory can improve supply chain resilience substantially. It effectively creates a buffer so that if or when a link in the supply chain fails, there is enough inventory to keep things up and running while the link is reestablished. It is particularly valuable to have reserve inventory for critical parts and parts that could not easily be sourced from alternative suppliers.

A challenge to the broad adoption of reserve inventory strategies has

been cost. However, as AI-driven cost analyses and predictions become more popular, supply chain partners will be able to more accurately predict the probability and cost of supply chain disruptions and weigh those against the costs of reinforcing inventories. In other words, intelligent technologies can make supply chains less reactive and more proactive. Predictive models can also help indicate other changes, such as demand drops or surges, which can help keep production and inventory levels in line with changing consumer trends.

Reserve inventory is an important element in long-term supply chain resilience strategies. Companies that rely on a lean manufacturing approach may benefit from incorporating more risk assessment, predictive models, and inventory buffers into their sourcing strategies.

3

GEOGRAPHICAL DIVERSIFICATION

Diversifying supply chains is essential to building resilience. Many recent events have demonstrated

this: pandemic lockdowns in China brought manufacturing to a standstill at various times between 2020 and 2022; while Europe's over-reliance on Russia for gas is leading to significant energy shortages. In our latest survey, we found that 41 percent of companies believe diversifying their supply chain is the best way to avoid disruptions in the future.

With a strong, distributed network of suppliers or potential suppliers, supply chains can adapt in the face of regional disruptions and changing geopolitics. If one geographic region goes down, suppliers in another can step up and fill the gap.

Enabling the greatest number of qualified manufacturers possible is a critical step to diversifying supply chains. The more complex a product is to make, the more specialized a manufacturer will have to be, which narrows the pool of possible production partners. By simplifying product designs, whether through consolidation or the elimination of complex features, companies will have access to a greater number of potential suppliers. Building

a robust and diverse network of suppliers is a daunting task. However, Hubs' approach to distributed manufacturing simplifies this process by guaranteeing instant access to vetted suppliers.

Hubs expanded its network of local CNC machine shops in the United States and Europe, allowing users to choose whether they want to source parts locally or globally. With its Hubs Local service, customers can order parts from manufacturers within their custom-clearance borders and enjoy lead times as fast as five days. In a survey conducted by Hubs in 2022, 43.7 percent of participants cited local sourcing as the most effective way to tackle supply chain disruptions in the future. This highlights the importance of having a diverse network of local suppliers in addition to global ones.

4

AGILE INTERNAL PROCESSES

Supply chain resilience is not only about adding flexibility externally—internal processes are also paramount. Startups are typically associated with agile processes, with team members working quickly and dynamically to grow business, but big organizations can also benefit from agility.

By encouraging cross-functionality and greater autonomy across teams, internal processes like product development become faster and more flexible. An agile strategy prioritizes collaboration with clients or stakeholders throughout every stage of development as well as continual improvements based on feedback. This ultimately leads to superior product quality, process transparency, and efficiency, as well as lower risk, since the project is being monitored and evaluated at every step.

With an agile methodology, your internal processes will be more flexible and can seamlessly adapt to market changes. For example, 93 percent of businesses reported that their agile business units fared better than non-agile business units during the pandemic.

TRUCK MANUFACTURER AUTOMATES PRODUCTION LINE TO EASE LABOR SHORTAGES

Based in Illinois, the Knapheide Manufacturing Company has been producing commercial vehicles since 1848, starting with wagons and now specializing in a variety of truck bodies and truck beds. Despite country-wide recruitment efforts, the company has struggled to find a suitable number of skilled workers in recent years, particularly welders, to meet its production demand.

In order to overcome this critical labor shortage, the company has invested in robots to further automate its production lines. In 2022, the truck manufacturer initiated a new production line for flatbed truck bodies using robots to feed steel parts into an automated welding process. The process will enable the company to maintain steady, consistent production rates despite labor shortages. Knapheide has also benefited from the integration of digital processes across its business.

Digital design solutions have enabled it to accelerate product development thanks to an agile approach, scale 3D modeling across its products, and facilitate communication and visibility between shop technicians and engineers.

Recognizing the importance of collaboration in agile processes, Hubs introduced Hubs for Teams for its customers. It is a collaborative feature on our quote builder that allows you to work with colleagues to source custom parts. This feature enables engineers and purchasers to share and review order details in a single place, making it easier and faster to order parts. This can help improve the efficiency of your team's workflow and reduce the time it takes to order parts.

5

SUPPLY CHAIN MONITORING

In the manufacturing industry, tier-one suppliers are companies that supply parts or materials directly to the original equipment manufacturer (OEM). Tier-two suppliers are vendors that provide parts or materials to tier-one vendors, and tier-three suppliers are companies that provide parts or materials to tier-two. Generally, most businesses only monitor tier one and tier two suppliers as they are considered the most important. However, that's not ideal because even tier-three suppliers can still play a significant role in the overall supply chain. Delays caused by deeper-tier suppliers can cause disruption throughout your entire supply chain. By closely monitoring

suppliers across all tiers, you'll be able to spot any warning signs well before the consequences of disruption take effect.

However, monitoring your supply chain from the raw materials to the finished product can be a complex and lengthy process. This may explain why this approach was the least popular according to our survey, with only 11.6 percent of respondents selecting thorough monitoring of supply chain as an effective measure to reduce the effects of supply disruptions.

Thankfully, specialized software tools have simplified the supply chain monitoring process. Additionally, companies are exploring emerging technologies such as AI and machine learning for supply chain optimization. While only 13.1 percent of surveyed companies revealed using AI and ML, a resounding 90.9 percent of the users found it to be useful.

- Supply chain mapping to monitor not only tier one and tier two suppliers, but the entire supply chain
- 24/7 supplier monitoring which alerts you to disruptions that may affect your suppliers
- Risk calculation of disruptive events with the potential revenue lost

CONCLUSION

With the ongoing war in Ukraine creating instability in Europe and causing a global energy crisis, as well as an increasing frequency of cyber-attacks and natural disasters, supply chains face a greater degree of risk than ever. It is therefore critical for organizations to transform and upgrade their supply chain processes to minimize vulnerabilities and achieve greater resilience.

Fortunately, there are many tools and strategies for building a resilient supply chain that organizations can use. Automation technologies, diverse supply networks, and moving away from JIT manufacturing models will help establish a robust, future-proof supply chain that can withstand a wide array of disruptions. Resilience is a must for organizations looking to succeed over the long term and adapt to whatever the future brings. ■

Hubs empowers engineers to create revolutionary products by making custom manufacturing more accessible. The company leverages automation to allow fast and affordable access to manufacturing capabilities from all over the world. Hubs started life as the world's largest peer-to-peer network of 3D printing services, but as it grew with its customers it needed to offer a broader range of capabilities to help their businesses succeed. Today hundreds of manufacturers in the Hubs global network and their customers can order parts in a broad range of materials using multiple manufacturing technologies, and with many secondary processes as well. For more information, visit www.hubs.com.

TESLA MITIGATES MICROCHIP SHORTAGES BY REMAINING AGILE

In the face of a global microchip shortage stemming from increased demand and limited supply, automotive company Tesla has been able to mitigate the challenge by remaining agile. The company, whose vehicles are equipped with microchips for various control systems—including its self-driving software—took a two-pronged approach, switching to the use of microcontrollers in some cases and developing special firmware to accommodate the use of microchips from a wider range of suppliers. The ability to remain agile in its own processes and retain much of its automotive design and programming in-house, has significantly reduced the impact of the microchip shortage, which is expected to last for years. Whereas other automotive companies have suffered from significant production delays and even stoppages, Tesla has remained largely on track and is better equipped to deal with any microchip shortages down the line.



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BY TOM DEARING, MARQMETRIX

Chemometrics, the application of statistics to the field of chemical analysis, is often used in the oil and gas industry to make product quality predictions. The data—which is typically derived from process analytical tools such as Raman, near infrared (NIR), gas chromatography (GC), high performance liquid chromatography (HPLC), and others—is critical for oil and gas companies to unlock valuable information about chemical composition, physical properties, and other parameters of oil, gas, and blended fuels.

TURNING DATA INTO DOLLARS

Chemometrics is a way oil and gas companies can turn data into dollars and it is becoming the de facto method for processing analyzer instrument output. The information

can then be used to fast track the delivery of products to the market, reduce processing costs, and maximize value.

It is particularly useful when deployed in conjunction with Raman spectroscopy as it translates the information rich spectra to accurately measure the composition of refined fuel properties of gasoline, jet, and diesel fuels.

Raman spectroscopy can be used to predict the different chemical compounds that make up the sample. It can be used to analyze the API number, research octane number

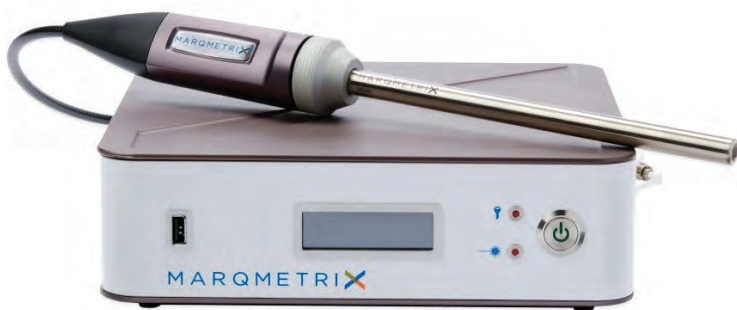
(RON), or motor octane numbers (MON), Reid vapor pressure (RVP), or to predict the concentrations of hydrocarbons, carbon dioxide, or nitrogen.

The challenge is that companies have typically created predictive models using other types of instrumentation, which are validated and approved by their performance committees and that satisfy ASTM standards. As a result, many labs may be reluctant to adopt new instruments due to the prospect of having to rebuild and revalidate their models from scratch.

SIMPLIFYING THE PROCESS

Fortunately, experienced Raman spectroscopy providers are simplifying the process by offering premade starter models that can be readily used for most common measurements in oil and gas. The





models can then be modified and expanded, as needed. This largely eliminates the time and cost required to conduct thirty to fifty reference analysis tests during the development of new models.

MarqMetrix has midstream as well as downstream refinery and third-party testing labs already using these core calibration models including U.S. Oil and Refining Co. (U.S. Oil). By using a model, oil and gas companies can substantially lower their cost by moving straight to the model maintenance phase where they collect just one or two samples to verify and update the model. Once a model is further developed, it can then be shared and deployed to additional analyzers.

MarqMetrix's chemometrics experts also assist in converting existing predictive models used on traditional analytical instruments to simplify an equipment upgrade.

A mathematical transformation allows the customer to continue using their validated models. MarqMetrix essentially collects data on the two separate instruments (the old and the new) and then maps the differences between them to enable the conversion," says Dearing.

STREAMLINING TESTING

Pre-developed models and a simplified conversion process facilitate the widespread use of Raman as a supplement to more expensive, time-consuming tests.

In one promising area of utilization, lab personnel have used Raman spectroscopy to supplement the analysis of octane number when testing gasoline blends. Instead of using the knock-engine to test a dozen samples during the blending process, the lab runs the knock-engine on the final sample. When Raman spectroscopy confirms the specified RON or MON target is reached, the lab will then run the knock-engine test on that final sample to validate the blend to ensure it conforms to ASTM standards. This approach significantly improves the throughput and processing speed within the lab and delivers pertinent operational information in seconds.

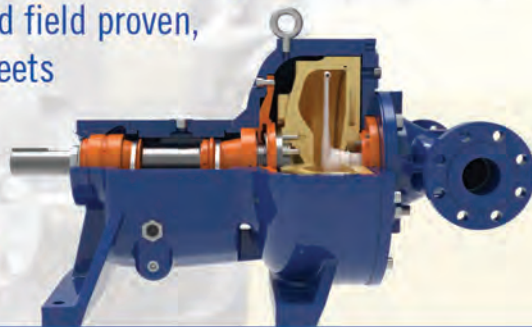
What may normally take two or three hours to process in a lab with traditional physical testing can be done in a fraction of the time with Raman spectroscopy and chemometrics. Raman spectroscopy with the addition of validated models allows labs to achieve faster turnaround,



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higher throughput, and near real-time results for processes they need to monitor, quantify, or blend.

There are many benefits to streamlining testing in the lab. Utilizing Raman with validated modeling and chemometrics, for example, can help processors achieve more accurate octane ratings without over blending.

Right now, oil and gas companies have to "give away" some octane

to make sure that when the actual samples are taken to the lab and analyzed, they are not below strict specifications. If below the target

value, they are required to re-blend to bring the octane up to the specification.

The incremental savings of not having to over-blend by even minor amounts like 0.2 or 0.3 can translate to a significant amount of money long term, not to mention time saved on having to reprocess out of specification fuel.

RAMAN EQUIPMENT

In the past, Raman instruments were less reliable and required models specifically designed for the analyzer. Now, more stable, solid-state systems

allow core models to be applied to achieve reproducible results from unit to unit. For example, in the MarqMetrix All-in-One each device is nearly an exact copy so common mathematical models can be applied across multiple systems to produce consistent results.

The compact All-In-One is designed in a package 80 percent smaller than previous Raman instruments and has no moving parts. The system works with a wide array of both contact and non-contact probes suitable for oil and gas applications that can be changed in seconds without the need for recalibration.

The instrument can be used on any samples (liquid, solid, gas) that require Raman analysis, providing labs with tremendous flexibility in measurement and capability.

As the oil and gas sector increasingly relies on chemometrics and Raman spectroscopy to expedite quality assurance, processing, and distribution, and simplified predictive modeling will play an important role. The combination allows labs to achieve faster turnaround, higher throughput, and real time results for the processes that they are looking to monitor, quantify, or blend. ■



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TOM DEARING is director of chemometrics at Seattle-based MarqMetrix, a company that specializes in compositional analysis using Raman spectroscopy. MarqMetrix works with a number of recognizable global and private sector brands across a multitude of industries that include pharmaceuticals, oil and gas, biotech, and food and beverage. For more information, call 206.971.3625 or visit www.marqmetrix.com.

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PUMP BEYOND BASELOAD AT POWER PLANTS

Sulzer secures flexible thermal power generation with pump retrofits

BY JAN LÜDER, SULZER

The rapid growth of renewable energy in Asia is presenting the grid with a challenge: how to flexibly accommodate changing demands with existing thermal power plants. Assets at these facilities, originally designed to provide baseload, are now being asked to cover any shortfall due to the intermittent nature of renewable energy. This change in operational strategy can adversely affect the efficiency and reliability of equipment such as boiler in-feed pumps.

Operators of these power plants should analyze the changes and

assess how their equipment needs to be adjusted to respond to the increase in renewable energy.

CHANGING REQUIREMENTS OF A SUSTAINABLE FUTURE

Electricity demand in Asia is growing by around 6 percent annually. Renewable energy is at the forefront of this, with the Association of Southeast Asian Nations stating that it wants to source 23 percent of its power from renewables by 2025, up from 9 percent in 2019, according to the International Energy Agency. With this transition, Asia's energy grid is

diversifying. However, the fluctuating electricity output from renewable energy sources means that thermal power plants are still having to cover any shortfalls in the grid.

Smoothing out these fluctuations in renewable energy supply means pushing equipment at thermal power stations beyond their initial design remit: baseload operations. Working at variable loads can damage equipment and cause energy losses.

With renewable energy not entirely dependable for the power requirements of billions across Asia currently, thermal power plants will be part of the energy ecosystem for a long time to come. If these facilities cannot adapt, the road to a sustainable future looks anything but smooth. Luckily for operators, there are proven solutions available.

THE RISKS OF OVERLOOKING PUMPS

Boiler in-feed pumps are a critical element of a thermal power plant, supplying the water that eventually drives the steam turbines. Flexible operation poses risks to existing boiler feed pumps, increasing the probability of wear and energy losses. This equipment can be neglected when adapting facilities for new operations, with plant managers usually prioritizing turbine improvements instead. However, this can be a false economy.

For example, at a thermal power plant meeting fluctuating load,



Sulzer's teams of dedicated, highly experienced field engineers ensure that power plants benefit from expert pump knowledge and services on-site too.



The rapid growth of renewables means existing thermal power plants must become flexible to the new energy landscape.

repeated stops and starts can cause damage to a boiler feed pump's shaft, thrust disk, impellers, and diffusers. Low flow cavitation at the suction impeller and corrosion in high flow velocity areas of the casing are additional risks. If this causes pump downtime, power generation can be adversely affected—a situation operators cannot afford.

As a global pump original equipment manufacturer (OEM) and worldwide independent service provider (ISP) with nearly two centuries of engineering heritage and experience in the power industry—Sulzer is well placed to support power plant in overcoming the challenges of meeting fluctuating loads.

TAILORED SERVICES FOR INDIVIDUAL POWER PLANTS

The first step recommended by Sulzer is a thorough pump energy audit. By assessing pump reliability, maintenance, temperature and vibration data—operators are able to identify the root cause of issues well ahead of any potential failure.

Next, Sulzer can deliver the retrofit services to enhance any pump from any brand, as part of its recently launched OEM-X line service. Even if pumps are nearing

30 years old, solutions are ready to give this equipment a new lease of life, improving efficiency and output power capacity.

Pump re-rates, including de-staging and new hydraulics, help to meet new duty points. Material and design upgrades can enhance durability and reliability in fluctuating load operations. Variable speed systems can deliver quantifiable energy savings. All work is backed by in-house reverse engineering, parts production, precision machining, 3D scanning, and additive manufacturing.

A global network of more than 100 service centers provides responsive local engineering support, along with teams of dedicated, highly experienced field engineers. This ensures that power plants benefit from expert pump knowledge and services on-site too.

SMOOTHING THE ENERGY TRANSITION

Sulzer's dynamic, bespoke pump retrofit service means that the operational needs of any thermal power plant can be met optimally and cost-effectively. By carrying out such a project along with turbine improvements, not only can plant managers efficiently support energy supply fluctuations to safeguard output and profits, but they can also



lower carbon emissions and reduce carbon taxes too.

Continuous investment in Sulzer's pump engineering research and development facilities helps power plants across the globe to become leaders in pump reliability and efficiency. To date, Sulzer has retrofitted hundreds of boiler feed pumps worldwide.

As more renewable energy integrates into the grid systems in Asia, load fluctuations for thermal power plants will continue to become more frequent. By partnering with Sulzer, operators can ensure that their pumps operate efficiently, reliably, and profitably, while adapting to grid changes and contributing to energy security and a more sustainable energy future. 🌞

JAN LÜDER is division president of Flow Equipment for Sulzer. Sulzer is a global leader in fluid engineering, specializing in pumping, agitation, mixing, separation, and application technologies for fluids of all types. Sulzer customers benefit from a commitment to innovation, performance, and quality and from our responsive network of 180 world-class production facilities and service centers across the globe. Sulzer has been headquartered in Winterthur, Switzerland, since 1834. The Flow Equipment division specializes in pumping solutions specifically engineered for the processes of its customers. Sulzer provide pumps, agitators, compressors, grinders, and screens developed through intensive research and development in fluid dynamics and advanced materials and is a market leader in pumping solutions for water, oil and gas, power, chemicals, and most industrial segments. For more information, visit www.sulzer.com.



THE WORLD'S LARGEST UNTAPPED RESOURCE: EXCESS HEAT

American industry is sitting on a potential gold mine
Part 2 of 3

BY ASTRID MOZES, DANFOSS



In the introduction to this series, we identified some of the sources of excess heat, what it is and why it matters, and also presented the case for exploring how capture and utilization of excess heat can accelerate decarbonization of the industrial sector—the source of over one-third of worldwide energy-related carbon emissions. Below, let's dig a little deeper into how excess heat can be found in different parts of the industrial sector, in everything from large wastewater treatment facilities to your local neighborhood supermarket, and begin to address the need for approaching this potential new source of energy.

EXCESS HEAT IN THE INDUSTRIAL SECTOR

The industrial sector accounts for 39 percent of all global energy-related carbon emissions and is—with its current rate of energy efficiency improvements of 1 percent per annum—not on track to meet the milestones of the Net Zero scenario that would require improvements of 3 percent. The structural challenge for factories all over the world is to meet growing demands for production while curbing emissions. The current energy crisis has placed the industrial sector under a great amount of pressure, since the share of energy costs for production has increased significantly.

Paradoxically, efficiency progress is slowing in the industrial sector. From 2015 to 2020, the rate of improvement in the energy needed to produce one U.S. dollar of industrial value dropped from the almost 2 percent per year achieved over 2010 through 2015 to just under 1 percent. The industrial sector needs to improve its energy efficiency at a rate of 3 percent annually to meet net zero. The overall progress in energy efficiency will continue to be stymied if strong industrial demand for energy persists without a major improvement in industrial energy efficiency.

The good news is that there is a huge, unharnessed potential for the industrial sector, namely utilizing

its excess heat. If we look at the European Union, industrial sites constitute the largest source of excess heat. The excess heat from heavy industrial sites in the European Union amounts to over 267 TWh a year. To put that into perspective, this is more than the combined heat generation of Germany, Poland and Sweden in 2021. If we look only at waste heat sources over 203 degrees Fahrenheit (95 degrees Celsius) and within 6 miles of existing district heating infrastructure, there is a potential of 64 TWh already. This corresponds to 12 percent of the energy supplied to European Union district heat infrastructure annually.

URBANIZATION AND EXCESS HEAT

The potential is also striking when looking at specific urban areas. Take Essen in the Ruhr district in Germany. There are approximately fifty industrial sites in the urban areas around Essen, and they

produce 11.98 TWh of excess heat per year. This is roughly the amount of heat required to heat 1,200,000 households—or close to half of the households in the area.

Three industries—cement, chemicals, and steel—account for almost 60 percent of industrial energy demand worldwide, with emerging and developing economies, in particular China, accountable for 70 to 90 percent of the output of these commodities. These heavy industries offer great potential in terms of efficiency since the excess heat from them is at such high temperatures and therefore easy to reuse.

The industrial sector, which is currently not on track to meet the milestones in the Net Zero Emissions by 2050 Scenario, has the ability to shift the needle on global energy efficiency by reusing excess heat. However, there are multiple ways for the industry to reuse excess heat, for instance, it can be reused to supply a factory with heat and warm water,

or it can be exported to neighboring homes and industries through a district energy system.

THE SOURCES OF EXCESS HEAT IN URBAN AREAS

Historically, excess heat from the likes of steel and power plants has been reused due to the very high temperatures. But as technology has evolved, many more sources that produce excess heat at lower temperatures have become viable to reuse, as we will see in the next chapter. While industrial sites are the largest source of excess heat, large cities without industry also have numerous sources of excess heat that add up to a considerable amount of energy.

Take data centers, for example. Data has become the lifeblood of today's global digital economy, forming the backbone of the flow of information in cities and powering a range of activities from infrastructure and transport to retail

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and manufacturing. Data centers are also heavy consumers of electricity. In 2020, data centers in the European Union and United Kingdom consumed 100 TWh of electricity or around 3.5 percent of the region's final electricity demand. According to the IEA, data centers and data transmission networks account for nearly 1 percent of all energy related greenhouse gas emissions worldwide. Conservative estimates from 2020 counted 1,269 data centers across the European Union and United Kingdom, for a total of 95 TWh of accessible excess heat yearly.

The same goes for supermarkets. Supermarkets are an integral part of communities around the world. They are also big energy consumers. On average, supermarkets consume approximately 3 to 4 percent of the annual electricity production in industrialized countries. In the European Union, there is an excess heat potential from food retail of a total of 44 TWh a year. Although this is significantly lower than the excess heat from industrial sites,

this equates to the heat generated by Czech Republic and Belgium in 2021. Adding to this, excess heat from supermarkets can be tapped into very easily and reused in the supermarkets themselves in order to heat the space or to provide warm water. All that's required is supermarket owners deploying existing, proven technologies. As the supermarket case shows, this can even contribute to significant energy bill savings—even more crucial in the current energy crisis.

Wastewater treatment plants are yet another considerable source of excess heat, with a potential over the whole European Union of 318 TWh of accessible waste heat annually. Even though these sources of excess heat are not as large as the excess heat from industrial sites, together they can cover a considerable amount of energy consumption in urban areas.

For example, let's look at Greater London. The area has 648 eligible excess heat sources including data centers, subway stations, supermarkets, wastewater treatment

plants, and food production facilities. The excess heat from these sources adds up to 9.5 TWh per year, roughly the amount of heat required to heat 790,000 households. The top three sites alone could provide 4.8 TWh of heat yearly.

CASE STUDY 1: REUSE OF EXCESS HEAT IN SUPERMARKETS

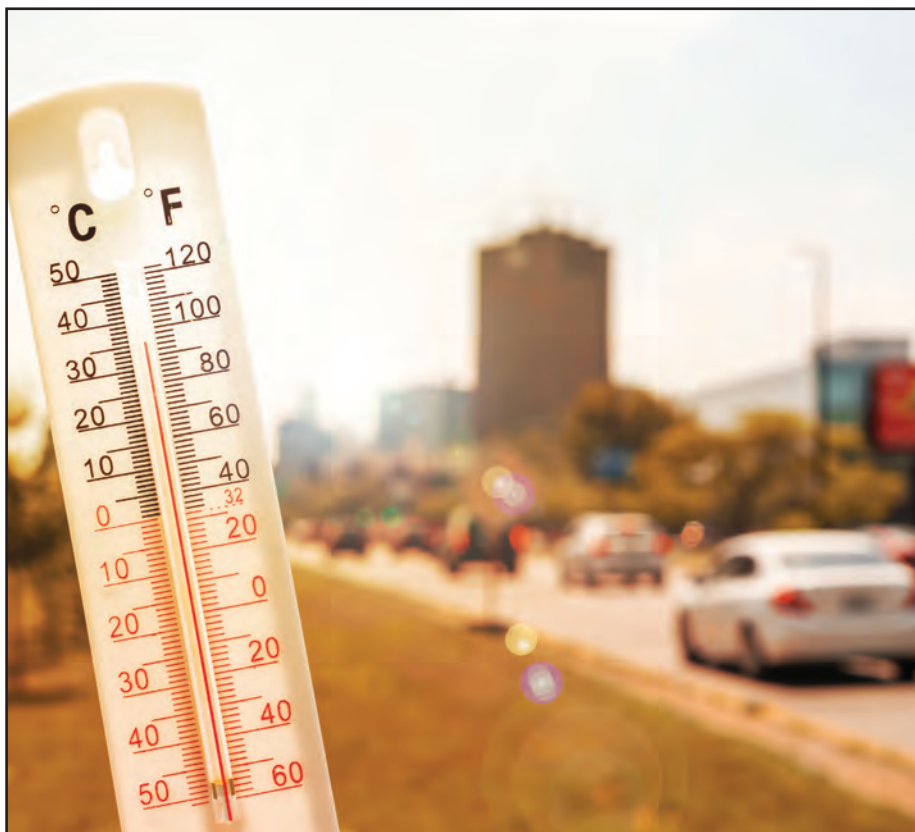
Keeping food fresh in cooling displays and freezers accounts for most of a supermarket's energy consumption. It might sound counterintuitive, but cooling displays, freezers and fridges produce a significant amount of heat. Anyone who has ever felt the warmth behind their fridge can confirm that. These cooling systems generate significant amounts of excess heat, which is often released directly into the atmosphere and wasted.

In a small town in Southern Denmark, the local supermarket SuperBrugsen has saved a considerable amount of energy by reusing and selling excess heat from the cooling systems.

Since 2019, 78 percent of SuperBrugsen's heat consumption has been covered by reused heat from cooling processes. And the supermarket has sold 133.7 MWh to other local buildings through the district heating grid.

Three interlinked initiatives have driven the results:

- First, the supermarket has converted from chemical refrigerants to a natural refrigerant, namely carbon dioxide, which has very good heat recovery properties.
- Second, a heat recovery unit is installed at SuperBrugsen, and it is designed to recover the waste heat from carbon dioxide refrigeration systems. The recovered heat is reused to heat up the store and produce domestic hot water.
- Third, SuperBrugsen runs energy efficiency programs to ensure



long-term efficiency. Cooling systems are monitored, technical parameters are adjusted and regular service has improved energy efficiency and lowered energy consumption even more.

CASE STUDY 2: THE POTENTIAL OF EXCESS HEAT FROM DATA CENTERS

Data has become the lifeblood of today's global digital economy, forming the backbone of the flow of information and powering a range of activities from infrastructure and transport to retail and manufacturing. According to IEA, in 2021 data centers consumed 220-320 TWh of electricity or around 0.9 to 1.3 percent of global final electricity demand—this is more than the electricity consumption of some countries.

Data centers are also significant producers of excess heat. The servers within a data center generate heat equivalent to their electricity use, and the necessary cooling of these machines also produces a great deal of excess heat. Compared with other sources of excess heat, the flow of excess heat from data centers is uninterrupted and therefore constitutes a very reliant source of clean energy. There are multiple examples that the excess heat from data centers can be reused to heat nearby buildings through a microgrid or it can be exported to the district energy network and used for multiple purposes.

In the city of Frankfurt am Main, there are several projects in the pipeline working towards assisting the city in taking excess heat from data centers and using it towards its entire heat demand of private households and offices. Mathematically, it has been estimated that the waste heat from the data centers in Frankfurt could, by the year 2030, cover the city's entire heat demand stemming from private households and office buildings.

In Dublin, Amazon Web Services has built Ireland's first, custom-built sustainable solution to provide low-

carbon heat to a growing Dublin suburb. The recently completed data center will provide heat for initially 505,000 square feet of public sector buildings. It will also provide heat for 32,000 square feet of commercial space and 135 affordable rental apartments.

In Norway, a data center has been co-located with the world's first land-based lobster farm. The co-location company uses a fjord cooling solution to cool its data center, with seawater entering the facility at 46 degrees Fahrenheit (8 degrees Celsius) and then being released back into the fjord at 68 degrees Fahrenheit (20 degrees Celsius). This so happens to be the right temperature for the optimal growth of a lobster. So, moving forward, a new production facility will be built in close proximity to the data center, allowing it to use the heated seawater for the breeding of lobsters.

CASE STUDY 3: WASTEWATER FACILITIES AS ENERGY PRODUCERS

According to the IEA, the global water sector uses roughly 120 million tons of oil equivalent per year, nearly equivalent to Australia's total energy use. Without action, global water-related energy consumption will increase by 50 percent by 2030. There is significant potential for energy savings in the water sector if all economically available energy efficiency potentials are exploited—not least when it comes to utilizing excess energy.

Wastewater contains significant amounts of embedded energy. Sludge can be extracted from wastewater and pumped into digesters. These produce biogas—mostly methane—that can then be burned to make heat and electricity. Consequently, wastewater treatment plants have the potential to be turned from energy consumers to energy producers.

In Aarhus, Denmark, the Marselisborg Wastewater Treatment Plant (WWTP) produces far more energy than it needs for treating

wastewater for the 200,000 people it services. In fact, Marselisborg WWTP produces so much energy that it can cover the energy needed for the demand for drinking water as well. Marselisborg WWTP offers a pathway to an energy-neutral water sector and shows how to decouple energy from water. The Marselisborg WWTP produces enough energy to cover the entire water cycle of a city area of 200,000 people—all with an estimated return on investment of 4.8 years. Furthermore, excess heat from wastewater treatment plants can heat buildings and industries through district energy systems.

A LOOK AHEAD

Recycling heat is not only an overlooked measure in the current energy crisis, but also the next frontier of the green transition. In the final installment of this series, we'll present policy recommendations for capturing excess heat that bridge into that exciting frontier. ■

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PUSHING THE BOUNDARIES OF VALVE POSITION INDICATION

New ThinkTop V20 is ready for Industry 4.0

BY EBBE BUNDESEN, ALFA LAVAL

Process industries demand reliability and accuracy at every step, which makes it the perfect proving ground for the newest integrated technologies associated with Industry 4.0. With automation, digitalization, and real-time communication, the ThinkTop V20 raises the bar on process control, making it more reliable and accurate while saving time and money on installation, commissioning, operation, and maintenance. Moving

valve position monitoring into the Industry 4.0 era delivers competitive advantage., and the new Alfa Laval ThinkTop V20, the next generation of hygienic valve indication units, is driving digital transformation within the process industries

The ThinkTop V20 is the first pure valve-sensing unit that is maintenance-free and does not require manual adjustment or programming. It enables 360-degree LED visual status indication from all

directions. It also provides convenient control-room monitoring of the real-time status of Alfa Laval hygienic valves used across the dairy, food, beverage, home and personal care, biotechnology, pharmaceutical, and many other industries.

MORE RELIABLE PROCESS CONTROL

Purpose-designed to digitalize essential on-off valve monitoring, the ThinkTop V20 sensing unit provides a



pragmatic approach to enhancing the reliability of valve status and position. This new addition to the advanced Alfa Laval ThinkTop V-series paves the way to a higher level of process control for manufacturers who rely on visual and signal feedback of the open or closed valve positions.

The intuitive ThinkTop V20 is a faster, more intelligent valve indication unit than what is available today. It brings reliable process control to a higher level with fast, accurate, intuitive live setup, the convenience of real-time valve position monitoring, and access to real-time and historical data from the control room. Overall, it is an invaluable time- and money-saver considering the efficiency demand factories are facing.

40 PERCENT FASTER SETUP THAN CONVENTIONAL VALVE INDICATION UNITS

A few seconds is all it takes to commission the ThinkTop V20 by simply installing, activating, and deactivating the unit. Live setup is fast and intuitive. Sensors automatically recognize the valve type and size, calibrate and record valve opening and closing distances, and complete setup without requiring manual interaction. Moreover, replacing, or hot swapping the valve top is easy without disrupting production. No expertise, training, adapters, or special tools are required. Anyone can correctly install a new ThinkTop V20 or replace an older valve indication unit while safeguarding hygiene, productivity, and uptime while saving time and money.

ADVANCED AESTHETIC DESIGN AND COMMUNICATION PROTOCOLS

Part of the proven ThinkTop V-series family, the ThinkTop V20 shares the same look, maintenance-free housing and enhanced 360-degree LED visual status indication as the best-selling ThinkTop V-series control tops. Its compact, robust

design makes it suitable for tight installations. Manufacturers select the communication protocol—digital, AS-Interface, or IO-Link—that best suits their processing needs. The V20 is hermetically sealed to ensure reliable readings of the valve position and prevent the risk of water, dust, and other unauthorized access into the unit. Using the point-to-point IO-Link communication protocol allows the connection of sensors to automation systems. IO-Link also makes access to meaningful real-time data easier, improving diagnostics and simplifying configurability and control while supporting Industry 4.0.

MORE FOCUS ON CORE BUSINESS WITH DIGITALIZED VALVE STATUS

The real-time visibility and remote monitoring capabilities of the ThinkTop V20 unit will provide a competitive advantage to those who rely on hygienic valve status data.

The V20 stretches beyond what manufacturers thought possible from conventional valve position indicators through faster setup time and more reliable process control. ■

EBBE BUNDESEN is portfolio manager of sensing and control for Alfa Laval. Alfa Laval is active in the areas of Energy, Marine, and Food and Water, offering its expertise, products, and service to a wide range of industries in some 100 countries. The company is committed to optimizing processes, creating responsible growth, and driving progress—always going the extra mile to support customers in achieving their business goals and sustainability targets. For more information, visit www.alfalaval.com.



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Mid-range lobe pumps are traditionally selected as an economic solution for less demanding applications, but they don't have the same performance benefits of a Sine pump. With the introduction of the Certa Compact a customer can enjoy the superior performance of Sine

technology such as gentle handling and powerful suction but with a competitive format that represents the best all round choice for a wide range of applications. Additionally, Certa Sine pumps typically require up to 50 percent less power than conventional pumps used in viscous fluid handling resulting in energy savings for the end user.

Selecting the best pump technology begins with an analysis of the entire process system including required flow rate and pressure, piping, and fluid viscosity. As system and pump experts, WMFTS partners with customers and supports them through the design process. ■

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The En Core Sampler collects, stores, and delivers soil samples within a single, easy-to-use device. This disposable volumetric sampling device was developed to empower field personnel to take soil samples with minimal handling and maximum accuracy. This one-use, self-contained, inert composite polymer sampling cassette is ideal for airtight sample collection and sealing. The airtight sealing cap prevents the loss of volatiles as the sampler becomes its own self-contained package. This allows the sampler to meet the EPA's SW-846 Method 5025. For more information, visit www.qedenv.com.



OPW ENGINEERED SYSTEMS

STOP-LOK MULTI-APPLICATION COUPLER

The newly introduced Stop-Lok multi-application coupler has been designed for use in connecting piping and hoses that are used in higher heat and pressure fluid-handling applications—with no tools required to complete the connection. The Stop-Lok is suitable for loading and unloading fluids in chemical, water, steam, hydrocarbon, and heating-and-cooling applications with pressures up to 400 psi (27.6 bar). Ease of use is found in the Stop-Lok's scalloped connection sleeve that allows for a hand-tight, tool-free connection that cannot be over-tightened. For more information, visit www.opw-es.com.

TRANSFORMING SMART MANUFACTURING AND ENGINEERING

German-based Weidmüller commits to “Made in the U.S.A.”



Weidmüller USA, a provider of smart industrial connectivity products and solutions, recently broke ground on a new engineering, production, and warehouse facility at its current Southlake location in Chesterfield County near its Richmond, Virginia, headquarters. The \$16.4 million expansion will create more than 100 new jobs for the area, allowing the company to engineer and manufacture products closer to domestic customers as part of its “Made in the U.S.A.” initiative. Below, Bernd Schröder, president of Weidmüller USA, shares his thoughts on what the new facility means for his company.

MPT: *How does this new facility connect with Weidmüller’s larger goals?*

BERND SCHRÖDER: Innovative electrical connectivity and software-driven automation continue to transform industrial production and smart manufacturing across the United States, including new clean energy industries that rely on increasingly sophisticated products and solutions. Drawing on more than 170 years in manufacturing, electrical connectivity, and first-to-market innovation solutions like SNAP IN and u-remote, Weidmüller is positioned to be a leading supplier for Industry 4.0 and the future of engineering and manufacturing, right here in the United States.

MPT: *What features will be brought to the facility itself to reflect these goals?*

BERND SCHRÖDER: The new building features solar panels generating 392,000 Kwh annually, high efficiency HVAC, recycled materials, and EV charging units (AC Smart). Further green technology aspects include that the building structure utilizes recycled materials, and prefabricated

roof panels offer reduced construction costs and increased energy efficiency.

For the facility’s high efficiency HVAC equipment, fresh air is supplied vertically, down to the employee level to improve comfort and health. Fumes, heat, and odor are exhausted from the molding machines to increase employee comfort and reduce cooling costs. The average cooling efficiency of the HVAC equipment serving the addition is a 27 percent improvement over the energy code.

Also, we plan to install 360 solar panels and are researching possibilities to add additional panels to existing structure (providing 20 percent of energy demand for ten machines). We will have EV Charger (AC Smart) and loading stations—our own Richmond-produced eMobility units!

MPT: *What timeline do you see for this project’s completion?*

BERND SCHRÖDER: Construction begins summer 2023, and is estimated to be done by May 2024. Production will start in Q3 2024. Products being made first include terminal blocks with other products to follow. Richmond, Virginia, was selected for expansion due to excellent universities, very good infrastructure with highways, the airport, and seaports. Furthermore, it is a good location for local sourcing with a lot of technology partners.

Weidmüller is known as a pioneer of smart industrial connectivity and this pioneering spirit continues to blossom in Richmond. We look forward to manufacturing automation solutions with local engineering and production talent and together, shape the way to digitalization. ■



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

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