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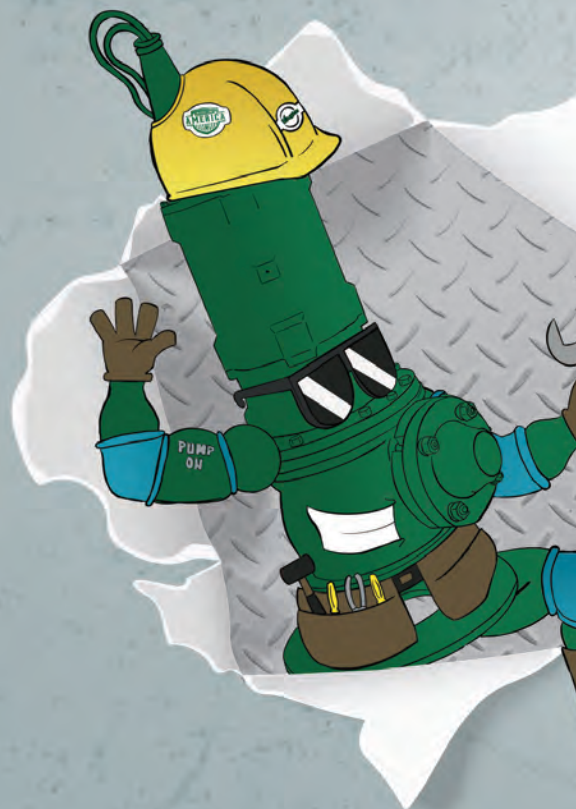
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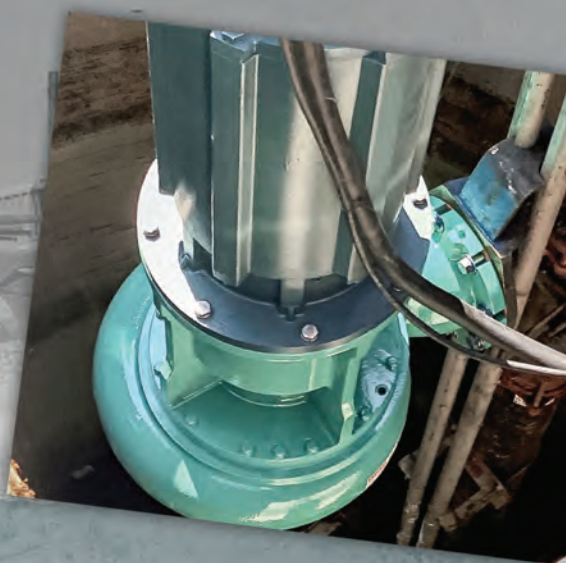
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## A NOTE ON THIS ISSUE:

Welcome to the September issue of MPT! In our Case Studies section, Soren Rasmussen of Landia illustrates two success stories of their vaunted JetMix, one of the company's many simple, yet highly effective mixing solutions (pg. 20). As you'll see, even when the mix gets tough, the JetMix powers through.

In our Pump Solutions section, a trio of experts from Sulzer weigh in on "Breathing New Life into Older Pumps" (pg. 32). As most pump owners know too well, even the most reliable equipment will one day reach the end of its service life. However, with the right know-how and wise investment, the end of the road for many pumps can be pushed a little farther back. Find out how.

Lastly, don't forget to check out our special section (pg. 13) featuring MPT's choices for must-see exhibitors at this year's WEFTEC. From long-established international brands to the newest kids on the block, each of these companies are worth working into your schedule at the show. See you there!



**J. Campbell, Editor**  
*Modern Pumping Today*

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[WWW.MPTMAG.COM](http://WWW.MPTMAG.COM)

3100 Lorna Rd., Ste 101  
Birmingham, AL 35216

**J. CAMPBELL** Editor

[jay@mptmag.com](mailto:jay@mptmag.com)

**TONYA BROWNING** Vice President

[tonya@mptmag.com](mailto:tonya@mptmag.com)

**JEFF FLETCHER** National Sales Manager

[jeff@mptmag.com](mailto:jeff@mptmag.com)

**LISA AVERY** Art Director

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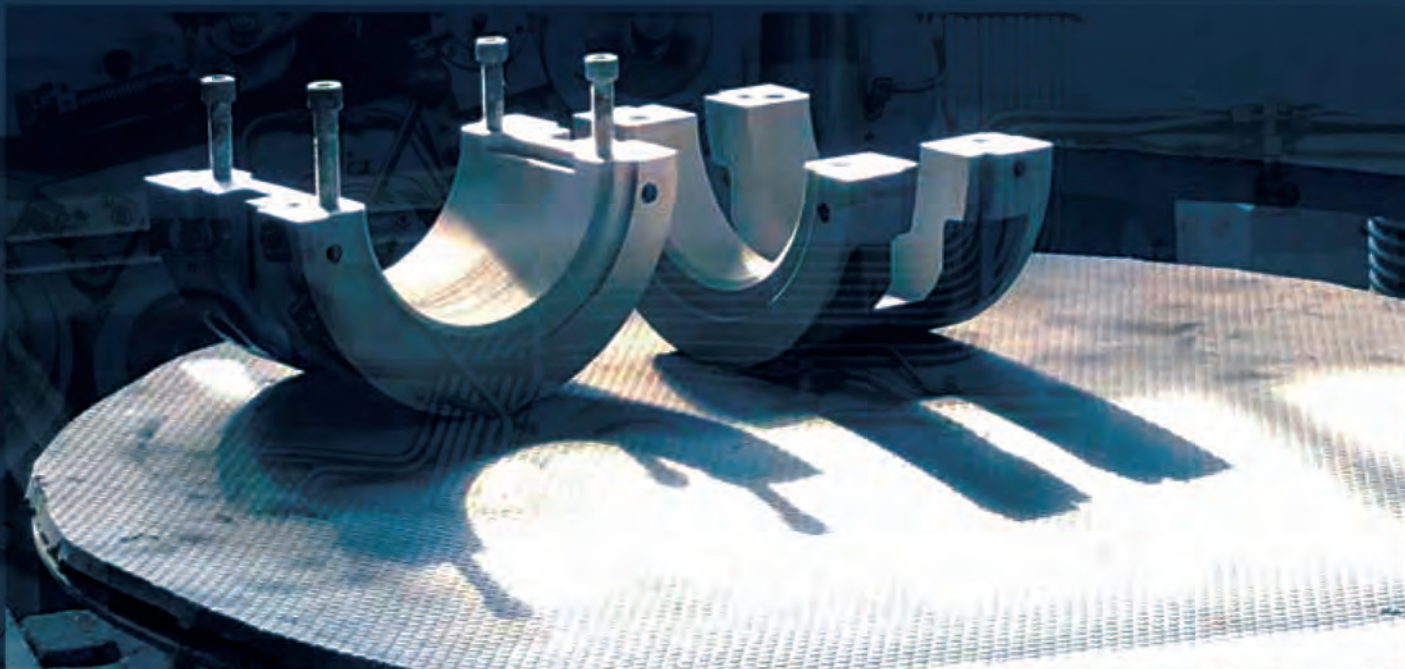


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## TEXAS-BASED SIMFLO EXPANDS OPERATIONS IN MISSISSIPPI, MEMPHIS

Simflo will soon open its third U.S. location in Southaven, Mississippi, part of the greater Memphis region. The company, which has been headquartered in Lubbock, Texas, since 1951, also operates a facility in Willcox, Arizona, and recently completed construction of a new state-of-the-art 35,000-square-foot Engineered Products Facility in Lubbock, which is one of the largest and most advanced vertical turbine pump test facility in North America.

Renovations will soon commence on Simflo's 40,500-square-foot Southaven facility, which is located on 3.5 acres at 8500 Aaron Drive. Located just eight miles from Memphis International Airport and 14 miles from the International Port of Memphis, its central U.S. location and proximity to major shipping hubs allows Simflo to better serve its growing customer base in the eastern and southern United States.

Included in the project scope is a complete interior remodel to modernize the office space, with all-new flooring, windows, ceilings, and LED lighting. Simflo is also making significant upgrades to its warehouse, which will include bridge cranes, expanded exterior doors, and new concrete and exterior storage adjacent to the facility for easy commercial vehicle loading and unloading.

## ACEEE REPORTS ENERGY EFFICIENCY EFFORTS STAGNATING

Energy savings from electric utilities' efficiency programs for customers have stagnated in recent years, according to the Utility Energy Efficiency Scorecard released today by the American Council for an Energy-Efficient Economy (ACEEE). The Scorecard evaluates fifty-three of the largest U.S. electric utilities on their incentive and other programs for energy-saving improvements and finds that energy savings dropped 5.4 percent between 2018 and 2021.

Utility programs are the primary drivers of energy savings in most states, and leading utilities can serve as models. Eversource Massachusetts topped the Scorecard for the third consecutive time. Rounding out the top five utilities are Pacific Gas & Electric in California (#2), National Grid Massachusetts (#3), Commonwealth Edison in Illinois (#4), and DTE in Michigan (#5). Overall, the report finds a wide range of performance, but only fifteen of the utilities earn at least half of the Scorecard's points.

"Amid ever-higher temperatures and increasingly common extreme weather, most utilities, regulators, and state policymakers should do a lot more to help reduce energy waste," says Mike Specian, utilities manager at ACEEE and lead author of the Scorecard. "Now is the time for bold action by all utilities and states to scale up energy efficiency efforts rapidly."

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## GE VERNOVA ADDS TO LEADERSHIP TEAM

Ken Parks will join GE Vernova as chief financial officer (CFO), effective October 2, 2023 and Vic Abate, who currently leads GE Vernova's Onshore Wind business, will expand his responsibilities effective immediately to lead the full Wind segment across GE Vernova, which also includes Offshore Wind and LM Wind Power businesses.

"It's a pleasure to welcome Ken to the GE Vernova leadership team as our chief financial officer," says Scott Strazik, CEO of GE Vernova. "He brings unique and valuable experience gained over a nearly forty-year career in finance. His proven and extensive track record in helping public companies transform and thrive will be a major asset to GE Vernova as we move towards our planned spin-off and continue to work alongside our customers to accelerate the energy transition."

"I'm very pleased that Vic will expand his role at GE Vernova and lead across our critically important Wind segment, where we are working to accelerate business improvement and drive the energy transition forward," continues Strazik. "Vic and I have worked closely together for nearly a decade across GE, and I've seen his ability to successfully impact business transformation from multiple vantage points. We are fortunate that GE Vernova will continue to benefit from his demonstrated leadership and operational focus."

## WORLDWIDE CENTRIFUGAL PUMP MARKET EXPECTED TO REACH \$51.5 BILLION

Centrifugal pump market size is expected to reach \$51.5 billion by 2028, at a CAGR of 5.4 percent during the forecasted period, as per the recent study by the research firm MarketsandMarkets. The requirement for desalination and water treatment has also contributed to the growth opportunities for centrifugal pump manufacturers. Desalination plants rely on centrifugal pumps for seawater intake, brine circulation, and product water transfer. As water scarcity becomes a pressing issue in many regions, the demand for desalination and water treatment solutions is rising, thereby driving the demand for centrifugal pumps in industrial sector.

Based on type, the market has been categorized into overhung impeller, between bearing, and vertically suspended. The market is dominated by overhung impeller type of centrifugal pumps. One common application of overhung impeller centrifugal pumps is in water supply systems for residential and commercial settings. Their compact design makes them a preferred choice in these environments where space is limited. As a result, the overhung impeller segment is projected to dominate the centrifugal pump market during the forecast period, driven by their increased usage in industrial and commercial applications.

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## SMOLTEK PATENTS ITS FIRST GREEN HYDROGEN TECHNOLOGY

Smoltek Nanotech Holding AB announces that a new patent has been granted, which brings the company's IP portfolio to comprise eighty granted patents. This granted patent is the first of a new patent family, called "Electro Catalyst Support," which is targeted towards the production of green hydrogen.

Smoltek protects the company's innovative technology platform through an extensive and growing patent portfolio consisting of around 110 patent assets. The latest patent is the first of a new patent family, called "Electro Catalyst Support", and regards how to use Smoltek's core technology in electrochemical cells. In this case, how the group company Smoltek Hydrogen can use the technology to radically decrease the amount of iridium catalyst load in PEM water electrolyzer cells as well as increase the output per area of the cell.

"With this new patent family, Smoltek expands its IP portfolio to include the field of green hydrogen production. This is a breakthrough for us as we now can be a key supplier of technical solutions that enable the hydrogen industry to scale up the production of PEM electrolyzers," says Fabian Wenger, head of R&D at Smoltek Hydrogen.

## BUILDING ENCLOSURE PERFORMANCE EXPERT RETURNS TO SGH

Simpson Gumpertz & Heger (SGH) is pleased to welcome Alex Kosis back to the firm as an associate principal, bolstering its expertise in building enclosure engineering consulting and sustainable building practices.

He joins SGH's Building Technology group from Denver, Colorado, partnering closely with SGH colleagues in the San Francisco Bay Area; Chicago, Illinois; and throughout the United States. Kosis brings more than fifteen years of experience in the industry, specializing in roofing and waterproofing system design and repair, and thermal analysis for optimal building performance.

"Alex has been a tremendously positive presence at SGH ever since joining us straight out of school. It is gratifying to see our homegrown talent progress from intern to partner and turn into leaders and client-focused problem solvers along the way," says Niklas Vigener, SGH chief technical officer. "We are thrilled to have him back with SGH and look forward to seeing how his professional dedication and personal enthusiasm will create new opportunities for our clients and project partners in Colorado and the Mountain Region. SGH is open for business in Denver!" ■



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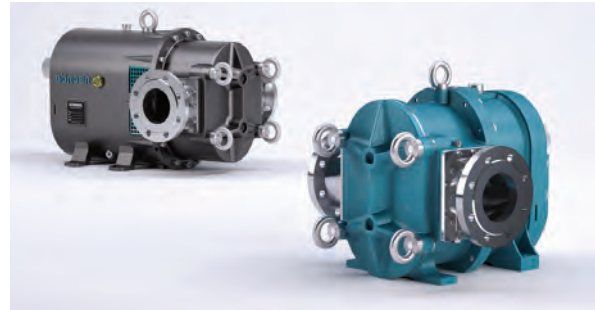
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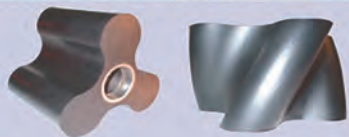


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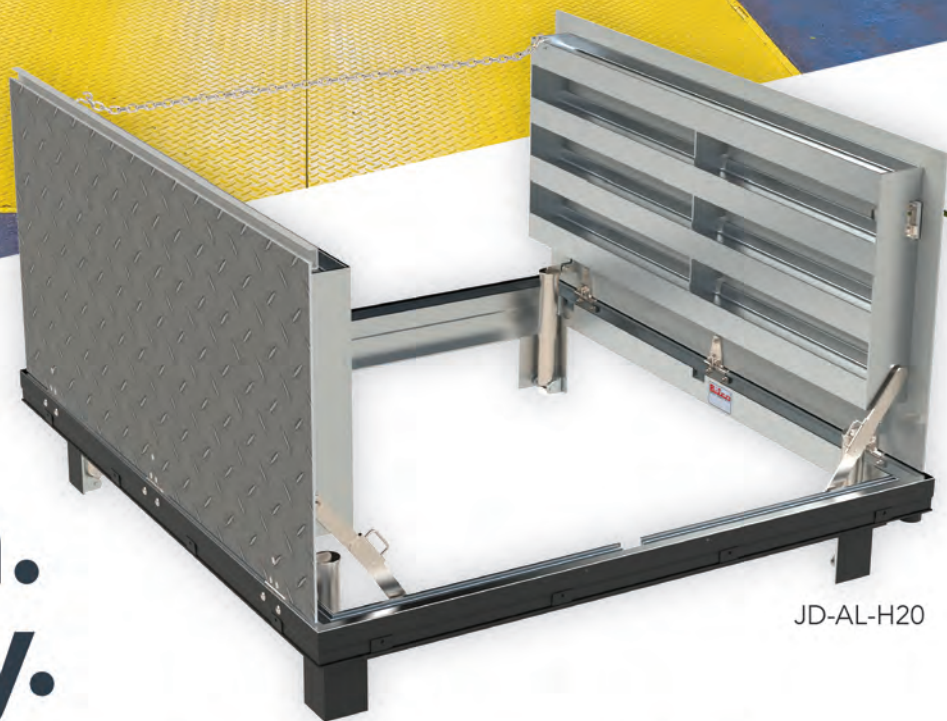
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# MAKING IT LOOK EASY

## *Landia JetMix covers sludge tanks from north and south*

BY SOREN RASMUSSEN, LANDIA

*JetMix offers the benefits of low energy usage and total cost of ownership plus long-lasting, reliable service.*



Landia has seen a marked increase in demand for its wastewater JetMix system, with new orders received from two of the United Kingdom's largest water companies.

The first, in the north, sees seven Landia JetMix units going into operation in sludge tanks, while in the south, a further nine mixing systems have also been specified.

### SIMPLE AND EFFECTIVE

One of the many simple, yet highly effective mixing solutions from Landia, JetMix incorporates the first and original Chopper Pump (invented by Landia in 1950), fitted with jetting nozzles specially configured for each tank.

Similar to Landia's proven AirJet aeration system, which continuously reduces the particle sizes of solids, and reduces odors, JetMix is externally-mounted for easy servicing.

Howard Burton, technical sales engineer at Landia, comments, "We were approached by a leading water

company who expressed interest in Landia's technology, and after many meetings and a raft of CFD modelling, they began their rolling program of

upgrades, appointing Framework contractors to handle each project. Around the same time, the other water company was embarking on a



*Similar to Landia's proven AirJet aeration system, JetMix is externally-mounted for easy servicing.*



major upgrade of one site, and they too chose Landia JetMix."

### MIXING MADE EASY

Previously, at Glatfelter, the leading global supplier of engineered materials, Landia's JetMix replaced a very troublesome mixing system for an open-topped 264,000-gallon above-ground (23-foot) glass-lined steel tank used for pH correction.

The mixer that was replaced was extremely cumbersome to retrieve, causing health and safety issues and significantly costly downtime due to numerous breakdowns. Now, the retrofitted Landia JetMix ensures that there is no build-up of crust in the centre of the tank, which regularly used to clog up the old pump.

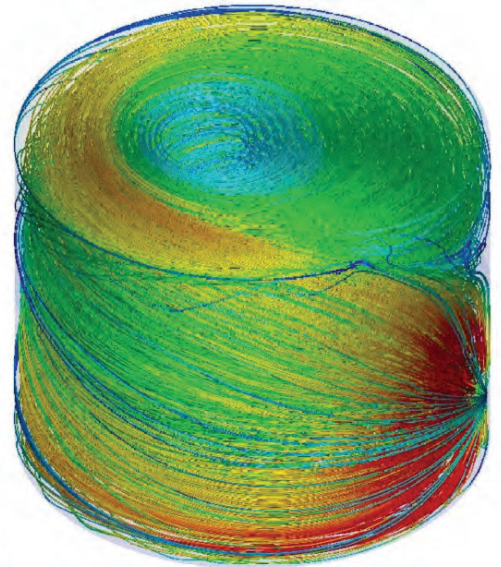
Following the success of the first JetMix system, Glatfelter invested in a further four Landia units, two for a 396,000 gallon vessel, one for a 132,000 gallon tank, and one for a below-ground 39,625 gallon pit, solving significant crusting issues.

### BUILT TO LAST

Landia sees the JetMix system as an integral part of building a sustainable water and wastewater infrastructure.

"It is very encouraging to see that water companies are embracing the benefits of low energy usage and total cost of ownership from a product that will give long-lasting, reliable service," concludes Burton. ■

*The CFD model visualizes the effectiveness of the JetMix inside the tank.*



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

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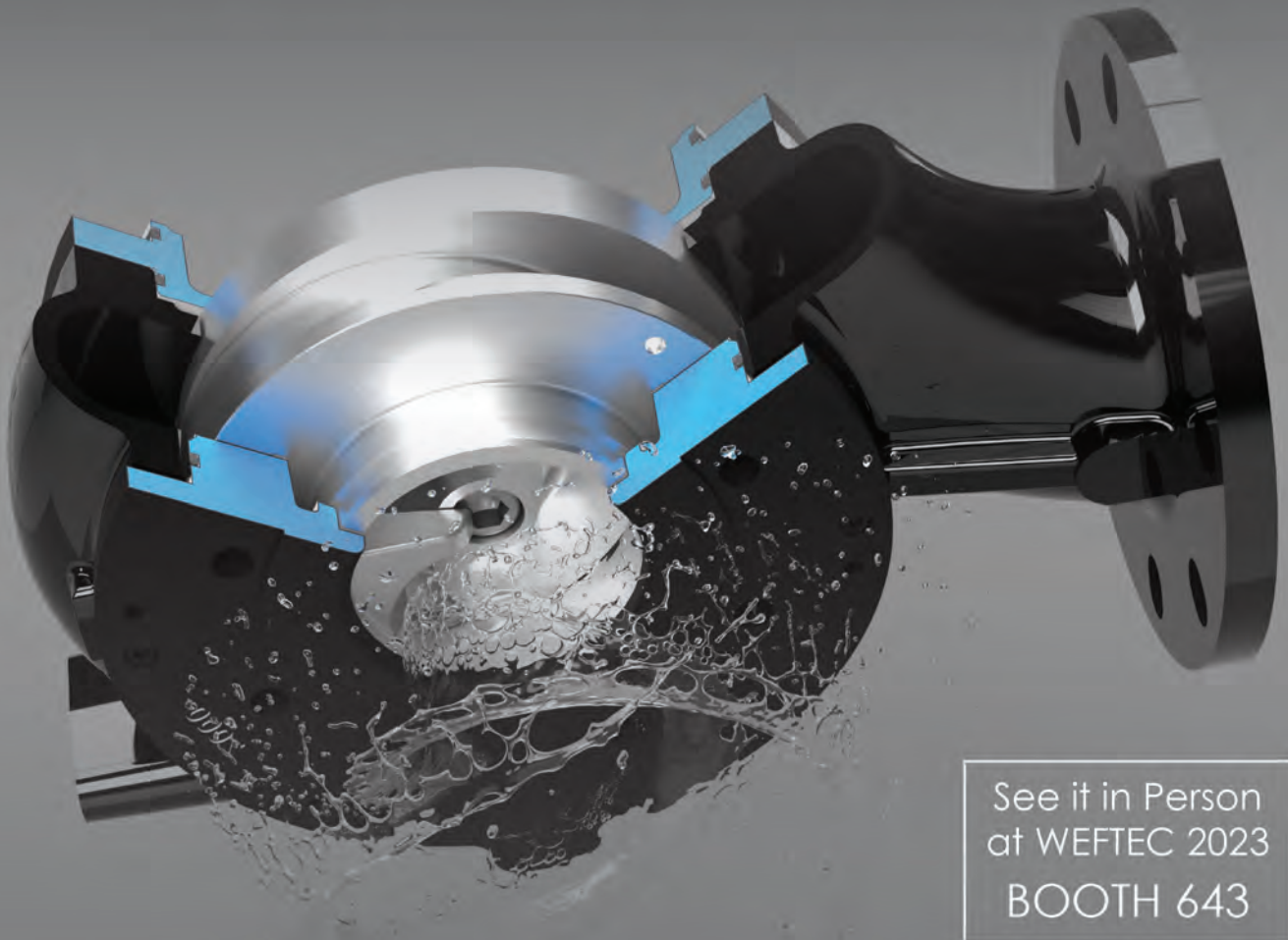
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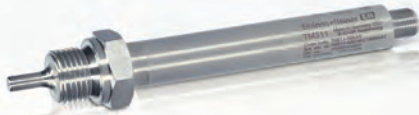
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# CHARGING THROUGH WITH TEMPORARY POWER SOLUTIONS

*Meeting the challenges of utility demand during peak seasons and severe weather Part 1 of 2*

BY SCOTT MILLIGAN, DISTRIBUTED POWER SOLUTIONS

**R**aging heat waves, crippling ice storms, devastating drought—extreme weather has continued to accelerate in the past decade, claiming lives and causing untold devastation. Just halfway through 2023 alone, the United States experienced seven confirmed weather-related disasters with losses that exceeded \$1 billion.

With the increasing number of weather disasters, homes and businesses rely on uninterrupted electricity and natural gas more than ever to accommodate their daily needs and take the brunt of emergency situations as they occur. Utility companies need backup or standby power sources to meet needs during peak demand, electricity gaps, off-grid power needs, and outages.

During these critical times, temporary power solutions provide

robust services and benefits to the most vulnerable. This series will delve into the crucial advantages of mobile power solutions and their evolving pivotal role in the ever-growing energy requirements of the utility sector. Read on to explore utilities' key challenges and learn the advantages of partnering with a temporary power provider.

## CHALLENGES FACED BY UTILITY COMPANIES

Utility's chief role in distributing power to businesses and homes is ensuring reliable and continuous supply to meet electricity demands. To meet these demands, utility companies must manage the essential infrastructure and systems to generate, transmit, and distribute power efficiently. However, these responsibilities come with significant challenges.

## PEAKING DEMAND

Energy demands vary throughout the day, season, and year. Peak times, such as during severe heat waves or ice storms, require high demand, while other times, such as in the middle of the night during relatively normal weather, the demand is low. Balancing these surges in demand requires a sophisticated, real-time understanding of usage patterns. During peak demand periods, utility companies need to be able to meet surging needs.

To meet this demand, utilities must have "peaker" plants that they can bring online quickly for peak demand. Building and maintaining peaker plants can be economically inefficient because they are used infrequently.

## GRID STABILITY

Maintaining electrical grid stability



is another significant challenge. Electrical power needs to be generated and used in real-time. The delicate balance between supply and demand must be maintained to prevent power outages. This balance can be especially challenging with renewable energy sources, like wind and solar, which can be intermittent and variable.

#### UPGRADING INFRASTRUCTURE

Much of the existing electrical grid infrastructure in many parts of the world is aging and needs upgrades or replacement, including power plants, transmission lines, substations, and transformers. However, upgrading this infrastructure can be costly and complex.

Modernizing the grid means more than just replacing old equipment. Utilities must integrate new technologies, like smart meters, distributed generation systems (like rooftop solar panels), and advanced communication systems. These upgrades improve grid reliability and resilience but require significant planning and investment.

These challenges mean utility companies must think strategically about their investments and operations. They must also collaborate with technology providers, customers, and other stakeholders to develop and implement effective solutions.

#### THE BENEFITS OF TEMPORARY POWER SOLUTIONS

With the numerous challenges utilities face, they often need to rely on third parties to help during severe weather and times of crisis. Temporary power solutions provide



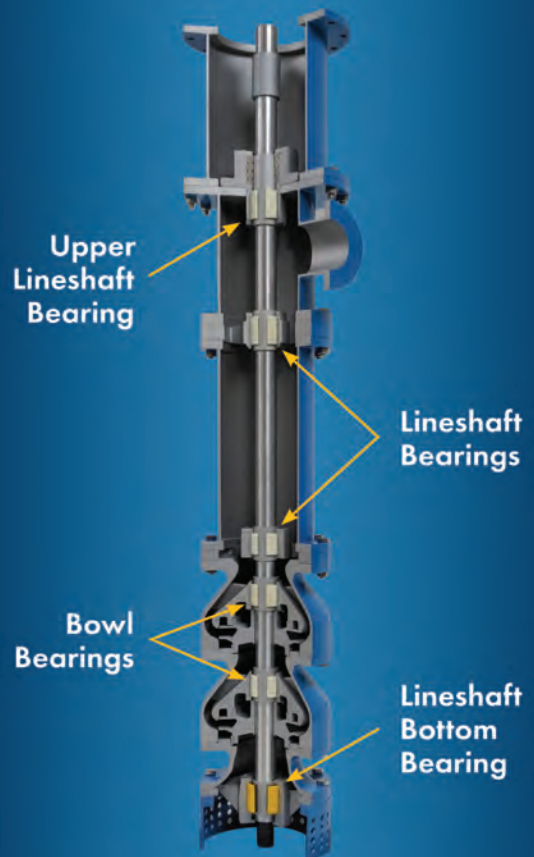
cost-effective, customized solutions to keep the power supply running for your customers. Plus, temporary power equipment supports a wide range of megawatts (MW) to generate as much or as little power as needed.

The right temporary power solutions company can provide valuable benefits to overcome the challenges of severe weather:

#### QUICK MOBILIZATION

Temporary power companies excel in their fast response to emergency situations, like power outages or equipment failures. Securing a trusted partner ensures rapid backup power deployment to minimize downtime and restore

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#### FUEL EFFICIENT, LOW EMISSIONS

Many temporary power solutions providers offer natural gas units equipped with advanced technologies, such as clean-burning engines, to minimize the carbon footprint and reduce environmental impact.

#### FLEXIBILITY

Temporary power solutions companies customize their solutions to meet each utility company's

specific requirements on a global scale. With various generator sizes, power capacities, and fuel options, these solutions scale and adapt to changing demand without significantly impacting infrastructure.

#### 24/7 AVAILABILITY AND SUPPORT

These companies offer around-the-clock support with expert teams ready to address any technical issues, monitor power systems, and deploy technicians for maintenance as needed in real-time.

While the advantages of a temporary power supply company are significant, it's important to emphasize that they're only achievable through an experienced and qualified power solutions provider. Selecting a reputable provider is crucial to get the right service for your business.

## A LOOK AHEAD: PREPARING FOR SEVERE WEATHER AND SUMMER PEAKING

It's no longer possible to put off planning for severe weather: it's only continuing to grow globally. With El Niño's return 2023, we have already seen new temperature records. Communities and utility companies need to prepare now to be ready for whatever comes.

Severe weather and summer peaking pose several threats to the utility market. For example, increased electricity usage for cooling purposes driving surges in demand, damage to utility infrastructure from hurricanes or tornadoes, brownouts or blackouts, and reputational risks if there is a sluggish response and power restoration can all spell trouble for utility companies. However, temporary power solution providers help to mitigate these risks.

In next month's conclusion to this series, we'll present the goals you should look for in choosing the right partner as well as some examples where utilities met these challenges head on. ■

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# CHOOSING THE BEST ALTERNATIVES IN INDUSTRIAL ANALYTICS

## *A PI Server data visualization tools buyers guide Part 1 of 2*

BY KEVIN JONES, DATAPARC

In late 2020, project managers in fields as diverse as oil and gas, chemical processing, food and beverage, and more, received news that OSIsoft would be retiring its ProcessBook software package, PI's venerable data visualization tool kit that debuted in 1994. Because of its tight integration with PI's industry-leading historian, ProcessBook was widely adopted by process engineers to build trends, dashboards, and process graphics from their PI Server time-series data.

Over the years, competitors have come up with newer, more powerful analytics tools, but many engineers have stuck with ProcessBook simply because of their familiarity with the tool kit, or because of the difficulty of migrating critical graphics and displays to a new platform. For those users who were comfortable with

ProcessBook, OSIsoft's announcement will challenge all users with finding a replacement.

While current users could continue to use ProcessBook indefinitely, by discontinuing support, OSIsoft is clearly encouraging customers to make plans to transition to alternative platforms. Security updates for ProcessBook ceased in 2022, and support for the platform will end entirely in December of 2024.

If you've been uncertain about replacing ProcessBook at your facility, now's the time to begin looking into alternative solutions. However, if you've been a devoted ProcessBook user, it may have been decades since your facility has shopped for an alternative industrial analytics tool. Below, we'll outline some of the key considerations as you start shopping for a replacement.

### EVALUATING PI SERVER ANALYTICS TOOLS

Since ProcessBook's introduction, the industrial analytics marketplace has become quite crowded. There are dozens, maybe hundreds of companies out there making analytics products for everything from broad industrial applications to niche manufacturing processes. So where does one start in a search for an alternative to ProcessBook? What factors should be considered to determine which of these solutions is the best fit?

At a high level, you should be thinking about the following:

1

#### EASE OF INTEGRATION

Chances are, if you're using ProcessBook, you're also using PI Server as a data historian. If you're looking to replace



ProcessBook, the most critical question you'll have to answer is, "How well does this alternative integrate with PI server?" The answer to this question means the difference between a quick, ten-minute connection to PI Server, or a costly and time-intensive investment in custom development and new OT infrastructure.

Migration is also a key consideration. Your organization has invested time and money into building the ProcessBook displays essential to efficient operations. Certain ProcessBook alternatives provide tools to simply migrate existing ProcessBook displays to your new platform. Others do not.

2

#### DIAGNOSTIC ANALYTICS CAPABILITIES

Diagnostic or "exploratory" analytics tools are used for root cause investigation and troubleshooting of downtime events or product quality issues. Trends and trending capabilities are at the core of diagnostic analytics. Effective root cause analysis depends on rapid ad-hoc analysis and the ability to quickly overlay historical data from various process areas to determine correlation and causation.

Trending is likely to be one of the top two capabilities ProcessBook users are looking to address with a replacement system. In addition to trends, diagnostic analytics are often supported by other visualization tools, such as histograms, X/Y charts, and Pareto charts. When

presented with difficult process questions, the more ways you can slice and dice your data the easier it will be to arrive at the correct answer.



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3

### OPERATIONS MANAGEMENT CAPABILITIES

"Operations management" is broadly defined here as the capabilities that allow for:

- Production tracking
- Process monitoring
- OEE tracking
- Quality management
- Process alarms and notifications
- Reporting
- Manual data entry

That's a lot of functionality, and most of it comes from dashboarding and process graphics-building tools that leverage process data for real-time monitoring. Basic analytics solutions typically only allow for monitoring at the site level, but more sophisticated offerings allow enterprise-wide tracking of production KPIs across multiple sites.

ProcessBook users have gotten the most use mileage out of the platform's dynamic, interactive graphics, and it's not uncommon for displays built with ProcessBook to see a decade or more of continued use. When looking to replace ProcessBook's operations management capabilities, you have a few options. You could look for point

solutions designed specifically for that capability, like SSRS for reporting. You could find a highly customizable product that has coding capabilities like ProcessBook. Or you could find a broad a solution that has the building blocks necessary to solve multiple business needs.

4

### ADVANCED ANALYTICS CAPABILITIES

Advanced analytics is another loaded term that we'll define here for the purpose of this post. Often used in relation to leading-edge manufacturing concepts, like machine learning and industrial AI, advanced analytics in ProcessBook replacement tools will typically take two forms: predictive analytics and prescriptive analytics.

Predictive analytics tools promise to prevent downtime and improve OEE by building models from recorded data to anticipate and alert users to potential productivity loss. Prescriptive analytics take the next logical step and tell you which actions need to be taken to address predicted production issues.

Together, and in conjunction with process automation tools, predictive and prescriptive analytics form a sort of elementary artificial intelligence used to maximize plant performance.

5

### COST/PRICING

Although it'd certainly be nice if it weren't the case, cost will likely be a consideration as you consider ProcessBook alternatives. Pricing for these solutions is usually determined by features and the scope of implementation, and most providers don't publicly list their pricing so providing even ballpark figures will be difficult. However, there's one key factor you should be aware of when evaluating pricing, the pricing model.

Pricing models vary between process manufacturing analytics providers, to include everything from flat rate pricing, usage-based pricing, tiered pricing, and user-based pricing. These days, many manufacturing analytics solutions use

"per-user" pricing, with the licensing cost going up according to the number of individuals using the tools at a facility. The upside with per-user pricing is that for small facilities, or for organizations with few people monitoring and analyzing process data, it can make for a relatively-cost effective solution. The flipside, obviously, is that for data-driven companies who believe in giving every operator, engineer, and SME the ability to contribute to improving plant performance, per-user pricing can get very expensive very fast.

### A LOOK AHEAD

Next month, we'll wrap up this overview with point-by-point comparisons of different ProcessBook alternatives already on the market: dataPARC's own PARCview; OSIsoft's ProcessBook successor, PI Vision; GE's Proficy CSense; Canary's Axiom software; TrendMiner; Seeq; and Inductive Automation's popular SCADA platform, Ignition.

Any of the above applications could be the right choice for your needs, but identifying which aspects of industrial analysis these different tools emphasize will determine which specific choice is right for you. Asking the right question for your facility will determine the right answer. ■

**KEVIN JONES** serves as the director of sales and marketing for Capstone Technology's dataPARC division. Founded in 1997, dataPARC is a leading provider of industrial analytics and data visualization tools for process optimization and decision support. With a focus on serving the process industry, dataPARC offers historian and real-time analytics software for vertical markets such as oil and gas, pulp and paper, mining and minerals, food, chemicals and refining, and power and utilities around the globe. For more information, visit [www.dataparc.com](http://www.dataparc.com).



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# BREATHING NEW LIFE INTO OLDER PUMPS

*Combining OEM knowledge, legacy doesn't mean end of life*

BY HECTOR CASTILLO, AARON BURTON, AND MITCHELL LEGG, SULZER

There are many pumps that have been performing vital operations for decades. Solidly built and offering reliable service, in some cases long after the manufacturer has gone by the wayside. However, there comes a time when even the most stoic of equipment needs to be refurbished, if only to improve performance and efficiency back to the original specifications.

Of course, the worst-case scenario of a catastrophic pump failure can be amplified if the original equipment manufacturer (OEM) is no longer in business; operators can feel

in a difficult position. Sourcing a new pump can, depending on the application, have a long lead-time and high investment requirement. In addition, the new pump will most often have a different design, which will necessitate significant alterations to the surrounding infrastructure.

## AN EFFECTIVE SOLUTION

Sulzer's alternative is its OEM-X Line service, which offers pump engineering expertise that has both the design capabilities and the manufacturing technology to refurbish an original pump from any brand. This approach has several

benefits, not least the opportunity to incorporate modern materials into the original pump, which can be reinstalled quickly and returned to normal operation. This is usually the most cost-effective solution, keeping downtime to a minimum and can, in some cases, even lead to efficiency gains.

As a pump OEM, Sulzer has developed cutting-edge design and manufacturing techniques that can also be applied to the maintenance and repair of equipment from any manufacturer, including those that are no longer in the market. This service is exemplified by a recent project that



went through the company's service center in Pasadena, Texas.

The pump in question was a between-bearing, six-stage type working with propylene carbonate. The failure happened when the rotating assembly spun contrary to its designed direction for a considerable period of time, leaving behind damage to all the stationary and rotating elements contained in the pump.

## DESIGN COMPLEXITY IS NO OBJECT

The design of the pump was a mix of an axially split and double casing barrel, containing both an outer shell and diffuser stages; the outer case didn't suffer any damage from the failure. The cost of a newly designed current API edition pump was prohibitive due to the requirements to change the foundations and existing piping configurations.

Initial investigations found many diffuser guiding vanes bent or broken, as well as diffuser walls that

had cracks and wear damage due to the contact with the impellers to the point where they could not be repaired. There was substantial damage to all internal parts as well as rubbing marks present on all elements. Most of the wear rings had become stuck between the stationary and rotating elements or were worn out of shape altogether. Some stationary rings were absent from their locations and several impeller walls were cracked or broken and couldn't be used again.

The challenge for Sulzer was to recreate all of the damaged internal components, maintain the hydraulic design from the third-party OEM and upgrade various aspects with the latest advances in technology.

## REVERSE ENGINEERING

The first step was for the design engineering team to reverse engineer the complex items, such as impellers, and diffuser passageways, using 3D laser scanning. This can render



*The pump in question was a between-bearing, six-stage type working with propylene carbonate, with damage to all the stationary and rotating elements contained within.*

a component's geometry with an accuracy of 0.0005 inches, allowing the design engineer to capture an accurate, digital mesh of the part.

The mesh enables complex measurements and sketch geometry details to be obtained. A solid 3D CAD model was then translated into a 2D sketch to perform the quality audit (QA) and control processes on the scanned parts. Once the QA process was complete, the parts manufacturing department



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The Sulzer pump service center in Pasadena redesigned and created the remaining components needed for the repair.

was tasked with producing the components by translating the model into a CAD-appropriate file to create molds and patterns for casting. These were machined according to the final specifications and dimensions requested by the repair engineer and returned to the service center.

Working in parallel with the parts manufacturing department, the pump service center in Pasadena redesigned and created the remaining components needed for the repair. These were less complex and consisted mainly of sleeves, wear parts, shafts, and rings. The parts were redesigned using 3D CAD software and manufactured according to specifications derived from Sulzer's expertise as a pump OEM.

### MATERIAL UPGRADES

In addition, the customer requested an upgrade to the pump's wear elements to a high-temperature, high-friction-resistant polyimide thermoplastic material. This technology has been used in aerospace applications for many decades and has been adapted to centrifugal pumps to achieve better results while preserving the component's lifespan.

These high-performing polyimide thermoplastics allow the pump to run at tighter clearances than metallic wear elements, resulting in less internal recirculation and increased pump performance. The modifications were discussed with the engineering and repair engineering departments

for approval to ensure all parties and the customer were agreed.

Once all parts were received, they underwent a preassembly process to allow the technicians to verify the fit and design of the new components. Finally, the pump was assembled and hydraulically pressurized to 1.5 times maximum allowable working pressure (MAWP) to ensure no leak paths were present and overlooked during the repair, before the pump was prepared for shipment back to the customer.

The result of all this effort was the restoration of a complex, third-party pump to its full capabilities with the same if not better performance than before, using the latest technology and materials. The other positive outcome for the customer was the capability of Sulzer's OEM-X Line service to fully support the pump in the future, thanks to all the completed engineering work. Going forward, the equipment's service life will continue, even though its original manufacturer is no longer present in the market. ■

**HECTOR CASTILLO** is field engineer, **AARON BURTON** is engineering manager, and **MITCHELL LEGG** is design engineer for Sulzer Pumps Service Inc. Sulzer is a global leader in fluid engineering. We specialize in pumping, agitation, mixing, separation and application technologies for fluids of all types. The Flow Equipment division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments. [www.sulzer.com](http://www.sulzer.com)



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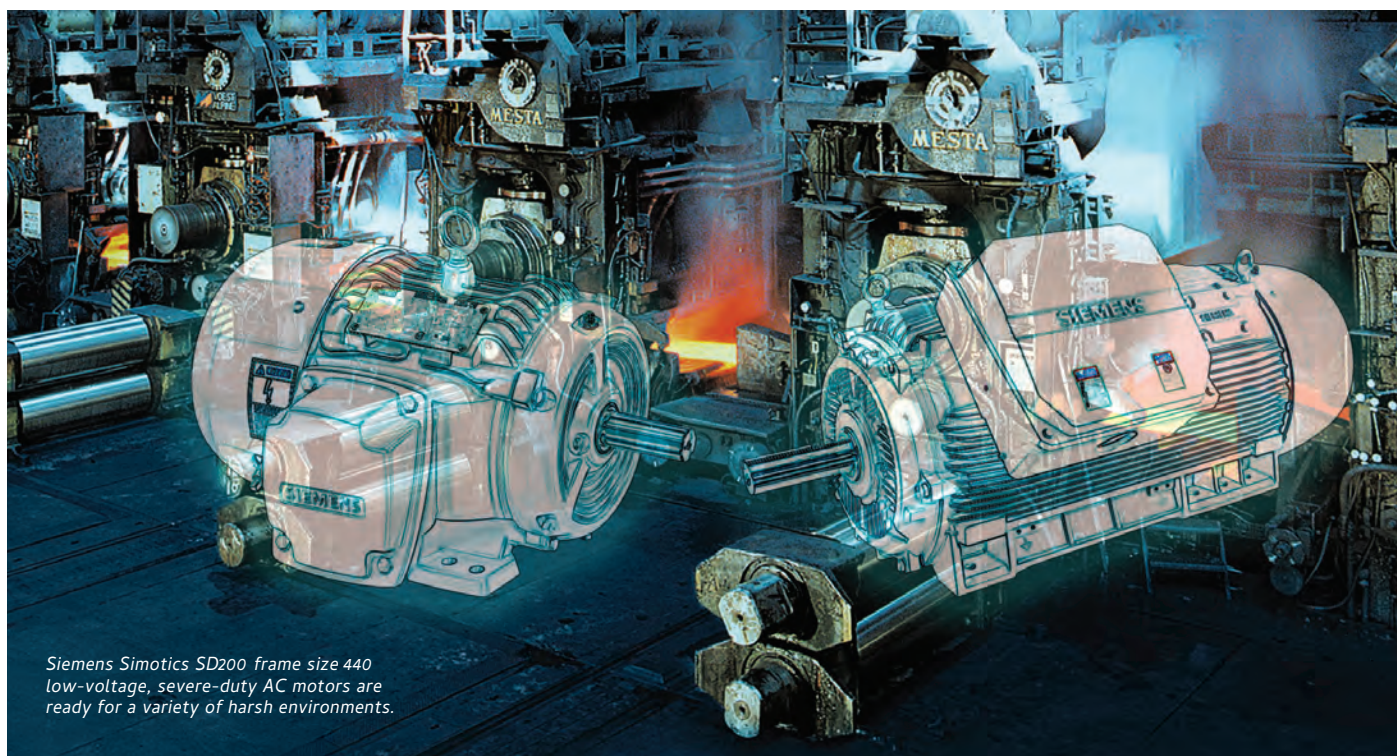
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Siemens Simotics SD200 frame size 440 low-voltage, severe-duty AC motors are ready for a variety of harsh environments.

# EXCEEDING NEMA PREMIUM EFFICIENCY STANDARDS

*Cast-iron motors bring new efficiency to harsh environments*

BY JOHN MEYER, SIEMENS

When it comes to power, whether it's the oil and gas market, petrochemicals, grain or rock product, food and beverage, or near countless other harsh environments, efficiency is everything. The Simotics SD200 440 low-voltage, severe-duty AC motors, which now provide a range from 75 to 800 horsepower output, are ready for the challenge—meeting or exceeding NEMA Premium® MG1 Table 12-12 efficiencies.

## MEETING TOUGH CONDITIONS

Providing high productivity and energy-efficient operation in all

torque ranges, these cast-iron NEMA motors are built to power pumps, fans, compressors, hoists, winders, and similar equipment in harsh environments. The motors feature 444-5013 cast-iron frames for operation in 460V and 575V ranges. A wide selection of options is offered, including IP56 ingress protection, encoders, brakes, and blowers plus others to suit the applications presented.

On these motors, the frame, end-shields, fan guard, and easy-access, diagonally split, oversized terminal box are all cast-iron. Complementing this construction are zinc-plated

hardware, epoxy paint, and stainless-steel nameplates for long life and easy identification in the field. A unique offset rotor bar provides improved efficiency, while larger bars and end rings reduce resistance. Each die-cast aluminum rotor assembly is dynamically balanced for extended bearing life and includes a high-strength C1045 carbon steel shaft for maximum performance. Premium C5-grade steel laminations and copper magnet wire are standard.

## FACING THE HEAT

For insulation, the Class-H non-hygroscopic system with NEMA Class



B temperature rise provides an extra margin of thermal life. The insulation system meets or exceeds NEMA MG1 2014 Part 31, making these motors suitable for variable speed drives in constant torque (4:1) and variable torque (20:1). All windings are tested for Corona Inception Voltage (CIV). The Siemens product manager for low-voltage NEMA motors, Oscar Palafox, explains, "One of the features of the SD200 is its flexibility in the field, as the motor can be switched from F1 to F2 and F3 orientation with ease. Plus, the safety features on this new line are unmatched by competition. Full H-Class conformity provides winding protection, while the swivel hooks are a significant improvement over eyehooks for handling of these heavy units. In addition, the unique Siemens composite insulation on the SD200 is a cost-saver over the ceramic bearing alternative with ten times the resistance of other solutions in the market."

## GOING THE DISTANCE

Even with tough conditions in mind, Siemens backs the SD200 with a three-year warranty.

"Finally, the NEMA Premium efficiency is a guarantee of long performance life with very tight deviation of losses. Shaft current remains more consistent for better uptime," Palafox adds. He further notes this line affords users Division II, Class 1 (gas) and Class 2 (dust) protection. ■



*Simotics SD200 motors are designed for use in oil and gas, petrochemical, grain, rock product, food and beverage, and other markets with Division II, Class 1 and 2 conditions present.*

Siemens USA has been a national asset moving America forward for more than 160 years, investing three billion dollars in the U.S. market, strengthening its technology portfolio and manufacturing footprint. The company's technology supports the critical infrastructure and vital industries forming the backbone of America's economy. With customers in all fifty states and Puerto Rico, Siemens USA employees and suppliers are creating more agile and productive factories, more intelligent and resilient buildings and power systems, and more reliable and sustainable transportation. For more information, visit [www.usa.siemens.com/simotics-sd200](http://www.usa.siemens.com/simotics-sd200).



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# HOLDING IT ALL TOGETHER

*An overview of EP31 high-strength resin applications*

BY DR. WALTER BRENNER, MASTER BOND

Master Bond EP31 is a two-component epoxy-based resin that is primarily designed for bonding applications. As with our other epoxy-based adhesives, it features high strength after curing. As shown by the case studies below, this compound can bond a variety of dissimilar substrate pairs, including aluminum-acrylic and Kevlar-polyimide. The three case studies below provide illustrative examples of EP31 used to bond components of aeronautical wings (piezoelectric actuators), biological apparatuses (DNA amplification), and thermocouple housings.

## CASE 1: PIEZOELECTRIC MICROFIBER COMPOSITE ACTUATORS FOR MORPHING WINGS

Morphing wings are desired in aircraft applications due to their advantages compared with fixed wings, including being able to responsively adapt to aerodynamic drag. Researchers from California

State University at San Bernardino have developed two approaches for obtaining control surfaces (aerodynamic devices that allow pilots to adjust the flight attitude of an aircraft) on morphing wings using microfiber composite (MFC) actuators. The authors explored the effectiveness of using two bonding approaches: a flap approach in which the MFC actuator was bonded to each side of a metal substrate and a direct bonding approach in which MFC actuators were directly bonded to the Kevlar wing using Master Bond EP31.

For the direct bonding approach, the authors bonded the MFC actuator as close to the trailing edge as possible while simultaneously avoiding knotted areas in the air bladder of the wing. The actuator was bonded to the airfoil using Master Bond EP31. According to the authors, EP31 was chosen because of its high shear strength of 20 kN, which helped reduce compliance problems that would have otherwise reduced

the actuator's performance. After cleaning the surface of the actuator and the airfoil with acetone, the adhesive was cured for twenty-eight hours at room temperature.

The bonding reliability was assessed by repeatedly applying sinusoidal voltage signals to the actuator over a frequency range of less than 1 Hz to greater than 1 kHz. After visually inspecting the bond, the authors found no visible signs of debonding. Furthermore, when using the direct bonding approach, the authors conducted bonding reliability tests for several days and successfully reproduced their experimental results several times. The authors noted that greater 90 percent of the actuator formed a strong bond with the wing, and this bonding percentage could be further increased by increasing the temperature during bonding.

After successfully bonding the MFC actuators to the wings, the authors compared the two bonding approaches. Their results showed that, although the flap approach



produced greater displacements, it also made the wing less flexible. By directly bonding the MFC actuator to a metal substrate and then attaching it to the trailing edge of the wing (similar to traditional wing flaps), the authors were able to maintain the flexibility of the wing but observed problems with tension loading at higher wing pressures. As noted by the authors, EP31 played a key role in ensuring the reliability of the direct bonding approach.

## CASE 2: MOLECULAR DIAGNOSTICS IN A TEACUP

*Salmonella enterica* is responsible for more than half of all food-borne illnesses worldwide. In the United States, food safety is ensured by testing for the presence of *Salmonella* by shipping samples to dedicated laboratories, which involves the use of expensive instrumentation. Researchers at the University of Hawaii at Manoa have developed a novel method based on loop-mediated isothermal amplification (LAMP) that does not require the use of such instruments to detect the presence of *Salmonella* DNA in milk. As part of this approach, Master Bond EP31 was used to bond the cylinders that housed the phase change material (PCM) that was responsible for maintaining the reaction temperature of the device.

To detect the presence of *Salmonella* DNA in samples, the authors' DNA amplification device needed to maintain a constant reaction temperature for at least thirty minutes

to ensure reaction completion. The continuous reactions were heated by adding a small volume of boiling water, and the temperature was maintained for ninety minutes due to the use of a PCM that was housed in an aluminum shell with acrylic caps. Master Bond EP31 was used to fit these pieces together by overnight curing, and then the temperature within the device was measured by using three thermocouples fixed with the epoxy.

The custom-made device successfully maintained the target temperature even longer than was necessary. The authors showed that the fluorescence signal of their custom fluorimeter had comparable performance to real-time PCR. Master Bond's EP31 played a key role in ensuring that the PCM did not leak from its enclosure, helping the device maintain the temperature required to run the *Salmonella* DNA amplification reactions.

This approach provides a simple approach for detecting *Salmonella*, especially for developing countries that seek an inexpensive alternative to instrument-based methods due to unreliable electricity grids.

## CASE 3: HEAT EXTRACTION FROM POROUS MEDIA BY MEANS OF CARBON DIOXIDE APPLICATION

Geothermal energy systems attempt to extract thermal energy in locations where sub-optimal geological conditions are present. Part of this process involves

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reservoir stimulation to overcome the lack of porosity/permeability of the rock using either physical or chemical processes with the use of a heat-transfer process fluid. Supercritical carbon dioxide can be used as the working fluid due to its lower viscosity and greater density difference between the cold and hot fluids used in this process.

Researchers at the University of California, Berkeley performed a variety of experimental and numerical investigations to determine the performance of supercritical carbon dioxide to extract heat from porous rock for geothermal applications. Due to the sparsity of academic literature on how best to construct a lab-scale supercritical carbon dioxide flow system, the authors took it upon themselves to construct an apparatus to continuously flow temperature-controlled supercritical carbon dioxide under controlled conditions into a pressure vessel.

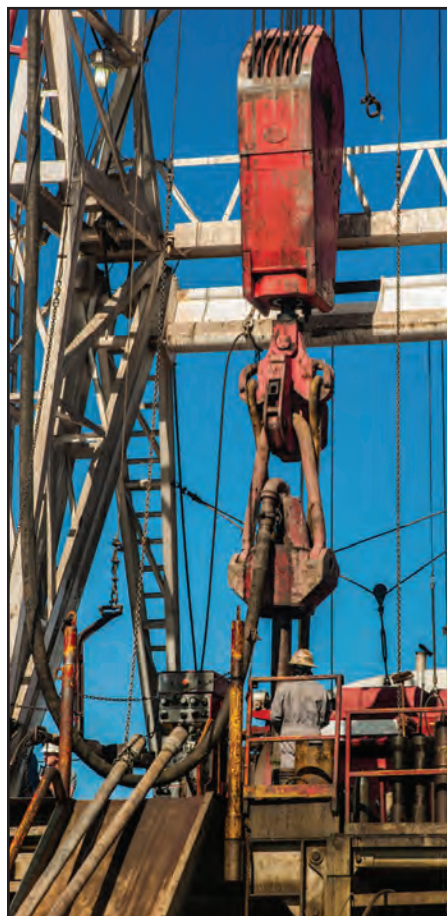
They measured the temperature of this vessel at twenty-three locations within the sample using thermocouples. Master Bond EP31 was critical to ensuring that the thermocouples measured the temperature without leaking supercritical carbon dioxide.

The authors inserted twenty-three thermocouples from the bottom of the vessel through two stainless steel pipes that were sealed using EP31. To optimize the bonding, the authors internally threaded the stainless-steel pipes and then cleaned them before assembly. Once the thermocouples were inserted and properly adjusted, a compression fitting cap was attached to one end of the pipes to allow the thermocouples to pass through. The pipes were filled with EP31, and the entire apparatus was vacuumed to remove air bubbles.

The developed apparatus provided data that may be useful for validating carbon-dioxide-based

porous media flow models for field scale geothermal applications. When working with supercritical carbon dioxide, effusion of the gas is a major concern, especially at higher temperatures and pressures. The authors investigated a variety of material combinations to obtain seals that prevented carbon dioxide leaks.

After a trial-and-error approach, the authors finally used Master Bond EP31 to seal the thermocouples into their stainless-steel housing. Without threading and cleaning, the authors noted that insufficient bonding was obtained, further highlighting the importance of thoroughly cleaning the bonding surfaces before applying and curing EP31. The authors noted that EP31 remained intact and maintained a seal throughout the duration of their experiments, preventing the leakage of supercritical carbon dioxide during experiments. ■



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**DR. WALTER BRENNER** is technical director of Master Bond. Dr. Brenner received his Ph.D. in polymer chemistry from Brooklyn Polytechnical Institute. He is a renowned professor of chemical engineering and has served as a consultant for various U.S. government agencies. He holds numerous patents and is credited with being the first person to develop electron beam radiation curing. Master Bond Inc. was founded in 1975. Our focus has been on developing the best in epoxies, silicones, polyurethanes, polysulfides, UV cures, and other specialty adhesive systems. We are true specialists in our field and are recognized by many as the preeminent adhesive formulation company in the world. Through research and development, we have been able to create innovative, new compounds with truly unique properties. For more information, visit [www.masterbond.com](http://www.masterbond.com).





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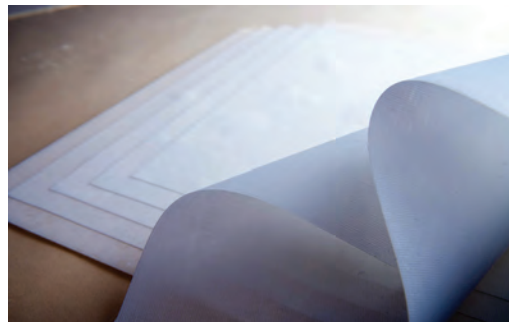
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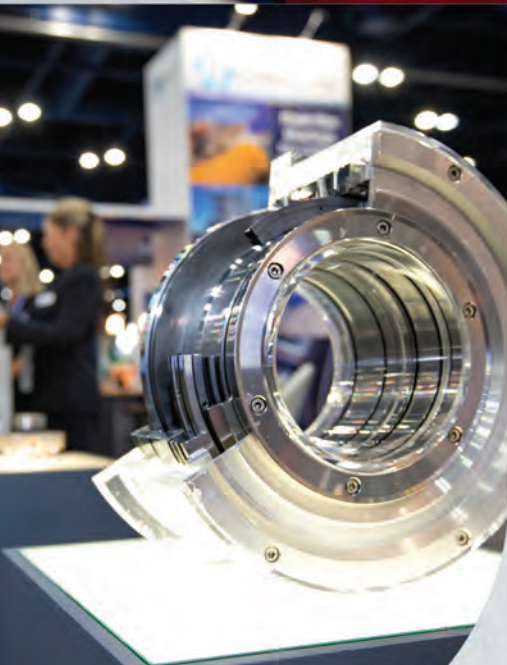
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# THE SUN SHINES FOR EVERYONE

*Unique partnership expands solar energy into low-income areas*

Last month, Australia's Allume Energy announced a \$1.5 million bridge investment from Elemental Excelsator and the Schmidt Family Foundation to bring its SolShare rooftop solar technology to more than 4,000 residents across the Southeastern United States, starting with shared solar projects in Florida, Georgia, and Mississippi. Below, Allume CEO and co-founder Cameron Knox and Elemental Excelsator founder and CEO Dawn Lippert explain why this partnership is prioritizing this funding to ensure low-income communities living in multi-unit buildings can benefit from shared solar in the Southeast.

**MPT:** *Why is it important to bring solar energy access into lower income areas?*

**CAMERON KNOX:** Until recently, solar technology has primarily been saving money for people who already have it. We need to ensure we include everyone in the energy transition. On average, beneficiaries of the SolShare technology can save up to 40 percent off their electricity bills. The first U.S. pilot project in Orlando has indicated an average annual savings of \$1,166 per apartment in the first year of operation, including net metering credit savings. This partnership will ensure low-income communities can benefit from clean, affordable energy from the sun.

**MPT:** *How expansive can this project get?*

**CAMERON KNOX:** We expect new projects across the Sun Belt over the next year will prevent over 10,000 tons of carbon emissions (equivalent to taking over 2,000 cars off the road for a year) that would have otherwise been created from conventional energy consumption. Allume will soon begin installation of its second project in Orlando, bringing the number of U.S. installations to three, with the other site in Jackson, Mississippi.

Back in Australia, Allume is already providing around 2,000 apartments with clean affordable energy, with around half of those in social or affordable housing. By bringing SolShare to the U.S. market, Allume is helping reduce the income gap that has plagued the American solar energy market.



Cameron Knox



Dawn Lippert

**MPT:** *How did Allume find partners to bring its technology to America?*

**CAMERON KNOX:** Solar installations can be 30 to 40 times more prevalent among single-family homes than apartments, echoing a profound lack of solar energy availability among lower-income families. Allume's ability to close this gap, as it has already demonstrated in Jackson, Mississippi, and Orlando, Florida, drew investment interest from Elemental Excelsator and the Schmidt Family Foundation.

**DAWN LIPPERT:** Elemental Excelsator originally invested in Allume Energy because they are leaders in bringing affordable solar to affordable housing. We could all use an extra \$1,000 a year in our pocketbooks rather than spent on electricity bills. We are now thrilled to collaborate with others in funding Allume's expansion in the sunny Southeast. Solar electricity is cheaper and cleaner than fossil fuels, and it is time that we all have access to it.

The partnership of Allume, Elemental Excelsator, and the Schmidt Family Foundation will not only benefit the environment and tenants' bottom lines, but it also will expand the market for clean energy in communities that are often overlooked, setting the stage for still more climate and economic benefits.

**MPT:** *What benefits to you think these residents and the area utilities will see over time?*

**CAMERON KNOX:** Allume Energy remedies one of the oldest and most vexing issues in green energy: installing solar panels on multi-family homes. SolShare is a behind-the-meter technology that takes solar energy generated by rooftop panels and allocates it to each grid meter as desired. ■

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





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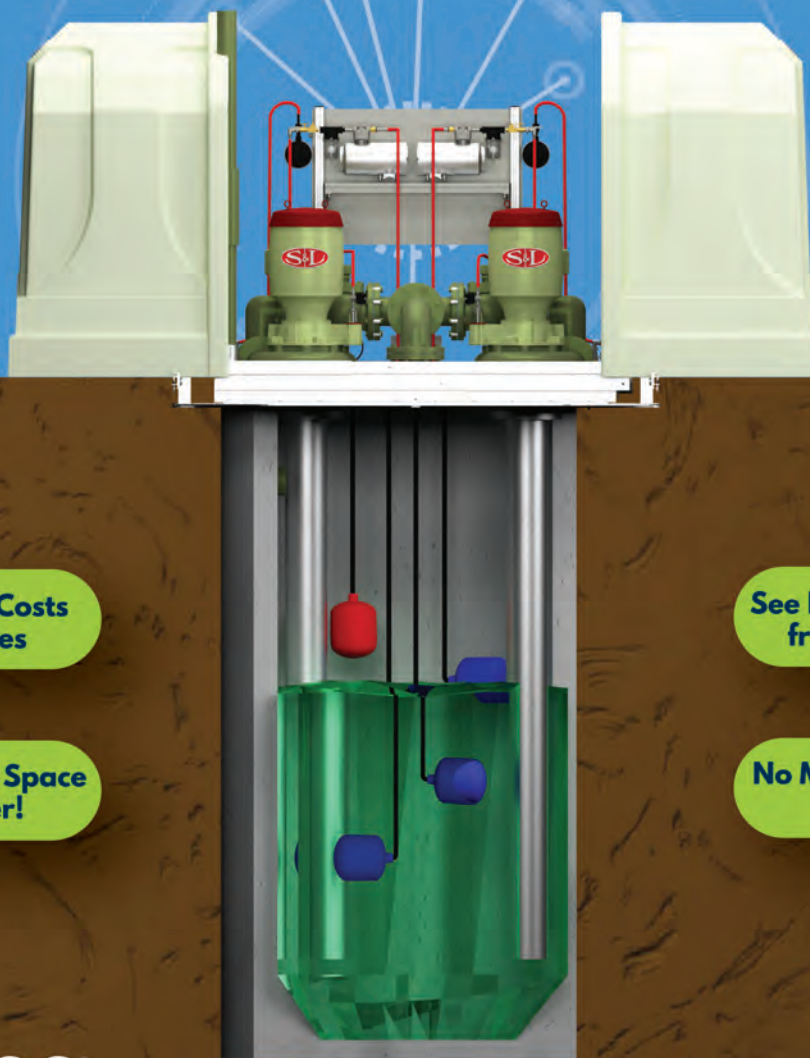
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