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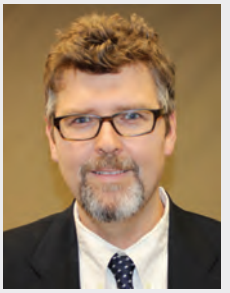

J. Campbell, Editor
Modern Pumping Today

Every family has different holiday traditions as the year heads toward its conclusion, and your MPT family is no different. Each December, the staff at MPT looks back on the year that was and presents our choices for the Top Products of the year (pg. 41). Our selections span the industrial pump and rotary equipment markets and speak to the sector's needs for efficiency, reliability, and innovation. The products range from large multinationals you're likely familiar with to smaller, regional suppliers worthy of your attention—all offering value you can take into the new year

Some other goodies under the tree in this issue include an entry in our Water & Wastewater Solutions section from frequent MPT-contributor Del Williams (pg. 20). Sanitary sewer overflows (SSOs) are a costly and regulatory headache for many municipalities. See how an innovative approach to preventing sewer pipe blockages can lead to a solution.

Also, in our Pump Solutions section, see how a nearly one-hundred-year-old tomato producer got involved in the energy business. David Brown of Börger shares a story of how his company's Multi-crusher and Bioselect Separator work together to harness biogas potential and send it back into the grid (pg. 28). Enjoy!

MPT
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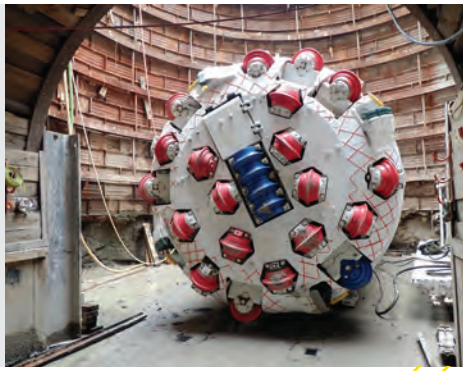

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SUR-SEAL LAUNCHES NEW BRAND TO UNIFY CUSTOM ENGINEERING AND MANUFACTURING CAPABILITIES

Sur-Seal has invested in growing its operations and capabilities through strategic acquisitions, completing partnerships with Spectex, a provider of die-cut felts and gaskets, and Mueller, a provider of comprehensive die-cut solutions and services. Together these businesses provide custom engineering, converting, and manufacturing of flexible materials. Now they will all go to market under one unified brand name, Sur-Seal.

"We now have three great companies coming together as one to reflect one family, one team and one brand," says Pete Futia, chief operating officer of Sur-Seal.

Sur-Seal is ISO-9001 and AS9100 certified and offers many MilSpec and ASTM-certified raw materials. Customers can anticipate the expansion of supply chain services that will include storage, kitting, and parts assembly. The company does business in twenty-five countries, with over 200 original equipment manufacturing (OEM) customers.

"We are thrilled about the unified brand, showcasing our new logo and new website," explains Dana Waterman, chief executive officer of Sur-Seal. "The rebranding work provides clarity to our mission and expertise with advanced engineering."

GE EXPANDS FIELD EXECUTION BEST PRACTICE "LIVE OUTAGE"

Following 2021's implementation of a new lean approach to outages, called "Live Outage," which was developed with input from experts from the field and experts in lean methodology to improve the field execution experience, GE and FieldCore, GE's owned field services company, announces an innovative outage workflow is available for GE 9F gas turbines in Europe and in the Middle East. Initially launched in the United States, at over eighty power plants powered by GE 7F gas turbines, it helped complete outages safely with a substantial reduction in cycle time.

Live Outage is a system of digital applications, tools, sequencing, and other initiatives to transform outages through lean methodology. The Live Outage application hosts the critical content and standard procedures that field crews need, all at the point of work. The weatherproof, touchscreen-based, digitized platform replaces a more antiquated, paper-based approach and makes best practices scalable and reproducible at sites around the world. Further, the app tracks project progress in real time, with status bars for each of the hundreds of tasks that need to be completed. GE field crews are expected to complete more than 700 major outage jobs in 2022.

Making it easy to get what you want

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

And to make it even easier, the XFP is available with a wide range of competitor retrofitting solutions for drop-in replacements, saving time and costly rehabilitation of a pump station. From retrofit brackets to controls to custom solutions, Sulzer makes it easy to get what you want. Don't you think it's time for change?

Time for Change

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SULZER

PEMAMEK TO DELIVER PEMA ONSHORE WIND TOWER PRODUCTION LINES

The Finnish welding and production automation company Pemamek Ltd. has signed a contract with Al Yamamah Steel Industries to supply PEMA onshore wind tower manufacturing lines.

The newly made order is a part of the construction project of the Al-Yamamah Wind Energy Systems Factory, which is Saudi Arabia's first wind tower manufacturing facility. The new facility, contributing to local wind power projects, is being carried out as part of Saudi Arabia's clean energy transformation and Saudi Vision 2030.

The scope of delivery includes a significant amount of advanced PEMA welding automation equipment designed specifically for high-capacity and safe on-shore wind tower manufacturing. Furthermore, the agreement includes a service contract with software and maintenance support.

"We are very proud to be elected for this meaningful wind-power project. Pemamek has a proven track record in developing highly advanced wind tower manufacturing solutions and now we are excited to create a substantial positive impact on Al Yamamah's production. It is also a big honor for us to help the ambitious Saudi Vision 2030 program with our state-of-art solutions," says Jukka Rantala, vice president at Pemamek.

NEW TERRITORY LEADERS JOIN RMI PRESSURE SYSTEMS

RMI Pressure Systems welcomes two new key territory leaders to the team. Huw Dodds has joined in the role of director for sales and service, Australia and will be based from the regional office in Cardiff, New South Wales. He will be responsible for developing and delivering a strategic growth plan for both the RMI branded Australian business and the Armstrong branded commercial/ industrial HVAC product offerings.

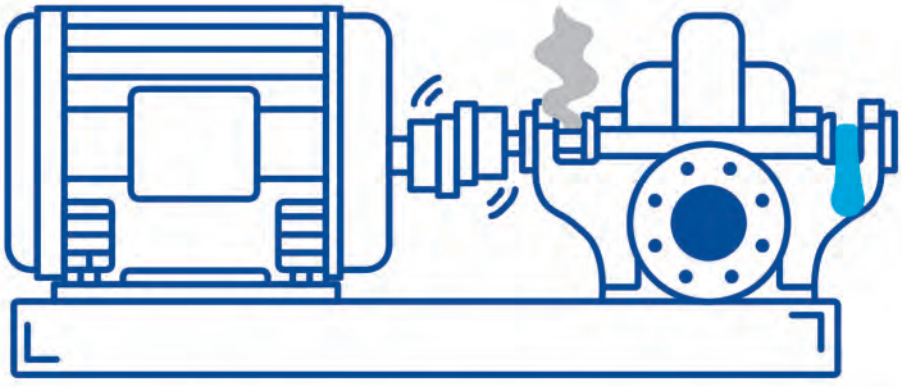
Dodds brings with him twenty-three years of professional experience in the air conditioning and refrigeration industry, most recently as sales manager and applications with Emerson.

He also holds a degree in air conditioning as well as certificates in refrigeration and air conditioning mechanics and marine engineering.

Sean Heary has joined RMI in the role of mining, industrial sales, and services manager, EMEA, based in Germany. Heary will work to expand RMI's sales opportunities across region as well as managing the service team to support customers' needs.

Heary holds a bachelor's of commerce from the University of Western Australia, where he was born and raised in Perth. He speaks English, German, and some Russian.

PENTAIR



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MANCHESTER CITY AND XYLEM TACKLE GLOBAL WATER ISSUES

As the World Cup matches kick off this winter, Manchester City Football Club's global community program, Cityzens Giving, and global water technology leader, Xylem are calling on sports fans to vote for their top project as the Water Heroes Academy returns for a second year. Fans from around the world can vote for one of five new football and water projects from young leaders working to tackle global water issues in Buenos Aires, Cape Coast, Kuala Lumpur, Melbourne, and Mexico City.

Young leaders involved in this year's program are using the power of football to provide essential education on water, sanitation, and hygiene in a bid to tackle water challenges specific to their communities. Projects include improving access to safe water in underserved communities in Buenos Aires and Cape Coast, building flood-resilient communities in Mexico City and Kuala Lumpur, and advancing water sustainability education in Melbourne.

The top-voted young leaders will experience a once-in-a-lifetime trip to the Etihad Stadium. There, they will learn more about water challenges and solutions, and receive further training on how they can help improve the health and well-being of young people in their communities.

OKUMA AMERICA CORPORATION RECOGNIZED AS A TOP WORKPLACE IN 2022

Okuma America Corporation, a world-leading builder of computer numerical control (CNC) machine tools, controls, and automation systems, was recognized as a 2022 Top Workplace within the Charlotte-metro area of North Carolina. This award recognition was granted by The Charlotte Observer.

Okuma America Corporation is recognized as one of nineteen companies in the intermediate-size business category, defined as an organization with 150 to 499 employees. The Charlotte Observer granted a 2022 Top Workplace distinction to only eighty-five businesses total for the entirety of the Charlotte-metro area, which has an estimated population of 2.6 million residents. Okuma America Corporation represents the machine tool industry among the wide variety of industries that are included in this year's list.

The Top Workplace selections were made based on feedback from participating companies' employees. In the spring 2022, Okuma members were offered an opportunity to complete an anonymous employee engagement survey that polled for feedback on twenty-four different topics related to job satisfaction and company culture. Over 80 percent of Okuma's employees completed the survey.

A MATTER OF CONTROL

Hunting inefficiencies due to outdated control systems

BY SWPA EXECUTIVE DIRECTOR ADAM STOLBERG, JOHN A. EVANS, P.E., AND DAVID L. UBERT, F.E.

SWPA has long recommended the "Systems Approach" for effective maintenance and system assessments. However, understood in that mandate is keeping abreast of current technologies and equipment. Below, SWPA Executive Director Adam Stolberg brings John A. Evans, president of M.P. Electronics, and consulting engineer David L. Ubert of Electrical Design Associates on board to discuss how to keep your pumping system up to date.

What are some of the benefits submersible pump users can find by applying the Systems Approach to their control systems?

Per the SWPA handbook, the systems approach establishes performance optimization by assuring the many components in the system operate efficiently and effectively in concert with each other. Although these systems components are independent, they must be carefully matched to each other because the performance and operation of each impact on all of the others.

This philosophy is common in other trades, such as the medical profession. It would seem more appropriate to maintain equipment from a system standpoint instead of individual equipment since individual parts have an effect on other parts of the system. The benefit of this approach is you get a better sense of how to repai and take care of individual components based on the whole system.

Inefficient pumping systems can be large energy wasters. What solutions can be found in the control systems for submersible pumps?

There are several things that can be done to avoid wasting energy and money as a result of inefficient pumping systems. There are also different things that cause systems to be inefficient, such as worn impellers, poorly chosen hydraulic conditions, and changing hydraulic conditions (changing over time) or worn bearings, etc.

Control systems can be a great tool to identify issues before they become major problems, and dynamically make modifications to control algorithms as system components change over time. Recent improvements in technology provide several options.

One solution to improving system inefficiencies is the use of artificial intelligence (AI) in control algorithms. Not only can AI help improve the functionality of control systems, but this technology can also be used to identify problems before they become major issues. AI algorithms can use machine learning techniques to map systems and create alarms to warn when systems deviate from the norm. Other solutions involve a more simplistic approach, utilizing straight control algorithms already available (i.e., PID control) and fine tuning these systems to ensure that pumps are running on their design curves.

One thing that cannot be ignored when trying to identify inefficiencies is the need for instrumentation. The only way to accurately identify inefficiencies is to deploy the proper instrumentation. Remembering that the desire for lift station control is reliability and simplicity, care must be taken that additional instrumentation does not add cost and complexity without improving the system.

For most industrial users, their pump system is a long-term asset. How would you advise submersible pump users best keep track of any inefficiencies over time?

Control systems are a great way to "watch over" expensive system components over time. Historical trending can be a good tool to document normal system behavior and system degradation. However, this requires operators to compare trends over time.

The control system can watch for these deviations as well. As an example, a traditional two-pump lift station controlled by floats should follow a pumping pattern over time. The control system can watch for deviations from normal behavior, such as the second pump is taking much longer than normal to pump the station down. This kind of control does not require any special instrumentation, only some programming by experienced engineers who understand system operation.

This concept can expand as well with the use of instrumentation, watching over other components of the system related to pump operation—vibration sensors, temperature sensors, current and voltage sensors, etc.

What are some things that may seem small but add up to bigger problems in the life-cycle of a pump?

The largest life-cycle cost of a pump is the operation, and maintenance of the pump during its lifetime. Pumps running off the pump curve, which is especially common when running pumps on variable frequency

drives, can lead to problems such as premature wear and tear on pump components, which typically go undetected for a long time with damaging consequences. Quite often the controls engineer programming the operation of a pump does not have a complete understanding of the hydraulics of the system.

Another issue that can go undetected and cause damage to pump motors overtime is poor pump motor voltage. Supply voltages that are too high, low, or inconsistent (unbalanced phases) can certainly cause issues for motors over time.

The Submersible Wastewater Pump Association (SWPA) is one of the pump industry's leading professional organizations. To find out more, or become a member, visit **www.swpa.org**.

CALIFORNIA'S WASTE-TO-HYDROGEN PLANT PROVIDES FULLY RENEWABLE ENERGY

Jenbacher engines to bring a "Ready for H2" option to the power grid

BY SUSANNE REICHELT, INNIO

Powering tomorrow's economy requires new technology and innovation. With that in mind, Raven SR plans to use INNIO's Jenbacher 60 Hz engines with to produce renewable energy in a continuous loop. The energy system, including Raven SR's Steam/CO_2 Reformation technology, will power and heat Raven SR's S-Series hydrogen production facility at a sanitary landfill in Richmond, California.

ADDING VALUE, EMPLOYING INNOVATION

Using its proprietary, non-combustion, non-catalytic Steam/CO_2 Reformation technology, Raven SR dependably produces a hydrogen-rich syngas, regardless of feedstock utilized. Raven SR is committed to adding value to local resources and communities while responsibly reducing greenhouse gases and achieving a low-carbon economy. By using modular systems and producing low air emissions, their systems can be located closer to customers and feedstock, creating local fuel from local waste for local mobility.

INNIO's Jenbacher engines and Raven SR's Reformation technology will be fueled by landfill gas (LFG), which will provide power for the non-combustion process that converts waste to hydrogen. The hydrogen product will be resold to power fuel cells in heavy-duty trucks. The Raven SR process also will provide a hydrogen-rich residual fuel containing green hydrogen from the concentration process that will supplement the LFG, fueling the Jenbacher Ready-for-H2 engines to generate renewable power in a continuous loop.

A MODEL MILESTONE

Raven SR, headquartered in Wyoming, transforms biomass, mixed municipal solid waste, bio-solids, sewage, medical waste, and natural or biogas into renewable fuels. Raven SR plans to bring its S-Series online in the first quarter of 2023 at the Republic Services West Contra Costa Sanitary Landfill.

"We are proud to collaborate with Raven on this hydrogen industry first, which is a milestone in the interconnecting of transportation and industry with the power-producing sector," says Dr. Olaf Berlien, president and CEO of INNIO. "This project produces onsite renewable hydrogen from waste, uses a blend of hydrogen to generate energy to power operations, and provides renewable hydrogen for the transportation industry. This is a model example of how innovation can enable sector coupling, which will be critical on the global path to net zero."

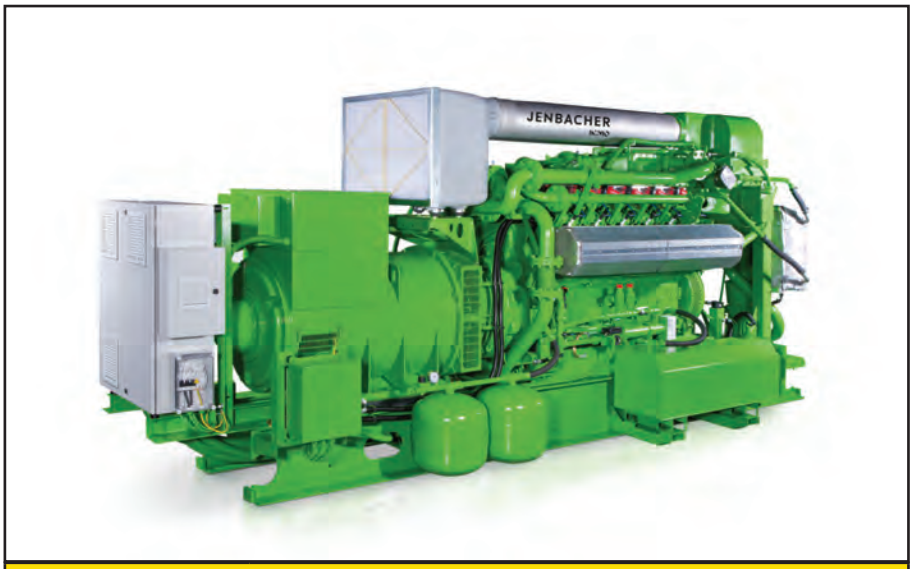
SUCCESS BY DESIGN

This project will initially process up to 99.9 tons of organic waste per day and produce up to 2,000 tons per year of hydrogen.

INNIO is able to meet our delivery schedule and provide engines that are compliant with emissions requirements for a blend of carbon dioxide, methane, and hydrogen. The Jenbacher engines are a very important element for us to realize our objective of producing renewable hydrogen with our non-combustion Steam/CO_2 Reformation process, independent of the grid," adds Matt Murdock, CEO of Raven SR. "Raven's success in the increasing energy and electricity crisis requires that we generate autonomous power on site. To succeed in the energy transition, collaboration among best-in-class engineering around the world is required. We are grateful to work with INNIO on this advanced, self-contained renewable-energy design."

THE FUTURE OF POWER

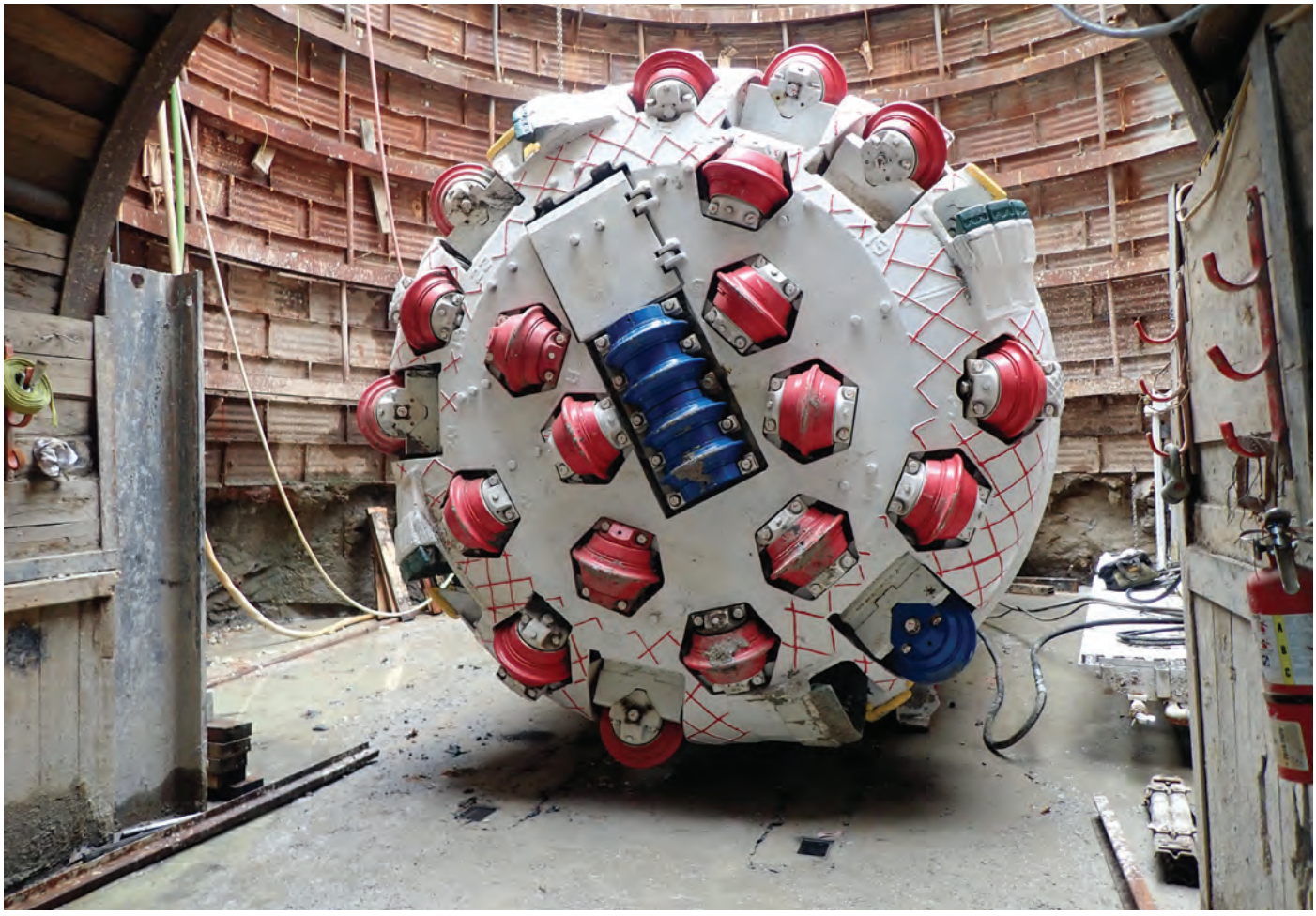
The collaboration with Raven SR's technology offers a strong renewable hydrogen alternative to electrolysis, using less electricity and no need for fresh water. INNIO's Jenbacher engines will allow the Raven SR facility to generate a significant amount of its own electricity, reducing demand on California's electrical grid.



KEY NUMBERS

0	amount of fresh water needed
UP TO 99.9	tons of organic waste to be processed per day
UP TO 2,000	tons of hydrogen to be produced per year

INNIO is a leading energy solution and service provider that empowers industries and communities to make sustainable energy work today. With our product brands Jenbacher and Waukesha and our digital platform myPlant, INNIO offers innovative solutions for the power generation and compression segments that help industries and communities generate and manage energy sustainably while navigating the fast-changing landscape of traditional and green energy sources. We are individual in scope, but global in scale. With our flexible, scalable, and resilient energy solutions and services, we are enabling our customers to manage the energy transition along the energy value chain wherever they are in their transition. For more information, visit **www.innio.com**.



A $46 million project in Greenville, South Carolina, established a 1.3 mile underground tunnel for wastewater conveyance (credit: Black & Veatch).

DIGGING IN

South Carolina project sets up wastewater conveyance for the next century

BY THOMAS RENNER

People are flocking to South Carolina. The state's population soared by 7.4 percent between 2010 and 2020 census, and by 2021 it was the nation's fifth-fastest growing state.

In that ten-year cycle, twenty-five communities in the state saw population increases of more than 40 percent. The population of Greenville, the state's sixth largest city, grew by 27.9 percent. Nearly 76,000 now call the city home, an increase of nearly 20,000 since 2020.

The swift population rise adds additional stress to the city's infrastructure. Fortunately, community leaders saw the need to improve its wastewater infrastructure as far back as fifteen years ago. After years of planning, construction on a 1.3-mile underwater sewer line commenced in 2018 with the goal to improve wastewater conveyance.

The $46 million underground tunnel is the largest infrastructure project in Greenville's history. Renewable Water Resources (ReWa), a ninety-seven-year-old organization that protects the region's waterways and wastewater infrastructure, spearheaded the project. Black & Veatch led the design and provided construction management services. The project, known as the Reedy River Basin Sewer Tunnel or Dig

Greenville, became operational earlier this year.

As ReWa Chief Executive Officer Joel Jones notes, "It's a large area that has seen a good bit of growth. We expect it to continue and accelerate. This project will help facilitate and accommodate that growth, while also protecting against sewer overflows."

CAPACITY PROBLEM

The existing sewer line in Greenville followed the Reedy River basin through the city's downtown district. Near capacity, it faced pressure from Greenville's recent and projected population growth. Without more capacity, the community would be at risk from increased overflows. That risk posed a direct threat to water quality, the environment and economic development.

ReWa considered eighteen alternatives before deciding on the gravity sewer tunnel. Rebuilding the sewer line was prohibitive, and too disruptive to the city and water basin. ReWa chose to install the new line underground, approximately 100 feet below the heart of the city.

The tunnel is 7 feet in diameter and virtually invisible to the public. Entry shafts at each end are the only hint of the massive pipe under the surface. The pipes are encased in granite, lined with fiberglass, and grouted. The gravity fed system means no mechanical equipment is needed to convey the flow of wastewater.

"While it is pricier to build, a deep sewer tunnel powered by gravity will be far less costly over its lifecycle for ReWa while providing the reliable additional capacity Greenville needed as it continues to grow," Jones says.

LEND A HAND

One of the most challenging issues for the contractors emerged right at the outset.

The initial plan was to drill from the downstream access shaft through the hard rock below with a tunnel boring machine. Before the TBM could be launched, however, a geotechnical investigation found the tunnel zone was comprised of soil and different types of rock in varying conditions.

"The tunnel boring machine can only work through one type of material," Jones says. "Right when we were getting started, we saw that the granite was not where we thought it was."

The complication resulted in hand-digging a starter tunnel. Starter tunnel construction also included drill

The project was spearheaded by Renewable Water Resources (ReWa), a ninety-seven-year-old organization that protects the region's waterways and wastewater infrastructure. Black & Veatch led the design and provided construction management services (credit: Black & Veatch).

BILCO, a manufacturer of specialty access equipment, manufactured thirteen floor access doors of various sizes for the project. The doors allow access to vertical shafts in which workers will descend into the tunnel or lower equipment into the tunnel (credit: Eric Glenn Photography).

DIG GREENVILLE

WHAT:
Dig Greenville, also known as the Reedy River Basin Sewer Tunnel, is a 1.3-mile gravity-fed sewer line in South Carolina.

PROJECT DETAILS:
The $46 million project started in 2018 and concluded in 2022. It is the largest infrastructure project in Greenville's history. The project is expected to support Greenville's wastewater conveyance needs for the next century.

WHY IT'S IMPORTANT:
The existing sewer line face pressure from increasing population. Without more capacity, the community would be at risk for overflow.

DIGGING DEEP:
The tunnel is located as far as 100 feet beneath the surface. Few people will even know it's there. The only evidence visible are access points at each end. thirteen floor access doors manufactured by BILCO provide workers access to install, remove and repair equipment.

DID YOU KNOW? Greenville is sixth in population and growth rate in South Carolina.

The existing sewer line was near capacity and face pressure due to the increasing population in Greenville (credit: Eric Glenn Photography).

and blast methods that required forty-one blasts over a nine-month period. Each blast was modified to fit the zone's complex geology. Workers also fabricated and installed a customized steel shield to secure ground support for the 14-foot-round horseshoe-shaped starter tunnel.

"What we found was about 240 feet of clay and rock that we had to dig out," Jones says. "It cost us about 10 months of project time. The tunnel boring machine can dig out about 40 to 50 feet per day. We were only digging out about two feet per day. It was very time-intensive and labor-intensive just to get started."

The tunnel boring machine, known in the Greenville community as "Drilly", carved out most of the tunnel. The 130-ton TBM, made by The Robbins Company in Canada, measures 249 feet and is one of only a handful of similar pieces of equipment in the world. Super Excavators of Wisconsin started tunnel digging in March 2018 and completed their work in September 2020.

"Once we got through digging the starter tunnel, we stayed on a fairly good track," Jones says.

LIMITED VISIBILITY

For a project of this magnitude and duration, workers were surprisingly able to stay out of the public glare. Almost the entire construction was underground, and out of sight of city residents.

Teams constructed wooden fencing around the construction to minimize the aesthetic impact of the project. During a two-month winter period, one roadway was closed off to facilitate quicker construction for a sewer crossing across Richland Creek and to accommodate the city's streambank restoration project.

While largely hidden from the public, the beginning and end points of the construction are identifiable by access doors.

The BILCO Company manufactured thirteen floor access doors of various sizes for the project. The doors allow access to vertical shafts—one is 35 feet deep, the other is 105 feet deep—in which workers will descend into the tunnel or lower equipment into the tunnel.

"We used those types of doors fairly often on our projects, especially at pump stations," Jones says. "We find they have good durability and reliability."

ON TIME, ON BUDGET

Cost overruns seem to impact every infrastructure project. The Greenville project, however, stayed within the confines of its original budget, and the delay in digging the starter tunnel was the only hiccup in otherwise well-executed project.

Now, city leaders in Greenville feel as though they have the wastewater infrastructure in place that can meet the community's needs for the next century.

"This is a critical area in Greenville County," Jones says. "The infrastructure serves a large area, and this tunnel will allow continued growth in the downtown area and northern parts of Greenville County. This project safely and efficiently revitalizes our wastewater infrastructure in the growing Greenville community for the next 100 years."

THOMAS RENNER writes on building, construction, engineering, and other trade industry topics for publications throughout the United States.

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With the goal of eliminating SSOs, KEG's training program corrects common cleaning errors which can waste water, labor, and time.

LIMITING SSOs WITH SUPERIOR SEWER MAINTENANCE TOOLS AND TECHNIQUES

KEG's KleenSight camera-nozzle system provides the ability to clean sewer and storm lines and view roots in a pipe while recording upright high-definition video.

Municipalities reduce sanitary sewer overflows to virtually zero

BY DEL WILLIAMS

Most municipalities are fully aware that preventing sewer overflows is a national enforcement priority for EPA, yet many struggle to stay compliant. Too often, when municipalities are short-staffed and must maintain miles of sewer line, they end up simply responding to emergencies. Instead, a growing number of proactive municipalities are choosing to utilize the most effective tools and techniques, which is helping them to properly maintain the line and stay EPA compliant.

"EPA's compliance goal is to eliminate sanitary sewer overflows (SSOs) from municipal collection systems and to ensure that wastewater is being conveyed to treatment plants in accordance with the requirements of the Clean Water Act. To eliminate

SSOs, EPA uses a mix of compliance and enforcement tools," according to the agency's website.

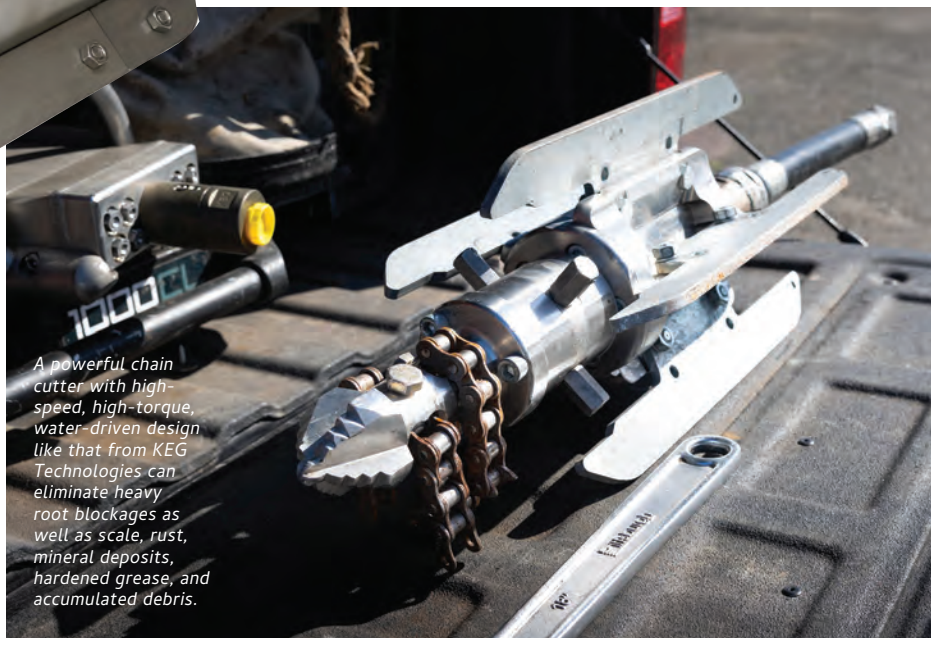
SSOs are overflows or releases from sanitary sewer systems and are illegal under the Clean Water Act. SSOs have a variety of causes, including but not limited to severe weather, improper system operation and maintenance, as well as vandalism. EPA estimates that there are at least 40,000 SSOs each year. The untreated sewage from these overflows can contaminate the nation's waters, causing serious water quality problems. It can also back up into basements, causing property damage and threatening public health.

"Today, one of the greatest underlying causes of SSOs is sewer pipe blockages due to growing tree roots that enter through line defects or openings, combined with inappropriate materials sent to sewers. This includes fats, oils, and grease along with products like baby or facial wipes, sanitary pads, and tampons. Non-degradable wipes are a particular problem when flushed because they get hung up in roots and start catching all the grease and debris.

Everything builds until the line is stopped, which leads to an SSO," says Dan Story, operations manager at KEG Technologies, a manufacturer of sewer and storm line products including nozzles, chain cutters, and camera nozzle systems. The Spartanburg, South Carolina-based company is a member of NASSCO, the National Association of Sewer Service Companies.

Proactively preventing blockages and removing those in progress is critical because failing to do so can lead to devastating consequences. "Sewer pipes fill up from any blockage and can back up into homes or run down the street, so the federal government mandates that a certain amount of sewer line must be properly maintained annually, or fines are levied," says Story.

Fortunately for municipalities, using the industry's most effective tools and techniques can virtually eliminate SSOs, and in some instances, have done so for decades. This is first achieved by preventing most sewer line blockages with powerful nozzles and efficient cleaning. Next, camera nozzles can quickly identify developing blockages during routine cleaning without deploying a separate camera crew. When the blockages must be removed, utilizing various cutters including robust chain cutters can do so quickly and efficiently. Finally, learning the most effective cleaning techniques from experts in the industry can further facilitate proper sewer line maintenance.



A powerful chain cutter with high-speed, high-torque, water-driven design like that from KEG Technologies can eliminate heavy root blockages as well as scale, rust, mineral deposits, hardened grease, and accumulated debris.

PREVENTING SSOs

Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all the sewage that flows into them to a publicly owned treatment works (POTW). However, occasional unintentional discharges of raw sewage from municipal sanitary sewers occur in almost every system.

The first line of defense against such SSOs is to use effective tools, specifically powerful nozzles, to sufficiently clean sewer lines and remove any debris so it does not accumulate to become a blockage. In this effort, using high-performance Tier 3 nozzles instead of lower performing Tier 1 or 2 nozzles can be an important advantage.

Although rated for water efficiency (Tier 1: about 30 percent efficient; Tier 2: 50 to 60 percent efficient; and Tier 3: 75 to 98 percent efficient), top Tier 3 nozzles can also more reliably direct the most force with less water, at lower pressure, to remove debris. The most efficient Tier 3 nozzles, such as KEG's Torpedo and OMG models, are designed with fluid mechanics engineering on a par with the aerodynamics of race cars. After exiting the jetter hose, water travels into the body of the nozzle before moving through smooth, curved channels. This design enables the water to maintain its power and speed before entering the nozzle's replaceable titanium ceramic inserts, which help to straighten the water stream. The water is further funneled to enable an even tighter water pattern to emerge.

The power and reliability of a superior Tier 3 nozzle can help operators clean more line, more effectively, before the sewer truck crew needs to stop work and drive to a hydrant to refill the water tank before

resuming work. According to Story, a Tier-1, 30-degree drilled nozzle running 72 gallons per minute at 2,200 psi will only exert 13 pounds of force to move debris nine feet away from the nozzle. In contrast, a high-efficiency Tier-3 nozzle running 60 gallons per minute at 2,000 psi will exert 98 pounds of force 9 feet away.

IDENTIFYING OBSTRUCTIONS

The EPA can hold municipalities accountable for preventing SSOs in hundreds or thousands of miles of sewer line annually. In addition, proper cleaning and maintenance must be accomplished. For these reasons, waiting for a separate crew with a CCTV truck to access pipe conditions can be insufficient. Out of sight, obstructions will develop into blockages that trigger SSOs when the camera crew cannot assess all line on a regular basis.

To enable timely sewer line inspection when a CCTV truck crew is unavailable, some manufacturers in the industry have developed camera nozzles that capture video while cleaning. As an example, KEG's KleenSight camera-nozzle system provides operators with the ability to clean sewer and storm lines while recording upright high-definition video. The device has a self-leveling camera head and provides its own illumination. Only a jetter hose connection is required—no cables or wires. The camera captures the video in memory and the files are automatically date- and time-stamped for later downloading by wi-fi to mobile devices or PCs for viewing.

Using a nozzle-camera during routine cleaning can capture video that shows if there are roots in a pipe that should be removed before they become a problem.

REMOVING OBSTRUCTIONS

When a serious blockage occurs, it usually results in an SSO, and a chain cutter is used to resolve the situation. Most are hydraulically powered. Although this reduces the overall cost of the unit, many hydraulic cutters supply insufficient power or torque to cut through the heavy roots, hard mineral deposits, grease, or wipes that can be at the core of a blockage. In some cases, the chain cutter can stall or seize up.

"Chain cutter nozzles that utilize water pressure are more efficient and can deliver the required torque to cut through thick masses," advises Story. "The high-pressure water enters the chain cutter nozzle chamber and is directed to spin the cutting chains at high velocity."

As an example, he points to a powerful chain cutter that has a high-speed, high-torque, water-driven design. The chain cutter can eliminate heavy root blockages as well as scale, rust, mineral deposits, hardened grease, and accumulated debris.

"When you remove the roots and debris from the lines, it becomes easy for future debris to pass through on its own. This eliminates the problem of backing up and sanitary sewer overflow," says Story.

PROACTIVE, NOT REACTIVE

When SSOs occur and municipalities are out of EPA compliance, it can be difficult to do more than react. However, proactively maintaining sewer line with the most effective tools and tactics is vital to prevent SSOs and quickly resolve them if they occur. For this reason, KEG offers customized training programs to municipalities that specifically target the challenge of SSOs.

With the goal of eliminating SSOs, the training program corrects common cleaning errors, such as excessive operator speed going up the sewer line, which ends up wasting water, labor, and time when multiple passes are required. Proper line assessment and cleaning speed are taught, which allow operators to adjust to circumstances as needed while minimizing water use.

When operators complete the training, most will understand how to "chop up the debris and let the flow of water work like a conveyor belt, carrying the debris out." They will be trained to "go from manhole to manhole and clean in a single pass." It takes a fraction of the time and resources to make one pass versus making several passes to remove the same material.

The results of being proactive with equipment and training to minimize SSOs have been more successful than might be expected.

"One city in Arizona that we have worked with has not had an SSO in thirty years. It's all about staying on top of your game," concludes Story.

DEL WILLIAMS is a technical writer based in Torrance, California. KEG Technologies Inc. is headquartered in Spartanburg, South Carolina. KEG`s patented fluid mechanics directs high pressure water from a truck or jetter hose in a manner so efficiently they were granted a United States patent, meaning operators can usually clean pipes using less pressure, less fuel consumption, and less time than other less efficient nozzles. For more information, call 866.595.0515 or visit **www.kegtechnologies.net**.

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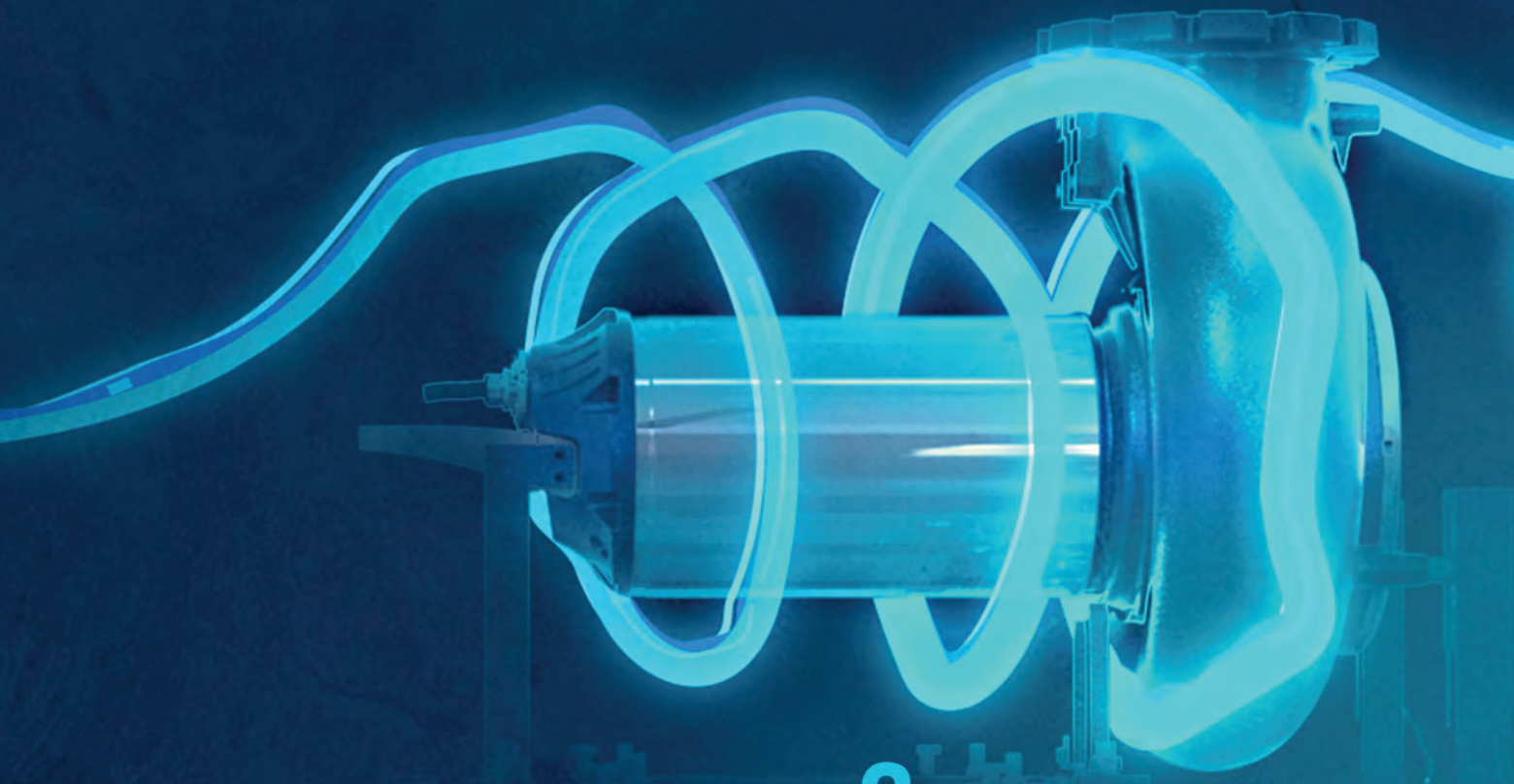

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REVITALIZING THE CIVIL NUCLEAR INDUSTRY

Benefits raise the bar across the entire engineering supply chain

BY JULIAN VANCE-DANIEL, VESSCO ENGINEERING

What has an SME Tier 2 welding and pressure-vessel fabrication business in Mid Glamorgan got in common with the global behemoths of nuclear engineering: prestigious world-beaters like GE, Jacobs, and Balfour Beatty?

Quite a lot as it happens. Such is the rigor for safety, regulation, and quality in the United Kingdom's civil nuclear industry, that a whole supply chain is being drawn into a process of business and engineering improvement that is proving beneficial for British engineers across myriad other industries. Going nuclear is good.

THE BENEFITS OF NUCLEAR ENGINEERING METHODOLOGY

The U.K. government has announced plans this year to build up to eight new nuclear reactors in the United Kingdom, aimed at improving the country's energy independence and reducing greenhouse gas emissions, as well as creating thousands of new jobs.

At present, the only stations planned or under construction in the United Kingdom are EDF's European Pressurized Water Reactors (EPR), at Hinkley and potentially Sizewell, with two reactors at each site. The commitment to the nuclear build program will, it is hoped, not only deliver the generating capacity required (if all the goals in the government's strategy are met, nuclear could provide 20 to 25 percent of U.K. electricity needs by 2050) but bring significant economic benefits to the United Kingdom, including to the nuclear supply chain. Successful delivery will strengthen the perception of the U.K. supply chain, which will be important given that foreign competition is strong and U.K. firms will face a significant challenge from overseas companies vying for the same work. An expanded and

more capable supply chain should be well positioned to access new home and export markets, and implicit in this is a focus on enhanced quality.

One could reasonably ask what all this has got to do with a medium-sized fabrication business in South Wales? Actually, in my experience, quite a lot because the transfer of knowledge and enhanced processes we have gained directly from experience of working in this ultra-safety-regulated and highly rigorous sector has undoubtedly impacted the quality of our delivery in other market sector applications. In our case that includes the water utility industry, chemicals manufacture and the oil and gas sectors. What is also clear is that we are not alone; our experience is being mirrored widely elsewhere across the nuclear Tier 2 and Tier 3 supply chain.

A TRACK RECORD OF SUCCESS

Vessco Engineering, accredited with the Fit for Nuclear Standard (F4N) in 2018 and a member of the Wales Nuclear Forum, specializes in the fabrication of pressure-vessels, heat exchangers, columns, and other similar mechanical structures. Over the past seven years the business has been able to build a strong track record in the nuclear sector, with a variety of commissions, from nuclear processing sites such as Sellafield and power generation sites like Hinkley Point C, through to experimental fusion facilities for STEP (Spherical Tokamak for Energy Production), and others, both in the United Kingdom and abroad.

Work recently commissioned includes an assignment to support Jacobs' contribution to ITER in France. ITER (International Thermonuclear Experimental Reactor) is an international nuclear fusion research and engineering project aimed at creating energy by replicating, on Earth, the fusion processes of the Sun. Jacobs is responsible for coordinating the assembly of more than a million components in the ITER machine, including the first wall panels which protect the machine from plasma temperatures of up to 270,000,000 degrees Fahrenheit (150,000,000 degrees Celsius); the test blanket modules, which are an essential part of breeding tritium to fuel the fusion reaction in future reactors.

Our support to this extraordinary project involves manufacturing two large vacuum corrosion-monitoring vessels, each 5 feet in height, 5 feet in diameter and weighing up to 44 tons—design on these will be completed next year.

For obvious reasons, material-sourcing and provenance is vital in the manufacture of all pressure systems, but for the nuclear industry especially its importance in the manufacture of components is on a completely different scale. Materials' cleanliness and welding perfection are prerequisites, but by far the most important factor demanded by principals and Tier 1 contractors in

nuclear is safety—for workers and of course end-users.

PREPARING FOR WHAT'S TO COME

The Hinkley Point C project, which started in 2018, involves the fabrication of a series of enormous deaerators and feed water tanks, each weighing in at 363 tons. So large in fact that they will need to be shipped in sections and completed on site. These vessels alone have been a three-year labor of love, such is the tonnage and size of each vessel—exceeded in dimension only by the main reactor vessels themselves.

Each, once assembled and in place, must be able to withstand 20 bar pressure and temperatures ranging from ambient to 392 degrees Fahrenheit (200 degrees Celsius). Manufactured in three sections, the first of the two fully assembled 180-foot-long cylindrical pressure vessels will be completed in the first quarter of 2023, to be installed internally with four ferritic stainless steel deaerator units, and capped with crown and petal dished ends.

So, what is it about the realm of nuclear engineering which raises the game for our work in other sectors? Again, it starts and ends with safety. A culture of absolute perfection literally pervades the entire manufacturing process because, bluntly, the scale of potential harm due to error is incalculable. Everything therefore aligns with the regulatory expectations placed on the U.K. Nuclear Licensees and is shared throughout the nuclear supply chain to support quality improvements. These range from BS EN ISO 9001 and the existing codes and standards within the Nuclear Industry; Office for Nuclear Regulation's (ONR) Technical Assessment Guides (TAGs), IAEA's General Safety Guides (GSG), and a host of others.

BRINGING IT ALL TOGETHER

At a practical level this has meant the intensity and precision of the documentation is much greater than we had anticipated, and that in no way underestimates the quality systems with which we were already familiar in our work in, say, the oil and gas sector, which has its own inherent risks to manage.

Nonetheless, and in terms of on-site production processes, the level of scrutiny is also a lot higher than we had been used to. All of this, of course, impacts on time and cost, which is undoubtedly one of the key learnings we have taken away when it comes to estimating new projects. In fact, so much investment of time and planning and trialing has been necessary in the fabrication of the first HPC vessel that cost-recovery and margin won't come through until the closing phases of the second 363-ton structure.

Through this iterative process we have learnt how to weld the superstructures better, how to manufacture the dished heads in a different way, how to speed up the fitting and welding of the nozzles, and so on. We have also determined how best we can run different parts of the structure in parallel, rather than do everything in one long sequence, although given the limited working space within and around some parts of the vessel structures, there's only so many pairs of hands that safely can be useful at any one time. We have none of the space advantages that one might have, for example, in building an aircraft carrier. The vessel in making has to be rotated in place so we can have the necessary working space to access all of the necessary surfaces, externally and internally. Thereafter, we can manufacture the internals, concurrently with the main vessel, including the saddles, bringing all of the various elements together at the end.

A BRIGHT FUTURE

Looking ahead, the time taken earlier for the initial designs, development, and procedural documentation can safely be cut back dramatically. In fact, the whole production cycle should be reducible by up to two-thirds of the original cycle, allowing the procedures to be performed in a more time efficient manner. Going forward, this will enable us to manufacture more cost-effectively.

All these are valuable learnings which can feed back into the nuclear realm for other manufacturers facing similar challenges, and has led to us using those learnings to provide consultancy services, supplying clients with experiential data on the length of time it takes to manufacture specific structures and components, all of which will be useful across the supply chain. Importantly, however, it can also add value in other market applications and, in our case, some of these have informed work completed, for example, in the design and manufacture of heat exchangers for the chemicals industry, and the same applies for work we will be commencing shortly for a major water treatment center in the Midlands.

Interestingly, one of the downsides of the nuclear sector's rigor is the

pace and resistance to incorporate potential learnings from other industries. For example, synergic MIG welding techniques are superbly suited for delivering neat fabrication quickly, but this is not yet approved for use in civil nuclear. In due course, for the right applications that may come. In the meantime, there's good reason why most of the traffic of learning is one-way.

Learning how to prepare for inspection and test plans and incorporating these well in advance in the organization of workflow, provisioning for the right welding procedures for each application, building up a library of procedures and techniques for future use, all feed into a compendium of best practice aimed at reducing time and improving quality. Reiterative documented learning in this way eventually reduces forty days of process down to fifteen while improving the quality, and above all the safety, of the end product.

JULIAN VANCE-DANIEL is director of Vessco Engineering in Bridgend, part of the LTi Metaltech group. Vessco Engineering was founded in 2006 to support local industries in and around South Wales with general fabrication work and the fabrication of air cooler header boxes. Its first vessels were small, relatively low-pressure filter-type units. LTi Metaltech has earned the trust of many world-leading organizations in a variety of technical sectors over the years. For more information, visit **www.vesscoengineering.co.uk**.

IDIOT-PROOFING THE ANAEROBIC DIGESTION PROCESS

Multi-crusher proves itself no rotten tomato

BY DAVID BROWN, BÖRGER

Family business Guy & Wright have been growing tomatoes for almost a century.

On the website of tomato producer Guy & Wright, the company (established 1928) describes itself as "being complete idiots; building our own AD plant."

Fifteen years ago, when the first 63,500-cubic-foot digester was built on the 100-acre site in Hertfordshire, England, John Jones (great grandson of the Guy half of Guy & Wright) could be forgiven for wondering what on earth he'd taken on. As if producing hundreds of tons of top-quality tomatoes each year wasn't enough to think about, he was now coming to terms with that very steep biogas learning curve of feedstocks, temperatures and digestates.

A decade and a half on, with a second, 247,200-cubic-foot digester, no energy bills, and enough excess power to sell for the equivalent of 1,500 homes, Guy & Wright are a shining example of how to survive and thrive though diversification into renewable energy.

None of us could have predicted the sudden, massive leap in energy prices that are such a challenge today, but even in the early 2000s, rising fuel costs were already a big concern for John Jones. In the heat-thirsty production of tomatoes, he knew he had to act in order to protect and develop the family business.

STARTING THE TRANSITION

At first, five natural-gas-powered 115kW micro-turbines were installed

Feedstock for the AD process at Guy & Wright includes cocoa powder, citrus fruits, grain, and potatoes.

to produce hot water, electricity, and carbon dioxide. This process enabled Guy & Wright to apply for ROCs (renewable obligation certificates), which at the time, allowed generators of renewable energy to sell on and receive a premium, as well as the wholesale electricity price. But with those gas prices rising steeply, Guy & Wright soon reached the point of no return, investing in a 500kW CHP (combined heat and power) engine from Edina, converting three of the five turbines to run on biogas.

The investment in carefully-sourced equipment also saw the start of what has become a long and productive relationship with Börger; best known for its rotary lobe pumps, but also makers of key farming/biogas kit.

In 2008, a Börger Multi-crusher was put into operation to reduce feedstock particles down to 8 millimeters to enhance the anaerobic digestion process. One might expect there to be no shortage of waste from growing so many tomatoes, but John Jones' son, Rob, who now runs the biogas operation, soon saw that tomato leaves were not only extremely difficult to break down but also low in calorific value.

MILKSHAKE CONSISTENCY'

So, as the never-ending fine-tuning of the AD plant continues, locally imported waste now includes citrus fruits, potatoes, grain and cocoa powder—plus processed DAF sludge from an ice cream manufacturer. This provides liquid to help create a "milkshake" consistency that the digesters will benefit from far more than a consistent supply of more solid material.

"The Börger Multi-crusher certainly proves itself as a very durable and effective piece of kit for the demands of an AD plant," says Rob Jones. "We keep one Multi-crusher as a spare so that in any eventuality, we can keep operating—with two always on the go, plus an additional unit now on order. They work very well for us."

BUILT ON—AND FOR—SUCCESS

Based on the proven Börger Rotary Lobe Pump, the Multi-crusher chops coarse material to ensure that downstream machines and pumps operate smoothly. The Multi-crusher homogenies mediums at throughput volumes of up to 11,300 cubic feet per hour. In addition to food waste, it can handle fibers, pieces of wood, plastics, membranes, and textiles across a wide range of applications.

The team at Guy & Wright adds, "Investing in our first CHP was a real turning point, and as we've grown the biogas plant, converting (covering) our old lagoon into a secondary, 247,200-cubic-foot digester, we've not hesitated to invest in more Multi-crushers from Börger".

The covered lagoon at Guy & Wright produces enough gas to run two of three CHP engines—and also provides retention times of up to six months, compared to most biogas plants where it is just thirty days. Every last bit of gas is extracted".

Guy & Wright secured another Börger Multi-crusher when it began taking in liquid animal bi-products, for which they also needed a (7.5kW)

Guy & Wright were the first in the biogas industry to take exhaust gas from a CHP and convert it into carbon dioxide for glasshouses.

Pumps and Multi-crushers from Börger have played an important role in the success of the Biogas plant at tomato producer, Guy & Wright.

The Börger Separator at Guy & Wright, which has resulted in capacity no longer be lost in the lagoon.

Börger pump. Utilizing this type of byproduct (via a new pasteurizer) has provided another important string to the Guy & Wright bow, enhancing biogas yields by having a feedstock with a high calorific value and also less digestate to deal with.

Two biomass boilers are also now in the fleet of machinery, providing much-needed additional heat to the nursery during winter. Hot water is stored in a buffer tank so that it can be used on demand. Guy & Wright have also become the first company in the biogas industry to take exhaust gas from a CHP and convert it into carbon dioxide for the glasshouses. The gas is cleaned by a special system of catalyst bricks that absorb harmful gases; leaving the resulting carbon dioxide (which is piped into the glasshouses) at perfectly safe levels. This also aids the photosynthesis of the tomatoes, resulting in more plentiful flowers and fruits.

ADDING THE NEW BÖRGER SEPARATOR

Always looking for improvements, Guy & Wright turned to Börger again to address the dwindling capacity of the plant's open lagoon. Working together with four nearby farms, there had been problems with blockages during spreading with an umbilical system, but that's all changed for the better now, thanks to the purchase of a Börger Bioselect Separator.

Using a purely mechanical process, liquid is separated from solids in the medium, so that nutrient-rich (PAS 110-approved at a maximum of 2 millimeters) organic matter can go back to the land as a top-quality fertilizer. A combination of separation machine and two Börger Rotary Lobe Pumps, the Separator is load-triggered. The feed pump only conveys the volume that the Bioselect is able to process. The high-density solids discharge pump determines the degree of thickness.

"We no longer lose capacity in our lagoon," concludes the team at Guy & Wright. "This is due totally to the Börger Separator, which protects it. Works an absolute treat."

Börger designs, produces, and sells pumps, chopping units, and entry technology for pumping low to highly viscous and abrasive media—including its core component, the patented Rotary Lobe Pump. Börger's guiding principle has always been to make things better. In the meantime, Börger manufactures many other products. For more information, visit **www.boerger.com**.

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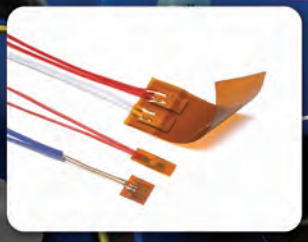

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HYDROGEN INNOVATION DELIVERS CLEAN ENERGY

The drive for a renewable, carbon-free energy transition hits home in California

BY BRIAN BURKOWSKY, EMERSON

Hydrogen use is growing rapidly worldwide to provide a clean source of energy in a variety of industrial applications, but until now the residential market has had limited use. This situation is changing as utility companies worldwide are exploring delivery solutions to enable their customers to use hydrogen for emission reduction.

For example, Southern California Gas (SoCalGas), a regulated subsidiary of Sempra Energy, is working with Emerson to deploy digital technologies, software, and services to demonstrate the resiliency and reliability of a hydrogen microgrid for southern California utility consumers.

The [H2] Innovation Experience is one of the first projects of its kind in the United States, and it shows how this carbon-free gas made using renewable electricity can be consumed in pure form, or blended with natural gas to fuel clean energy systems of the future. Now operating, this demonstration project provides a path to reducing emissions from home energy use—another critical contribution to a cleaner energy future.

EMISSIONS ARE THE ISSUE

Current electric and natural gas production and distribution systems provide a reliable source of low-cost energy to billions of residential customers worldwide, but more effective and efficient appliance designs can reduce emissions at use points.

Electricity is typically generated by large plants and facilities, and then distributed to residential customers. This system works well in terms of reliability and cost, but limitations arise due to a variety of factors. Fossil-fueled generation results in emissions, and there are limits regarding how much power can be produced by hydro, geothermal, nuclear, and other low- or zero-carbon energy sources. Solar and wind power are an alternative in some locales, and stored hydrogen can smooth out the intermittent nature of output from these sources.

Natural gas is the cleanest-burning of all the fossil fuels, largely because of its high hydrogen content of four hydrogen atoms for each carbon atom. It is by far the lowest cost and most plentiful source of energy for many residential applications, including space heating, water heating, drying laundry, and cooking.

Alternative sources of energy, primarily electricity, are much more expensive for these types of residential applications, rendering them impractical for many. And, has been shown in many natural disasters, the natural gas distribution system is much more resilient than the electrical distribution system, largely because it is underground, and thus protected to a large extent from storm damage.

But despite these advantages, even the most modern natural-gas-fueled appliances produce some level of carbon dioxide emissions. The [H2] Innovation Experience addresses this and other issues by reducing emissions and providing other benefits.

CLEANER ENERGY GENERATION AND USE

SoCalGas commissioned its project [H2] Innovation Experience to provide a working example of what tomorrow's residential energy system could look like (see figure 1). The nearly 2,000 square-foot home is outfitted with solar panels, a power storage battery bank, an electrolyzer to convert solar energy to renewable hydrogen, and a fuel cell to supply electricity. Hydrogen, produced at the site, can also be blended with utility-provided natural gas and used in the home's heat pump HVAC unit, water heater, clothes dryer, and stove.

Gas flow and precise gas concentrations are monitored and controlled with control hardware, instrumentation, and software provided by Emerson and integrated by Caltrol Inc., an Emerson Impact Partner. The [H2] Innovation Experience is effectively a small-scale

Figure 1: Now operating, this home in Southern California demonstrates practical implementation of a future residential energy system.

microgrid, able to reliably deliver power in multiple forms when energy is needed. Such installations can provide long-duration energy storage, along with low-carbon distributed power. When constructed on a larger scale, this type of system could provide clean energy to residential neighborhoods and businesses.

The Emerson- and Caltrol-designed control system balances energy supply and demand within the home, and the system contributes energy to the local grid when possible, either as electrical power or by blending hydrogen into the natural gas distribution system, all with zero-carbon emissions.

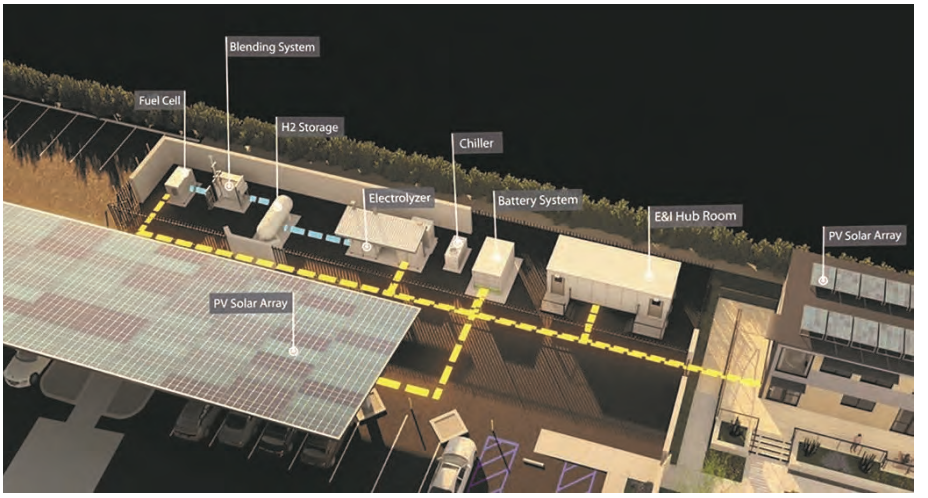


Figure 2: SoCalGas's [H2] Innovation Experience demonstrates a full range of possibilities for clean energy residences.

IMPLEMENTATION DETAILS

In addition to deep domain expertise in hydrogen, Emerson delivered advanced process control systems to SoCalGas, as well as:

- Safety instrumented systems
- Electronic marshalling technology
- Instrumentation
- Final control elements
- Analytics solutions

These work together to help meet the utility's environmental, social, and governance goals—as well as safety requirements.

The [H2] Innovation Experience is powered entirely by electricity generated by a photovoltaic array. During a sunny day, immediate power requirements are provided by the array, plus it has additional capacity to charge a large stationary battery and/or feed power into an electrolyzer to manufacture green hydrogen.

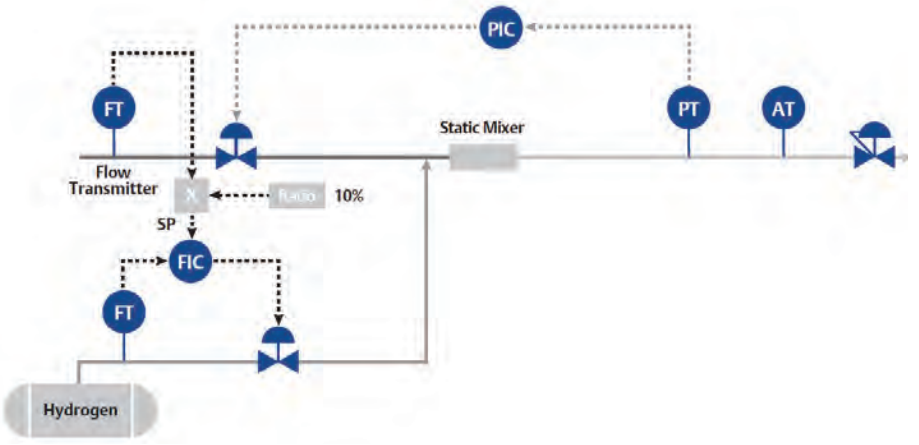


Figure 3: Adding hydrogen to natural gas at a fixed ratio depends on accurate measurement of flow and pressure for both lines, with the final ratio verified by an analyzer.

This arrangement offers multiple energy supply and consumption options:

- The residence can store compressed hydrogen, and feed it into appliances (e.g., water heater, clothes dryer, etc.), modified to burn pure hydrogen, or blend it with natural gas for use with standard appliances.
- If electric power is needed in excess of what the array can provide, at night for example, it can be drawn from the battery, or stored hydrogen can be fed into a fuel cell to create electric power. A fuel cell creates heat as well as electric current, so maximum efficiency occurs when the heat is used for hot water or warming the residence.

Operating an electrolyzer and internal blending station requires an appropriate level of control to follow consumption closely, requiring flow control across a high turndown range. Depending on the number of natural gas consuming applications in use at any given time, the amount of hydrogen added may be at maximum or turned down to virtually zero. Maintaining a consistent hydrogen feed rate requires, minimally, monitoring the natural gas feed flow and pressure so the blending system can calculate the maximum addition rate.

An analyzer must be used to determine the actual composition after mixing. Unfortunately, relevant analyzer technologies may be fast by analyzer standards, but are slow compared to a flow meter, and the lag time is too long for controlling a loop if loading changes frequently. For example, this can happen if a large appliance consuming a significant proportion of the total flow starts or stops, as with a clothes dryer.

A more sophisticated approach (see figure 3) is used in this case for monitoring the flow of both natural gas and hydrogen to determine the appropriate ratio, with an analyzer (Figure 4) verifying the mix. This approach is especially critical if gas supplied to the residence already has hydrogen blended with it from other sources upstream.

This arrangement requires multiple flow meters, pressure transmitters, control valves, and an analyzer, all supported by an automated control system. It reads the process variables, makes all necessary calculations, and adjusts various valves to ensure a desired mixture, confirmed by the analyzer. It must have the ability to adjust quickly to load changes, even where they can be unpredictable and abrupt.

The control system reliably performs all these functions and more, providing a high degree of efficiency for the entire system.

CONCLUSION

These types of residential and small neighborhood-scale facilities, like the [H2] Innovation Experience, can generate, store, and transmit electricity with zero carbon emissions, and will thus be a critical component for meeting sustainable power demand. Emerson equipment and Caltrol know-how facilitated a shorter startup, while ensuring the safety and reliability of the systems necessary to make this approach practical.

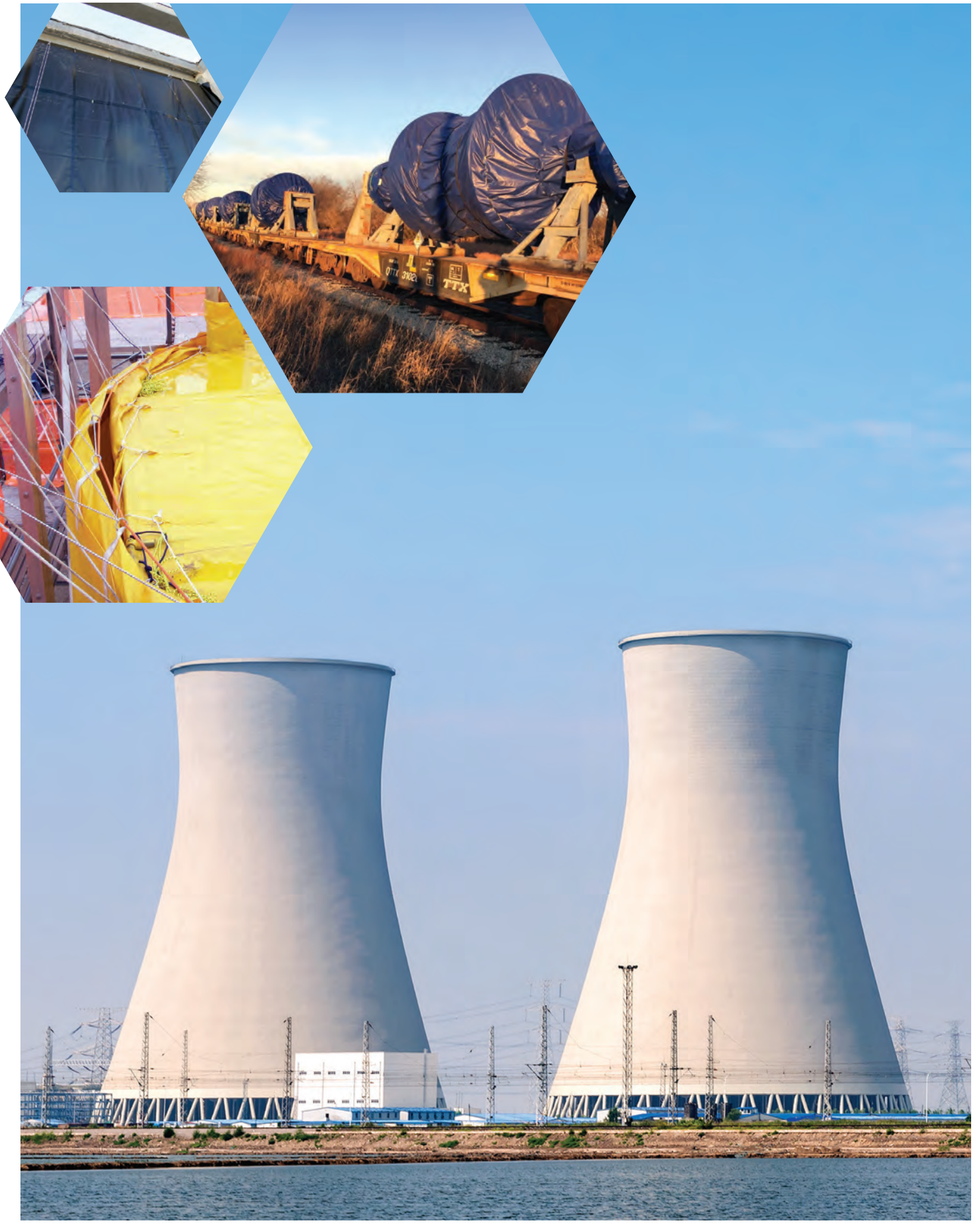
Balancing energy consumption optimally with existing sources requires sophisticated control and precise measurement. Emerson has provided automation solutions and expertise on a wide variety of hydrogen projects globally, often working with its Impact Partners near the sites, as it did with SoCalGas and Caltrol on this project. The potential for hydrogen to make power distribution more sustainable is enormous and shows how the utility industry, and individual consumers, could benefit from it as a practical means of change.

While just a single home, this project shows what's possible, and its solutions can be implemented

Figure 4: A thermal conductivity gas analyzer monitors all the components critical to natural gas blending.

all at once for new construction, or they can be retrofitted one at a time for existing residences. Either approach empowers consumers to play their part in reducing emissions, following the actions of many industrial and commercial plants and facilities worldwide.

BRIAN BURKOWSKY is a hydrogen strategy specialist for Emerson. Emerson is a global technology and software company providing innovative solutions for the world's most essential industries. Emerson is an automation leader that helps process, hybrid, and discrete manufacturers optimize operations, protect personnel, reduce emissions, and achieve their sustainability goals through its unmatched automation portfolio. For more information, visit **www.emerson.com**.


TTX

REINFORCED LAMINATES OFFER MANY USES FOR THE POWER INDUSTRY

Griffolyn® products provide high strength, versatility, and corrosion protection

BY MARK MULLIN, REEF INDUSTRIES

Power plants are filled with applications that require tarps or other barriers to protect equipment and workers from unwanted exposure to a variety of things. In some cases, protection is needed from the weather, including both hot and cold temperature extremes, as well as exposure to rain, snow, wind, or sun. In other situations, foreign material presents a danger, and a rugged barrier material is needed to keep potentially damaging dirt, dust, and debris from entering systems. These situations and more make material providers who can evaluate potentially debilitating plant situations and develop solutions to mitigate the hazards a vital partner to power generating companies.

Griffolyn® is a high-quality, internally reinforced polyethylene laminate manufactured by Reef Industries. The material is designed for a wide range of applications. Its patented, high-strength reinforcement provides superior puncture, tear, and abrasion resistance, even in the most demanding of situations.

Griffolyn can be formulated with many enhanced performance characteristics. From outstanding weathering characteristics to custom features, such as fire retardancy, anti-static properties, corrosion inhibition, or heat shrinkability, Griffolyn products offer a range of features to meet almost any power plant need.

CUSTOMIZED TO ANY SIZE AND SHAPE

Among the uses some power plant operators have found for Griffolyn are as corrosion protection, equipment storage and shipping covers, landfill covers, vapor and moisture barriers, dust and environmental partitions (see figure 1), contaminated soil covers, tarps, and more. The possibilities are virtually endless.

Griffolyn is commonly available in white, black, and clear, but custom colors are also available upon request. The product is a cost-effective and durable solution to prolong the service life of power plant investments.

For example, a municipal utility in Texas worked to solve a problem they were having at one of their power plants. Reef Industries went out to the site a couple of years ago and had its technicians take some measurements. Then, the team made some custom tarps for them to fit around some of their equipment, creating partitions.

Figure 1: Custom partitions are just one of the many uses for Griffolyn internally reinforced polyethylene laminate.

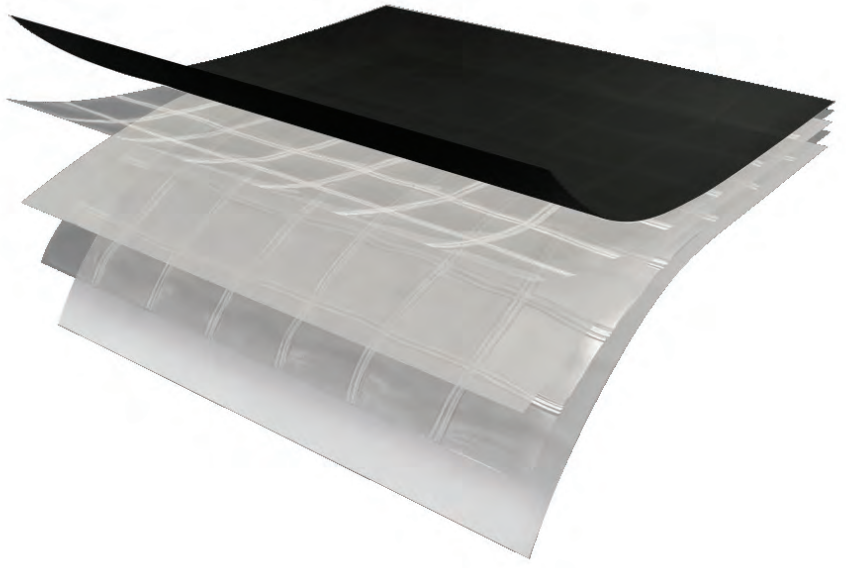


Figure 2: Each layer contributes to the quality of the film and enhances its performance.

Having custom partitions helped keep birds out of the units, but more importantly, it protected vulnerable areas in the units from harsh weather. When the area experienced the hard freeze in Texas in February 2021, the municipal utility had everything ramped up to the fullest. The partitions helped keep them from shutting down.

LAYERS EXTEND LONGEVITY AND ENHANCE PERFORMANCE

When it comes to plastic sheeting, it is important to understand the strength and thickness of the film, its composition, additives, chemical makeup, and the job it must perform. These factors will help determine if a film is fit for the task.

Many improvements have been made to polyethylene film such as Griffolyn since it was first used to cover greenhouses in the 1960s. Most polyethylene film is manufactured as a co-extrusion of three layers with different polymers and additives (see figure 2).

It is important, however, to consider more than just a film's mil thickness. The fact is polyethylene film life is limited due to degradation processes induced by sunlight and heat. For example, co-polymer poly is a low-cost material, but it is only good for about one season. Therefore, if the film is expected to be regularly exposed to sunlight, a greenhouse-grade poly with ultraviolet (UV) protection is often a better option. While the cost could be twice that of co-poly, the product has a life expectancy of four years or more, which ultimately saves customers money. In high-wind locations, a woven poly or scrim-reinforced material could be the best option. That's why Reef Industries' technicians are so valuable—they know what their products are capable of and can recommend the best option for a given application.

"We're a custom fabricator," says one Reef Industries technician. "We can make whatever shape or size Griffolyn product a power plant needs—box-shaped items, openings with grommets, or anything else you can imagine. We can formulate a specific tarp, go out, measure the equipment or the structure, and we custom fit these things to the application." For example, equipment at one facility is often different from that at another, but because the group is custom-creating each solution, the end product is always ideally suited to the situation.

FOREIGN MATERIAL EXCLUSION

The nuclear power industry has unique and closely monitored requirements designed to enhance plant safety, and one thing nuclear operators and maintenance staff take very seriously is foreign material. Foreign material intrusion into primary or secondary plant systems, equipment, and components can cause fuel damage, safety equipment inoperability or degradation, lost generation, high radiation, and increased contamination levels.

The Electric Power Research Institute (EPRI) has reported that single instances of foreign material intrusion have cost hundreds of millions of dollars due to damage to plant equipment and complicated recovery requirements. Therefore, foreign material exclusion (FME) is an industry-wide initiative that all nuclear plant personnel—permanent and supplemental—must enforce.

Nuclear power plants generally conduct refueling outages on an eighteen- or twenty-four-month cycle. During these routine maintenance periods, FME programs are used to prevent debris and foreign objects from entering components. Many FME barriers are available for different situations, and Griffolyn has been used at some nuclear plants for these purposes (see figure 3).

For example, Reef Industries was called about a bird situation at a nuclear facility in the southern United States. The birds were getting into the area over the plant's spent fuel pool and their guano was changing the pH level of the water. They take that stuff pretty seriously, especially the foreign material exclusion. That's just something they have to have—these barriers to prevent things from happening—they can't have contaminants in there. Reef designed a custom tarp to prevent that from happening.

Heavy-duty nylon covers are some of the most frequently used FME barriers. These standard nylon covers provide a cost-effective way

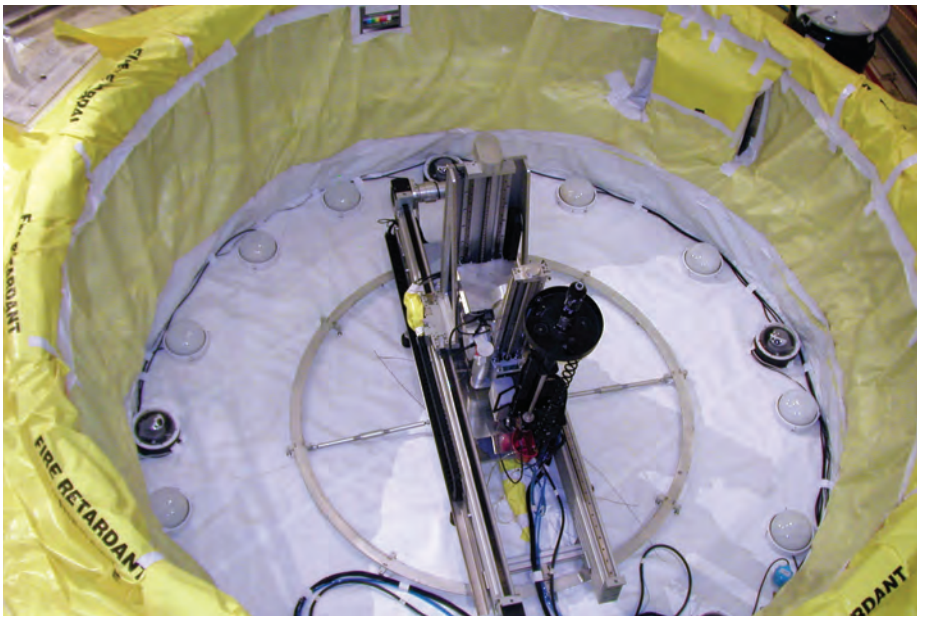


Figure 3: Foreign material exclusion is vitally important to nuclear power plant safety. Griffolyn tarps have been used to prevent intrusion of dirt, dust, and debris in nuclear plant systems.

Figure 4: Heat shrinkable wraps with a volatile corrosion inhibitor incorporated in the film are an excellent way to protect equipment from corrosion during shipment and while in long-term storage.

to prevent foreign material intrusions. Vented FME covers allow pressurized systems to be covered more safely than with non-vented covers. Nylon FME barriers of all sizes are a convenient way to maintain foreign material control. Furthermore, FME tarps are often used to ensure machines and other components that are important, sensitive, or valuable do not get contaminated or damaged by foreign objects. Designing these critical tarps and covers regularly involves taking precise measurements and meeting extremely tight tolerances, which Reef Industries technicians have proven to be adept at doing.

PREVENTING SPREAD OF CONTAMINATION AND PROTECTING EQUIPMENT DURING SHIPMENT

Another application for which the nuclear industry has relied on Griffolyn products is to cover contaminated components and prevent the spread of contamination. In fact, Reef Industries has been providing reliable storage and contamination control solutions to the nuclear industry for more than 60 years. Like other Griffolyn products, contaminated equipment tarps are tough and durable, and come in a variety of shapes, sizes, and colors. Whether customers want to reduce shipping costs, maximize facility use, comply with regulatory requirements, or save time and money, the value and performance of Griffolyn are unsurpassed.

Furthermore, these high-quality plastics can be produced with specialized properties including fire retardancy for safety applications, anti-static for critical equipment, and are incinerable to reduce the volume of radioactive waste. Additional tie-down methods, such as grommets, D-rings, webbing straps, pipe loops, and drawstring closures, are also available to help secure contaminated equipment covers in place.

There are plenty of non-nuclear power plant applications for which Griffolyn tarps and FME covers also make good sense. Boiler manufacturers have found heat shrinkable wraps help to keep shipments clean and reduce corrosion (see figure 4), especially when combined with other rust prevention methods, such as incorporating a volatile corrosion inhibitor (VCI) in the plastic film.

VCI is a technology that simplifies the corrosion process and is ideal for keeping items such as packages, equipment, and metal cavities rust-free. VCIs work by releasing molecules from corrosion inhibiting compounds into the air. When these compounds touch metal surfaces, they form a thin layer of molecules that prevents air and moisture from coming into contact with the surface, which effectively inhibits corrosion.

VCIs are considered one of the better rust prevention methods because the corrosion inhibiting molecules have the ability to protect surfaces that are difficult to reach with traditional rust prevention products. That's because the VCI transforms from a solid or a liquid into a gas, which permeates throughout the area to be protected and forms a molecular barrier layer. This layer then blocks other molecules, such as water or oxygen, from attaching to metal surfaces.

VCIs can be applied against equipment or incorporated into

a material, such as Griff-Shrink®, which is a patented multi-ply heat-shrinkable laminate. Griff-Shrink three-ply VCI consists of layers of UV stabilized polyethylene, cord reinforcement, and high-strength shrinkable film. Reef Industries' five-ply VCI product combines alternating layers of reinforcing between three layers of specialty shrink films and polyethylene for a heavy-duty cover. One advantage of VCI incorporation is that parts can be stored with the film applied without rust preventative oil, which often requires careful and time-consuming cleaning before a part can be used. Large equipment has been wrapped in VCI shrink film for long-term outdoor storage with excellent results.

Nobody likes to see rust on new components, but the issue goes beyond just visual aesthetics. Rust not only degrades the appearance, but can also hinder equipment operation, causing sticking, in some instances, or even causing components to seize in extreme cases. That's why taking precautions to protect investments is important.

PROVEN PERFORMANCE WITH WIDE-RANGING SPECIAL FEATURES

Reef Industries began producing Griffolyn in 1957. It has proven to be a high-quality product that has countless applications in many different industries, including the power sector. Among the attributes that make Griffolyn so versatile are weather and corrosion protection, antistatic, chemically resistant, lightweight, fire retardant, heat shrinkable, low permeability, UV stabilized, puncture resistant, fire rated, and long outdoor life.

MARK MULLIN is Griffolyn product manager with Reef Industries. For more than sixty years, Reef Industries has been manufacturing and fabricating reinforced film laminates and composites. Its expertise in producing quality, custom configured final products ensures customers' needs are always met in a timely and professional manner. Reef Industries offers a wide range of products, material grades, additives and fabrication capabilities to meet or exceed requirements. For more information, visit **www.reefindustries.com**.

2022 TOP PRODUCTS

Whether it's at product launches, factory tours, or trade shows, the staff at MPT is afforded an up-close look at the newest offerings for our industry, and each December, we look back on the year that was and present our choices for the Top Products spanning the industrial pump and rotary equipment markets.

In the pages that follow, MPT shares its selections for the products that speak to the industry's needs for efficiency, reliability, and innovation. Each of our Top Products was chosen through submissions from our staff, advertisers, and readers like you. The products range from large multinationals you're likely familiar with to smaller, regional suppliers worthy of your attention.

Regardless of their size or reputation, they all offer value you can take into the new year. Enjoy!

BLACOH INDUSTRIES

SURGE TRANSIENT PRESSURE MONITORING

Often referred to as surge or water hammer, transient pressures occur when there is a rapid change of fluid velocity in a pipeline as a result of normal and sometimes unplanned operations, such as the start/stop of a pump or the closing of a valve. These pressure variations can be positive or negative and have a magnitude several times the normal or maximum operating pressure, resulting in severe system damage. The term water hammer was coined to describe the audible hammering sound in the pipes as a result of these transient pressures.

While transient pressures are heard audibly in some systems, in other systems transient pressure waves go undetected until something breaks. The duration of a transient event can be anywhere from several hundredths of a second up to a few minutes. It is quite common for operators and engineers to review pressure records after suspecting a pressure problem in search of "the event."

Typical pressure measurement systems often capture small ticks in pressure. When reviewing pressure records, these small ticks are often deemed acceptable (perhaps even unrelated) to the event in question, especially if they are within design allowances. However, what remains unseen is the true degree of pressure fluctuations, which can only be captured with a high-speed data recorder such as Blacoh's patented SurgeWave™ Transient Monitoring System.

The SurgeWave system allows pipeline operators and maintenance engineers to accurately detect and record transient pressure events occurring in water, wastewater, and petroleum/chemical pipelines. It is unique in that it employs a system of dynamic pressure transducers and digital technology to monitor pipelines for indefinite periods of time. When a transient such as a pressure spike or water hammer event is detected, the system activates a high-speed data recorder to record the event up to 100 times per second. The granularity of this data allows users to see broader and more frequent pressure fluctuations that normal pressure measurement devices cannot provide. The engineering breakthrough that is SurgeWave allows designers, engineers, manufacturers, and operators the ability to assess the overall performance of a pipeline, pumping plant, or petroleum refinery using non-destructive, real-time sensors and hand-held monitoring equipment. With it, users are able to capture true transient pressure fluctuations, address pressure loads immediately, and, ultimately, better protect their pipeline systems.

For more information, visit

WWW.BLACOH.COM

CHECK-ALL VALVE

ADAPTER VALVE

Since 1958, Check-All Valve® Mfg. Co. has manufactured a complete line of spring-loaded piston-type check valves, also known as silent check valves. We service customers all over the world in the chemical, petrochemical, pharmaceutical, biofuel, food and beverage, water treatment, OEM, and MRO industries and our products are trusted in the most demanding applications.

Check-All Valve® is happy to announce the addition of the Adapter Valve to our full-service line of check valves. The Adapter Valve is available in two styles, model AM (MNPT x FNPT) and model AF (FNPT x MNPT). Both models have the same size pipe thread on both ends for installation where a threaded straight adapter is needed. The one-piece body design is machined from high quality bar stock and is manufactured at our factory in West Des Moines, Iowa.

FEATURES

- **SIZE:**
  0.5- to 4-inch NPT threads
- **BODY MATERIALS:**
  316 Stainless Steel, Brass, Carbon Steel, Alloy 20, Alloy B, Alloy C-276, Monel® 400, Titanium
- **SEAT MATERIALS:**
  AFLAS®, Buna-N, EPDM, KALREZ®, "Metal-to-Metal", Neoprene, PTFE, and FKM
- **SPRING MATERIALS:**
  316 SS, Alloy C-276, Alloy B, INCONEL® X750, MONEL® 400, 17-7PH SS, and Titanium

AM Model: MNPT inlet x FNPT outlet

AF Model: FNPT inlet x MNPT outlet

For more information, call 515.224.2301, email sales@checkall.com, or visit
WWW.CHECKALL.COM

INDUSTRIAL FLOW SOLUTIONS

OVERWATCH® DIRECT IN-LINE PUMP SYSTEM

PUMPING

SHREDDING

Industrial Flow Solutions™ (IFS) OverWatch® direct in-line pump system offers a revolutionary solution for the municipal wastewater and stormwater industry. The OverWatch patented system is designed to eliminate the wet well by lifting influent directly from the inlet to the discharge while detecting and responding to solids, eliminating potential clogs. Operation is based on continuous pumping, decreasing backups by lifting influent directly at the entry point, without water loading. Because the system handles influent as it arrives, rags, fats, oils, and greases (FOG) have no chance to solidify and collect near the pump's inlet.

APPLICATIONS

- Sewage and solids handling
- Stormwater management
- Wastewater
- Lift / pump stations

ELIMINATE THE WET WELL AND IMPROVE SAFETY

The OverWatch system creates safer working conditions for maintenance crews and reduces environmental impact. Because influent is contained within the system, it never becomes atmospheric. As a result, there is no buildup or exposure to hazardous odors, bacteria, or hydrogen sulfide (H_2S) gases; work safety is optimized.

NO DOWNTIME FROM A CLOGGED PUMP

Redundant dual pump design maximizes reliability to reduce maintenance and extend the life expectancy of the system. Simplified installation and maintenance means no more screen cleaning and cost savings!

SELF MONITORING SAVES TIME AND MONEY

The OverWatch smart sensing system is designed to improved operational efficiencies as it adjusts in real time to manage flow, detecting and removing clogs without human intervention.

PATENTED DIPCUT® IMPELLER

Variable vane, vortex impeller design features hinged vanes that fold flat exposing shredding blades when operated in reverse rotation. When an elevated torque level above the threshold value is detected, the smart, self-monitoring variable frequency drive reverses the direction of the impeller rotation, changing its function to shred and remove the clog without human intervention, all without losing its high hydraulic pumping efficiency.

CASE STUDY: SHERMAN, NEW YORK

This rural community is home to 730 residents and a lift station that caused twenty-six hours of maintenance each year to remedy frequent pump clogging and weekly bar screen cleaning. The 36-inch silo access descending 20 feet into the ground compromised worker safety.

Solution: One OverWatch® System replaced two submersible pumps previously used to lift influent to the plant headworks, converting the pit into a dry well. Total annual cost reduction is nearly $8,500 in vacuum truck rental, removing clogs, manual bar screen cleaning/raking, and preventative maintenance, reducing total overall maintenance to twenty minutes over four years.

For more information, visit
WWW.FLOWSOLUTIONS.COM

SUNDYNE

ANSIMAG SEAL-LESS MAGNETIC DRIVE PUMPS

ANSIMAG seal-less magnetic drive pumps are specifically designed for chemical processing applications. All wetted parts are molded ETFE components that can safely handle a wide range of corrosives and solvents without corrosion. A patented, fully encapsulated mag drive hermetically seals the inner magnets to isolate them from process fluid and maintain magnet integrity for the life of the unit. A Kevlar-fiber reinforced vinyl ester shell delivers unprecedented reliability.

During the last several months, ANSIMAG pumps have been used in a wide range of prominent applications. They're used to pump the harsh chemical polymers that coat the electrodes for electric vehicle lithium-ion batteries. ANSIMAG pumps are used by COVID-19 vaccine manufacturers to pump the coolants used in freeze driers. And ANSIMAG pumps are used by Hydrogen Fuel Cell producers to pump caustic chemicals into electrolyzers to adjust the pH of water used to generate green hydrogen.

ANSIMAG pumps are more energy-efficient than mechanically sealed pumps. An innovative rear casing generates no eddy currents, thus eliminating heat generation and reducing energy costs. Because ANSIMAG pumps do not have seals—there are no leaks, no emissions, and no costs related to seal maintenance.

ANSIMAG benefits include:

- **Zero leakage:** Seal-less design and a single, fully-contained O-ring eliminates possible leakage.
- **Chemically resistant lining:** Carbon fiber reinforced ETFE is resistant to most chemicals.
- **Secondary containment:** Lined Kevlar fiber/epoxy offers unsurpassed pressure handling capability.
- **Corrosion protection:** Powder coat exterior is more durable and resistant than epoxy-based paints.
- **Durable construction:** Ductile iron exterior is designed for heavy-duty chemical applications.
- **Magnetic drive:** Hermetically seals the inner magnets, isolating them from the process fluid.
- **Fully-encapsulated inner drive:** Provides unsurpassed resistance to chemical attack.
- **Easy service:** Nine wetted parts and a back pull-out design enables service without breaking the wet end.
- **Small footprint:** Close-coupled design offers quiet operation.

For more information, visit

WWW.SUNDYNE.COM/PRODUCTS/ANSIMAG-PUMPS

VAUGHAN COMPANY

THE VAUGHAN ROTAMIX®

Hydraulic mixing is a dirty job that requires a durable pump to keep things flowing smoothly. The Vaughan Rotamix® system is the world's most cost-effective and durable means of mechanical hydraulic mixing for sludge tanks, digesters, and other high-volume applications. Cutting-edge and American-made, the Vaughan Rotamix® pairs the original Vaughan Chopper Pump with a set of high-velocity nozzles to mix the tank, handling any tough solids.

WE STIR UP EVERYTHING BUT TROUBLE

As treatment plant operators know, the absence of hydraulic mixing leads to thick sludge and difficult-to-pump slurries. To solve this problem, The Rotamix® system incorporates several basic principles of physics and hydraulics, including uniform and vortical fields of flow, induced flow and surface contact. Combined, this unique mixing system optimizes solids contact due to the homogeneous state.

WHAT MAKES ROTAMIX® DIFFERENT?

Nobody else in the market can claim to have the Rotamix® system's nozzle assemblies and the Vaughan Chopper Pump. The system's mixing power is supplied by fixed nozzle assemblies installed at a factory-specified angle and permanently tightened so no additional adjustments are required. These high-velocity nozzles offer a ten-year warranty and increase the effective mixing volume, inducing entrained fluid which significantly increases the overall mixing effect. In a uniform flow field, the entire contents rotate as a solid unit with the highest velocity on the outside. In a vortical flow field, fluid velocities are the greatest at the center, thus creating a vertical-axis vortex. With multi-zone mixing, average velocities are higher and steadier, preventing solids from settling in the center.

The heart of the Rotamix® system is the Vaughan Chopper Pump, which provides clog-free pump operation. Vaughan's proven technology over the past sixty years provides low maintenance and the highest reliability of any chopper pump. Continuously chopped solids not only eliminate nozzle clogging but enhance sludge quality. Digester efficiency is increased by further reducing solids' size and increasing surface contact.

Using custom engineering software, each application is analyzed and sized by Vaughan® in order to achieve the desired mixing effect. The Rotamix® system may be applied in circular, rectangular, oval tanks and basins and other unique process configurations such as egg-shaped digesters, CSO tunnels, and pump stations. No more issues with conventional system—just real cost-effective sludge mixing.

AMERICAN-MADE RELIABILITY YOU CAN COUNT ON

Family-owned and operated, Vaughan Company specializes in durability with over sixty years of experience and four generations of expertise. By combining exceptional technology with a history of unmatched pump reliability and customer support, the Vaughan Rotamix® is engineered to handle whatever your job requires.

For more information, call 360.249.4042, email info@chopperpumps.com, or visit WWW.CHOPPERPUMPS.COM

WANNER ENGINEERING

HYDRA-CELL MT8 LOW FLOW/HIGH PRESSURE METERING PUMPS WITH FKM O-RINGS

PTFE diaphragms with fluoroelastomer (FKM) o-rings are now available for Hydra-Cell MT8 metering pumps. FKM is recommended in applications where exceptional chemical, thermal and oxidation-resistant properties are desired. FKM also has a wide operating temperature range and good mechanical properties.

Manufactured by Wanner Engineering, Inc., MT8 pumps are designed for injecting, dosing, mixing, spraying, and other metering applications that require a low flow rate and discharge pressures up to 3500 psi (241 bar). They feature hydraulically balanced, multiple diaphragms to provide smooth, linear, virtually pulse-free flow without the need for pulsation dampers. Featuring electronic flow control, MT8 model pumps exceed API 675 Performance Standards for accuracy (±1 percent), linearity (±3 percent), and repeatability (±3 percent).

MT8 metering pumps have a minimum flow rate of 0.06 gallons per hour (0.227 liters per hour) and a maximum flow rate of 8.00 gallons per hour (30.28 liters per hour). Metallic pump heads (316 Stainless Steel, Hastelloy C, and Alloy 20) have a maximum discharge pressure of 3500 psi (241 bar). Maximum discharge pressure for non-metallic models is 350 psi (24 bar) for PVDF pump heads and 250 psi (17 bar) for PVC pump heads. The hydraulically actuated, balanced diaphragms provide superior performance across the entire pressure range.

The patented Hydra-Cell overfill/underfill valve system ensures optimum actuating oil on every stroke for continuous accuracy and protects the pump and diaphragms. The integral relief valve protects the pump from over-pressurization on the discharge side. If a blocked suction line or other conditions occur, the MT8 will run dry indefinitely without damage to the pump.

MT8 pumps are optionally available with a manual adjustment controller to provide local control of the pump's flow rate. It can be used in hazardous-duty locations and to expand the turndown ratio within the performance envelope of the pump.

The MT8 duplexing option uses one motor and gearbox reducer to operate two pumps, thus doubling the flow capacity to 16 gallons per hour (60.56 liters per hour) while lowering initial costs.

Maintenance requirements are minimal for Model MT8 pumps because its seal-less design means no seals to leak, wear, or replace. Simple-to-replace cartridge check valves have double-sealing surfaces.

MT8 pumps feature robust construction and have a small, space-saving footprint. They are available with various accessories to enhance pump system performance, including calibration columns, back pressure valves, pressure relief valves, SmartDrive motor controllers, oil cooler systems, and a magnetic oil drain plug. Customization and testing services are also available.

For more information, call 612.332.5681, email sales@wannereng.com, or visit WWW.HYDRA-CELL.COM.

YASKAWA

FP605 INDUSTRIAL FAN AND PUMP DRIVE

IP20/UL Type 1

IP55/UL Type 12

IP55/UL Type 12 w/Switch

IP55/UL Type 12 Backside Flange

Here for the long haul and helping to contribute to a healthy and sustainable environment, the Yaskawa FP605 is an easy to install and configure industrial fan and pump drive. It is designed for countless applications to reduce energy use, including centrifugal compressors, fans, pumps, and process control in industries such as material handling, food and beverage, chemical, rubber and plastics, textile and printing.

The FP605 builds on the successful legacy established by its predecessor, the P1000 AC Drive. Like Yaskawa's latest GA800 and GA500 AC Drives, the FP605 uses flexibility, sustainability, and ease of use to make the complicated simple.

FLEXIBILITY

The FP605 shows its flexibility by providing a drive solution for all environments, having the ability to run any motor type, accommodating hardware and network control solutions, with a simple installation procedure.

SUSTAINABILITY

The FP605 proves its sustainability with its integrated functional safety capability, environmentally-friendly materials, and, as always, Yaskawa's durable and long-lasting quality and design.

EASE OF USE

We made the FP605 easy to install and easy to start up. Its innovative and award-winning in-box media, intuitive keypad, and software tools help you get the drive out of the box and into the field as fast as possible.

For more information, visit

WWW.YASKAWA.COM

AUTOMATIONDIRECT

FREE PLC TRAINING–NO PURCHASE NECESSARY

As the world around us becomes more and more automated, an understanding of electrical control systems becomes more and more vital. Manufacturers, as well as the technicians, integrators, and/or engineers they employ, know firsthand the benefits automation provides. In fact, for many, automation has been the key to their success. That's why we feel the more people know about automation, the more prepared they are to succeed in a world that's increasingly automated.

Access free video libraries that explain the fundamentals of PLC control from entry level programming to advanced PLC functions. The online video series initially offered non-brand specific PLC basics with topics on logic gates, basic switches, sinking and sourcing, scan time, I/O fundamentals, memory addressing and more. Additionally, the course provides in-depth training on AutomationDirect's families of PLCs including the award-winning CLICK PLC. No time or viewing limitations, simply enter your email address to register your account or continue your training.

AutomationDirect offers tens of thousands of high-value industrial automation products, both name brand and private-labeled, that are chosen by our product engineers for their best-in-class features, price, and quality. Our name-brand products come from companies such as Fuji Electric, EATON, and Hubbell/Wiegmann. We also co-engineer many of our private labeled products with the manufacturer to ensure our customers are getting the features they ask for at prices they can afford. And, once a purchase is made our automated facility has an order accuracy of 99.98 percent but we do offer a thirty-day money back guarantee on most products for any last-minute changes customers may need. And, orders over $49 ship free of charge.

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GREASEZILLA

FATS, OILS AND GREASE (FOG) SEPARATION SYSTEM

Developed by Downey Ridge Environmental Company, Greasezilla® is a turnkey system that provides an ecological and cost-effective process to divert FOG from the waste stream. Greasezilla® leaves almost nothing to be landfilled and has a total operating cost of one to two cents per gallon, making Greasezilla® the ideal front-end pretreatment system for FOG waste.

Greasezilla's® hydronic thermal system takes grease trap waste in its trucked-in form and separates it into three layers—brown grease, batter, and water. The brown grease is pumped off and stored, with the remaining layers sent to wastewater treatment plant headworks or anaerobic digesters. The brown grease is a high-quality advanced biofuel, ready as a biodiesel feedstock. Greasezilla® can also polish used cooking oil (UCO) into a premium yellow grease advanced biofuel.

Greasezilla® is fully automated, making it easy to operate and maintain with minimal staffing. Greasezilla's® standard two-tank reactor system requires a footprint of only 1,000 square feet and is available in two formats to accommodate interior or exterior placement.

Currently, the company is working closely with pumpers and wastewater treatment sites across the nation eager to incorporate Greasezilla's® sustainable, proven, and profitable technology into their operations.

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For more information, visit WWW.GREASEZILLA.COM.

HELWIG CARBON

BPK: ULTIMATE SOLUTION TO SHAFT GROUNDING

Bearing failure is the number one cause of electric motor failure and it can be avoided. Many pumps utilize a variable frequency drive (VFD) to increase pump motor efficiency. While VFDs lower power consumption, they also induce currents onto the motor shaft. These shaft currents will often discharge through the motor bearings causing fluting, burnt grease, and eventual bearing failure. Downtime, repairs, and warranty claims can be the result of bearing failure and can be extremely costly to any company.

Helwig's BPKs (Bearing Protection Kits) have been leading the industry in shaft grounding solutions for years. Our proven silver graphite brush technology, K007, is unlike other shaft grounding systems because it eliminates the need for maintenance and will keep bearings protected year-after-year. Helwig BPKs effectively divert induced electrical currents away from the bearings. The result is the lowest shaft voltage and maximum discharge to ground through the kit rather than through the bearings, protecting them from damage and failure.

From small pumps and motors to large industrial applications, the BPK's versatile shape and size have made shaft-grounding solutions possible for motors across all industries. BPKs have also proven to be effective in

contaminated and harsh environments. The constant force spring provides a self-cleaning track that is undeterred by grease and other contaminates. Additionally, our MultiFit Bracket mounting system allows for a BPK to be attached to multiple bolt designs while keeping constant contact on the motor shaft. The MultiFit Bracket system can be used with existing bolts, which eliminates the need for drilling and tapping.

For more information, visit
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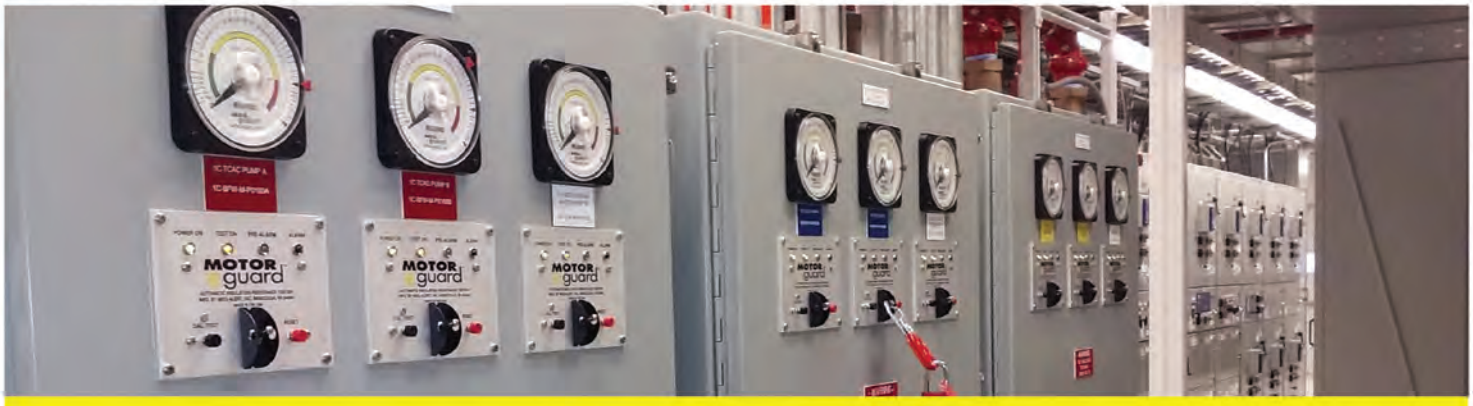

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TOUGH CONDITIONS REQUIRE TOUGHER SOLUTIONS

Digi International's Sayeed Quazi on Industry 4.0 adoption in harsh environments

As smart technology and AI are adapted into more areas of industrialization, these technologies are entering conditions once believed too harsh or hazardous for reliable wireless connectivity. Into this new frontier steps Digi International, who earlier this year unveiled its Digi IX30, an industrial-hardened cellular router solution for harsh environments. Below, Sayeed Quazi, senior principal product manager at Digi, explains how this product could prove an all-in-one solution for clients in industries such as oil and gas production, water utilities, smart cities, and more.

MPT: ***Could you tell us how Digi IX30 fits into your company's overall product line and what needs it is meeting in the market?***

SAYEED QUAZI: Digi IX30, the newest member of our next-generation IX family of devices, builds on our widely successful legacy of industrial cellular routers. The ruggedized IX30, with additional compute for edge applications and additional analog and digital I/O, reduces the points of failure by eliminating the need for additional equipment. Its faster performance and LTE speeds deliver greater value through a complete, cost-effective IoT solution and significantly reduces OPEX in the most challenging deployment.

Digi IX30 is powered by Digi Remote Manager (Digi RM) and the Digi Accelerated Linux operating system (DAL OS). Digi RM is the command center of an intelligent network, enabling companies to efficiently configure, deploy, monitor, and manage tens of thousands of mission-critical devices and assets from a single desktop, tablet, or smartphone. DAL OS, along with Digi RM, enables programmability for edge intelligence applications, interoperability for legacy serial devices/protocols, and MQTT Sparkplug B. These capabilities deliver critical connectivity between devices and sensors in the Industry 4.0 ecosystem, allowing users to experience high levels of security, control, and performance.

MPT: ***In preparing this product for release, how did you assess its readiness for harsh industrial environments?***

SAYEED QUAZI: Digi has designed its entire industrial (IX) product family to meet high-performance requirements in harsh environments with wide temperature ranges. Its Class 1, Division 2 (C1D2), and ATEX certifications makes it suitable for environments where potentially explosive gases, vapors, dust, or fibers may be present, and its DIN rail mounting design enables easy installation in field containers and cabinets.

MPT: ***Does it require specialized connectivity or is it ready for public or private cellular networks right out of the box?***

SAYEED QUAZI: Digi IX30 delivers fast performance for public, private, and hybrid network deployments that support both licensed spectrum and CBRS Band 48 to enable migration between multiple networks in a single SKU. A future variant of Digi IX30 will include Anterix Band 8 along with Anterix Active certification to offer public and Anterix private cellular network support.

MPT: ***How adaptable is the Digi IX30? What options do potential customers have in incorporating it to their system?***

SAYEED QUAZI: Digi IX30 has the highest number of analog and digital I/O and serial ports along with rich protocol support and offers versatile integration options to manage a large of number of legacy systems from a single piece of equipment.

Digi IX30 was designed with dual Ethernet ports and GNSS, as well as support for remote sensors with four analog and four digital inputs and outputs. Leveraging its new Python programming implementation that provides interoperability with legacy serial devices/protocols, the Digi IX30 solution brings greater reliability, simplicity, and security to edge computing.

For customers who deploy and manage systems globally, Digi's IX line provides a single SKU for high-volume global deployment, which simplifies inventory and reduces the costs of global distribution, deployment, and management.

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