

The background is a technical line drawing in white on a blue background. It depicts a complex industrial machine, possibly a pump or engine, with various components like pipes, valves, and a large spherical tank. The drawing is a wireframe style, showing the internal structure and connections of the machinery.

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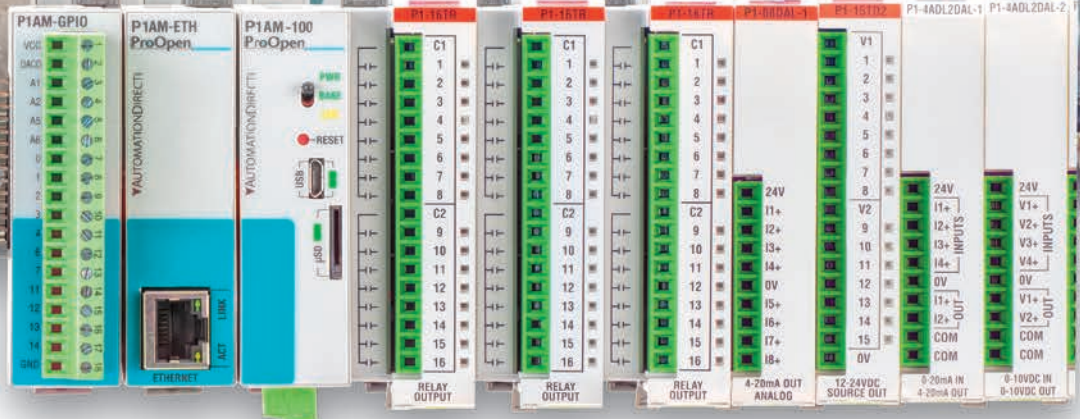
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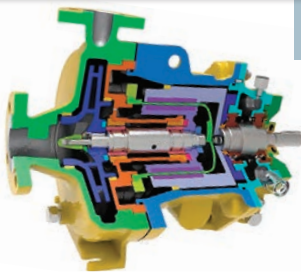
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DRÄGER AND VECTOR CAG TEAM UP TO PROMOTE PRODUCT PORTFOLIO

Dräger, an international leader in the field of safety technology, announces the appointment of Vector Controls and Automation Group (Vector CAG) a leading manufacturers' representative of control and automation solutions. The organization will represent and promote Dräger's fixed flame and gas detection systems portfolio sales in the states of Texas, Oklahoma, Kansas, Missouri, Southern Illinois, Iowa, Nebraska, and Southeastern New Mexico.

"We are very pleased and excited to partner with Vector CAG as an official manufacturer representative for our innovative line of fixed gas and flame detection solutions," said John Wilson, Dräger's senior vice president of sales and marketing for safety solutions in North America. "Working alongside our own Dräger personnel and through Vector's strong customer relationships, we will continue to grow our installed base of fire and gas detection system solutions in this key geographic territory."

"Vector CAG has always committed to partnering with best-in-class manufacturing companies to represent the top products in the industry," says Jared Boudreaux, president, Vector CAG. "We are proud to enhance our extensive safety product portfolio with Dräger's world-class fixed gas and flame detection solutions."

ABB NAMES NEW DODGE PRESIDENT

ABB recently named company veteran Roger Costa as president of its global Mechanical Power Transmission Division, also known as the Dodge business. Established in the United States in 1878, the Dodge business today is considered the leading manufacturer of mounted bearing, enclosed gearing, and power transmission components in the nation.

"ABB's recognition as a global leader in the mechanical business stems from a strong culture that focuses on customer experience," Costa says. "I look forward to joining a team that values that culture. Together, we will work to continue to develop and grow markets for our superior products."

With more than seventeen years of experience at ABB, Costa has held executive roles in both the United States and Canada. During his tenure at ABB, Costa has gained considerable knowledge of the company's extensive operations ranging from mechanical to motors and robotics. Costa's unique perspective brings valuable insight to ABB's leadership team.

Costa has a bachelor's degree in electro-mechanical engineering from Humber College and completed an advanced university program in business management at the University of Toronto-Roman School of Management.

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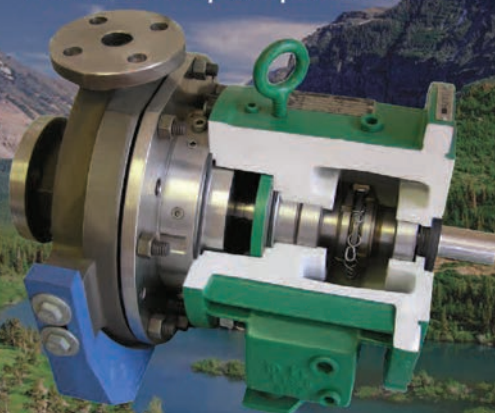
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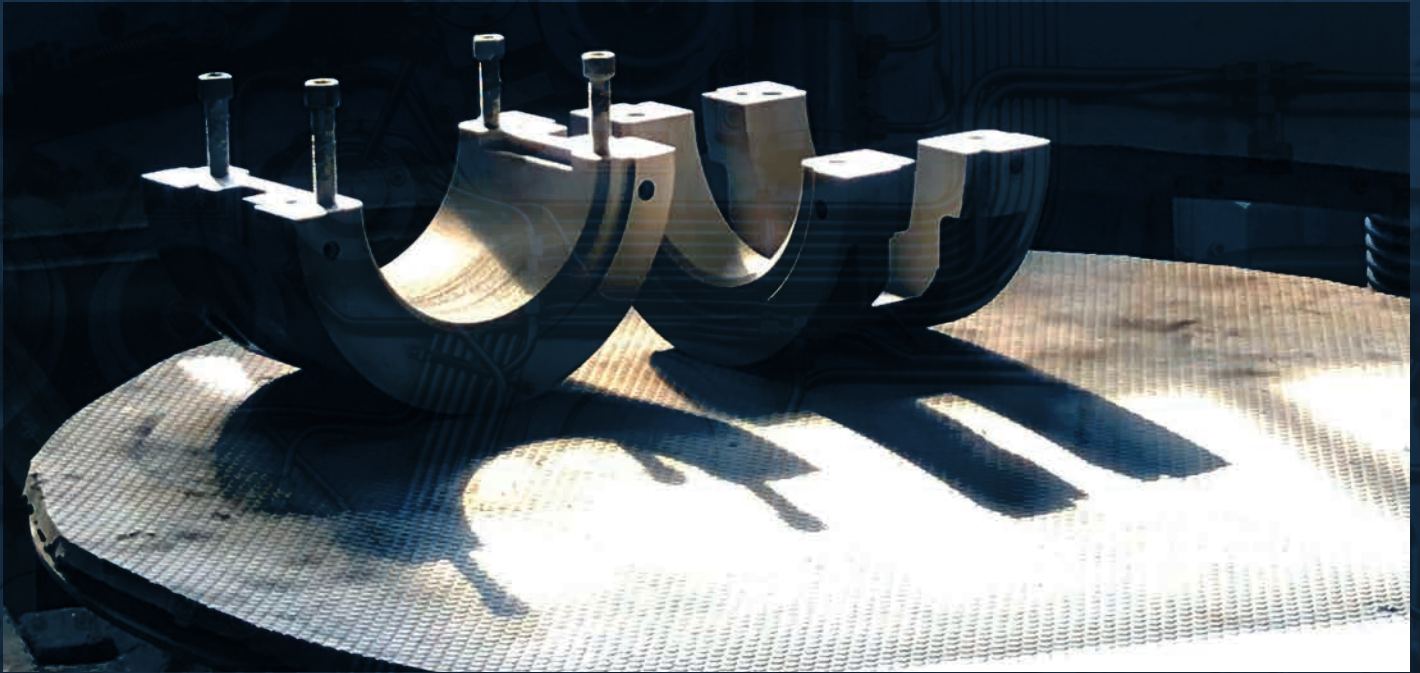
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BLACOH INDUSTRIES ANNOUNCES NEW HIRES

Blacoh Industries announces the addition of two new specialists to support the company's goal of growth by providing innovative solutions for improved performance in fluid pumping systems. Scott Bradley and Luis Ornelas were appointed for their diverse talents and experience, and will increase Blacoh's capacity for innovation in engineering, product design, manufacturing and services.

Professional mechanical engineer Scott Bradley joins the Blacoh Surge division bringing extensive experience in designing, sizing, and specifying pressure vessels, piping, pumps, compressors, and various other equipment. Bradley began his career managing multiple projects from award stage to ready-to-ship for CSI Compressco, a natural gas compressor packaging company, and later went on to manage a team of engineers at HPF Consultants, Inc.

With a bachelor's in mechanical engineering and a master's in engineering management, Blacoh's new quality assurance engineer, Luis Ornelas, combines valuable skills with experience in efficiency and quality improvement, process auditing, ISO compliance, certifications, training, and team development. Before joining Blacoh, Ornelas led a team of quality inspectors for EGR Incorporated, a leading designer and manufacturer of automotive accessories for OEM and aftermarket applications.



Colin Guppy

SUNDYNE APPOINTS NEW CHIEF COMMERCIAL OFFICER

Sundyne announces that Colin Guppy has been promoted to chief commercial officer. In this newly created role, Guppy will lead the original equipment and aftermarket strategies for Sundyne's vertical markets in the Americas, Europe, the Middle East, Africa, and India.

With more than twenty-five years of industry expertise, and a successful career with Sundyne that dates back to 2000, Guppy is uniquely qualified to bring the breadth and depth of Sundyne's engineering and operational resources to meet today's challenges. His proven track record of co-creating innovative solutions and leading global sales teams will ensure the success of Sundyne's customers and channel partners.

In the newly created role of chief commercial officer, Guppy will work with Sundyne customers and channel partners to continue developing the right mix of products and aftermarket services that customers in the oil and gas, chemical, and industrial markets need to meet their evolving business needs.

"Sundyne has always been a customer-focused company ... we're realigning some of our internal resources and our business processes to match the evolving needs of our customers," says Sundyne's CEO Mark Sefcik.

FEDERAL PROCESS CORPORATION IS NOW FPC INTERNATIONAL, INC.

Federal Process Corporation, a diversified manufacturer of specialty chemicals and premium-quality building products and supplier of innovative plumbing products, is rebranding as FPC International, Inc. As the company has grown, building its product offerings through its own research and scientific innovations, along with recent acquisitions, the action is a more fitting reflection of the company's expansion into a much broader range of niche industries.

"We have evolved significantly over the course of our rich history, and our name change is an appropriate action to more clearly demonstrate our growing presence in the markets we serve," says Jon Outcalt, Jr., president, FPC International, Inc. "With that said, as we grow, we continue to take pride in our commitment to maintaining close connections with our customers and providing expertise and counsel on a very personal level."

Today, FPC International, Inc. remains loyal and dedicated to its local roots, retaining its global headquarters in Cleveland, and manages five distinct businesses within the building product and specialty chemical industries.

QUALITY COMPANIES APPOINTS NEW BUSINESS DEVELOPMENT MANAGER

Quality Companies has appointed Iain Gault as business development manager for Houston and International. Based in Houston, Gault will serve to grow the Quality Companies client base in the deepwater and international arenas and introduce an expanded range of Quality Companies services to the energy sector.

Previously, Gault served as business development and technical services manager at Stork Technical Services USA, where he was the technical authority for rope access and specialist services in the Americas and the Caribbean. He has also provided assessment and evaluation of rope access classes throughout the Americas and Europe for Industrial Rope Access Trade Association (IRATA) and Society of Professional Rope Access Technicians (SPRAT).

Richard Tang, director of business development, Quality Companies, says, "Iain has a deep and wide-ranging technical proficiency, specializing in rope access with hands-on experience acquired in locations around the world. This, coupled with his extensive managerial expertise, ensures he is the ideal individual to manage deepwater and international business development initiatives for Quality Companies." ♦

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GPRS Uses Ground Penetrating Radar to Expand Business

Versatile technology helps company diversify services

By Jason Schaff, GPRS LLC

Many early adopters of ground penetrating radar (GPR) technology found concrete scanning to be the effective application. Those anchoring, saw cutting, or core drilling concrete would hire a contractor to scan the area before cutting to avoid accidentally hitting an object. For this reason, construction firms have come around to the notion that concrete scanning is vital to job site safety and efficiency. In recent years, service companies have also found synergy between concrete scanning and the need to provide utility locating services. Many contractors find GPR to be an important tool that allows them to scale and expand their business while maintaining a high level of service.

NON-DESTRUCTIVE SUBSURFACE SURVEY TECHNOLOGY IN DEMAND

Toledo, Ohio, based Ground Penetrating Radar Systems (GPRS) LLC was one of the first companies in the country to focus on concrete scanning, using GPR technology. They determined that GPR was preferable to other non-destructive subsurface survey technologies, including x-raying.

While concrete x-raying remains a valid technique to locate reinforcing steel in certain applications, GPRS found it lacked the flexibility to meet the demands of many projects. The method must be done in conditions in which radioactivity can be safely introduced; it also requires access to the underside of the concrete to be scanned and the job site to be closed.

GPR is used without any radioactive element, instead emitting a pulse of energy into the concrete that bounces off any objects in the slab. When some of that energy returns to the antenna, it creates a signature which clearly shows where and at what depth items within the slab are located. GPRS opted for this more versatile technology, which can be used for both elevated concrete slabs and slab-on-grade applications.



GPRS operators using the GSSI StructureScan Mini at Yankee Stadium

GPRS found that GPR equipment helps contractors safely avoid obstacles in concrete, reducing costly delays and potential injuries. For example, during a recent project to revitalize the upper deck at New York's Yankee Stadium, the general contractor had to penetrate the concrete floor to work on the ballpark's protective railings and expected the presence of post-tension cables. If accidentally severed, these high-tension steel strands can snap with enough force to break through the concrete and possibly injure the contractor. Due to the severity of the potential risk and the popularity of Yankee Stadium, x-ray was impossible for this job.

The contractor turned to GPRS, who scanned the area with the GSSI StructureScan™ Mini XT. This compact tool combined with a GSSI Palm XT antenna, gives operators the ability to cross-polarize for an enhanced level of horizontal and vertical positioning accuracy. Since GPR is entirely safe to use around people, no section of the stadium had to be closed off for other workers, avoiding any major work disruption.

A concrete job like this would not be possible without GPR. You never really know what's beneath the surface. GPR lets us provide quantitative data and relevant



The Palm XT gives GSSI StructureScan Mini users a handheld miniaturized GPR antenna for enhanced access to tightly spaced areas.

information to our customers so that they're able to do their jobs more safely.

The GPRS team was also hired by a structural engineering firm to determine the structural reinforcement of a Boston, Massachusetts, building originally used to manufacture cannons and as an armory. The building featured



GSSI's easy-to-read visualization allowed GPRS to create drawings with locations and depths of obstacles.

an 8-inch slab with a 1.5-inch topping slab. Scanning the slab and topping with the SIR 4000 and Palm Antenna, the technicians uncovered a complex circumferential reinforcement design. GPRS provided a mark-out of the location and depth of targets as well as a 3D camera report with a virtual tour to the structural engineering client.

Along with GPR equipment, GPRS also uses other tools that complement each other, including a reference point locator that gives operators an added certainty that the area they scan on one side of a thick slab corresponds exactly

to the same scan on the other side, and an electromagnetic tool that hooks onto a conduit to passively look for something drawing power. To meet the need to locate live power in conduits, GPRS also began providing utility detection services.

BRANCHING INTO DIFFERENT MARKETS

In recent years, GPRS has moved into using GPR for utility location, diversifying its business from 95 percent concrete scanning in the early 2000s to now performing 40 percent concrete scanning and

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Mark-out of the location and depth of complex circumferential reinforcement design.

60 percent utility scanning. Utility projects range from mapping out an entire facility's utility plan and providing a detailed AutoCAD file to examining a small area before installing even a single light pole.

Just like combining GPR with other techniques for concrete scanning, GPR is an integral part of the utility locator's toolbox. Rodders are used to send traceable lines through pipes to then put a tone on the tracer to assist location. A radio detection tool actively locates pipes under the surface, putting a tone on a tracer and tracing metallic pipes. Magnetometers measure magnetic fields and provide a useful back-up to confirm the location of a cleanout. Other electromagnetic induction equipment serves a similar purpose. GPRS also uses closed-circuit video (CCTV) robots that navigate pipes internally to produce an inside-out visual pipe inspection.

GPR can determine the location of a PVC pipe that does not have a

tracer wire, which would have evaded radio detection or discovery by an electromagnetic tool. GPR technology really allows us to hone in, be more precise, and sets us apart from other service companies that don't have it.

GPRS demonstrates the efficacy of their technique when executing a recent contract to locate utilities under parking lots at Target and Walmart locations nationwide. These retailers demanded uniform parking spots to allow customers to quickly pick up online orders. The project had a unique set of challenges because they were not conducting a complete utility location survey of the property to enable them to fully identify all gas, water, sewer, and electrical hazards that lay under the surface.

When we're in those parking lots, we don't have visible meters, tracer wires or cleanouts that we can just find and trace out utilities with. GPR units are fully capable

to locate unknown objects. If we did not have GPR we would not be able to properly locate each one of those sections before they run the electrical conduit and put the bollards in. GSSI's easy-to-read visualization allowed GPRS to create drawings with locations and depths of obstacles. Overlaid on Google Earth maps, these detailed references enabled contractors across the country to quickly and safely expedite excavation and construction of these novel parking features.

Utility locating also came into play at the Yankee Stadium project, where GPRS had to locate utilities under the sidewalk in front of the stadium before the contractor dug a 125 square foot trench. For the utility locating portion of the job, GPRS used GSSI's SIR® 4000, with a 400 MHz Antenna. The SIR 4000's modular design enabled the team to easily configure the system for utility location.

Ground penetrating radar allows GPRS to scale both halves of business nationwide. Because our business has two different verticals with concrete scanning and utility location, we want to use an equipment company that has the ability to cross over and do both. In 2019 alone, GPRS completed 70,000 individual projects in nearly sixty markets with an overall accuracy rate of 99.5 percent. We use GSSI GPR for every one of those markets and every one of those jobs.

CROSS-TRAINING IS KEY TO QUALITY

GPRS has adopted a strategy of developing new markets with limited personnel by cross-training its personnel. All GPRS project managers undergo a three-month training process to ensure a repeatable methodology so each customer gets the same level of service.

The strategy is furthered by the availability of systems small enough to transport in the trunk of a sedan, and capable of quickly determining the reinforcement of concrete (hollow core, rebar, post-tension cables, metal decking) or adjusting to soil makeup at a utility location site with ease.

To ensure quality across the company, GPRS instituted an intensive training program and developed a specification, Subsurface Investigation Methodology (SIM), that lays out requirements for training, equipment, and process. In addition, GPRS has partnered with GSSI for their GPR equipment to ensure they're using professional-quality equipment. GSSI has been at the forefront, developing new technologies. They know what they're doing, and we know what we're doing. It makes total sense to pair with the manufacturer that fits us so well.

THE FUTURE OF GPR SERVICES

Historically, nearly 80 percent of GPRS clients are either repeat or referral. The company focuses on long term performance, recognizing that repeatable accuracy is at the core of their services. By effectively leveraging the flexibility and precision of GPR technology, GPRS has diversified and expanded its business from regional to nationwide—all without diminishing service quality. To continue to build on its success, the company has acquired four GPR service provider companies to better meet customer needs and prepare for market growth. ♦

Jason Schaff is vice president of sales and marketing at GPRS LLC. Ground Penetrating Radar Systems LLC is the nation's largest company specializing in the detection of underground utilities, video pipe inspection, and the scanning of concrete structures. GPRS has an extensive nationwide network of highly trained and experienced project managers in every major U.S. market. For more information, visit www.gp-radar.com.



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Manage Dredge Operations from Your Smartphone

DSC Dredge launches first-of-its-kind dredge production smartphone app

By Mercedes Gabriel, DSC Dredge

For over fifty years, DSC Dredge has met the needs of the dredging industry in terms of designing and manufacturing quality dredges and dredge equipment. A three-generation family business, each generation has introduced new and innovative opportunities to better serve this unique community, it's no surprise that DSC has continued to grow more innovative in addressing the technology gaps experienced by the dredging industry.

The most recent addition to DSC Dredge's custom services is the launch of its new app for iOS mobile devices—the DredgeMaster Suite. This addition to DSC's technology suite illustrates the company's initiative in building the most comprehensive experience for dredge owners and operators.



DSC's newest dredge class, the Sharkuda, now in operation and utilizing the new DSC Vision software.

CLOSING THE GAP THROUGH TECHNOLOGY

"We get dozens of requests to do dredge evaluations on a weekly basis," says William "Bill" J. Wetta, senior vice president and chief technology officer. "For years we have tried to figure out a way to allow customers to have access to this information themselves without giving away all of our trade secrets. From this desire to better serve our customers, the concept of the DSC DredgeMaster Suite app was born."

The first comprehensive solution of its kind, the DSC DredgeMaster Suite app has been developed entirely in-house

as a collaborative father-son effort. Bill's youngest son, Nick Wetta, has spent the past two years working tirelessly to bring this concept to life.

This app is the first of its kind that will allow dredge owners and operators to take better control of their operations. "As time evolves, it is important to remember that it is not that we live in technology but that we use technology daily and the dredging industry should be no different," states Nick Wetta, official creator of the DSC DredgeMaster Suite app.



DSC DredgeMaster Suite is now available in the Apple AppStore and currently available for the iPhone or iPad. Additional versions to be released soon.

FROM "WHAT IF" TO "CAN DO"

This digital tool is a comprehensive production toolbox that provides users with benchmarking data, operational information, and "what-if" options at their fingertips. When paired with DSC's Dredge Rx system, it becomes part of a complete maintenance solution that allows users to view and track dredge performance and required servicing while on the dredge or while working remotely.

According to Bill Wetta, "We are living in an age where technology can offer enormous upsides, and Nick has brought to life an idea that my brother, Bob, and I have been talking about over the past decade. This app, in a nutshell, shows whether a particular dredge meets the conditions requested. We are excited to introduce this technology to the dredging community as it will allow for easy access to information in real-time."

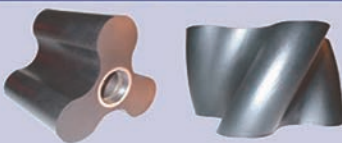
THE FUTURE OF DREDGING SOLUTIONS

Over the years, DSC has focused its expertise on the design and manufacturing of customized

dredges of all sizes and purposes for the dredging market. As a result, we have dredge units in use throughout the world and across an expanse of industries; aggregates, mining, construction, environmental, navigational, recreational, restoration, and specialty projects. This is all about customer service and helping make our product more user-friendly by putting the control in the palm of your hand. It can save time, increase operational efficiency and instill confidence in the day-to-date operation. ♦

DSC is also a global leader in the dredge manufacturing industry, engineering superior customized dredging solutions to meet specific application needs. DSC Dredge designs and manufactures high quality, durable cutter suction, and underwater pump mining dredges. DSC Dredge operates from three manufacturing facilities located in Reserve, Louisiana; Poplarville, Mississippi; and Greenbush, Michigan. For more information, visit www.dscdredge.com.

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Keeping Spills in Check

Four strategies for spill prevention and containment in the workplace

By Prajakta Pingulkar

Various companies need to use, store, transport, or handle liquids and chemicals that are hazardous in nature. Hence, it's imperative to take some precautionary and counteractive measures for containing an accidental spill. It may be easier to, at times, neglect the rudiments of sustaining a safe workplace, especially when you are responsible for smoothly running a business. Nevertheless, failure to take precautionary measures for spill containment can put your company at risk for hefty fines by OSHA or EPA. It also can impact the health of the workers, leading to massive downtime at work.

Thus, spill containment products at workplaces are indispensable for avoiding leaks, spills, or unanticipated mishaps. This article broadly speaks about four must-do strategies to implement for spill containment in workplaces. Let's dive in!

1. REGULAR MAINTENANCE AND INSPECTION OF THE INDUSTRIAL MACHINERY

The maintenance group should be appointed to examine all equipment routinely to ensure they are in the midst of safe and stable working conditions. It's also a good practice to report their checking and audits in an inspection log for easy tracking. Additionally, in case of any observed

issues, the safety manager should be promptly notified.

You can even develop your own preventative maintenance program for spill containment. An effective preventative maintenance program for spill containment will help distinguish all segments required to be examined, then set a timeline for inspecting and repairing the components, and finally include a record for easy tracking.

Below are a few things your maintenance personnel should check while inspecting the industrial machinery:

1. Spraying or splashing
2. Tight connections
3. Drip marks or slow drips
4. Corrosion
5. Pooling or puddling
6. Various tools and machinery are in the desirable working state
7. Any leaks or spills in the pipes, seams, or containment pans



It's a smart practice to ensure that these containers are guarded with quality secondary spill containment, to avoid any unforeseen disaster.

2. ENSURE THAT THE VESSELS AND SPILL CONTAINMENT BERMS USED ARE IN GOOD SHAPE

Ensure that you examine storage tanks and bulk storage vessels frequently through visual inspections and integrity testing. Drip marks, gaps, corrosion, cracks, or discoloration are some of the things that you need to look out for, among others. On noticing any of these aforementioned symptoms, make sure that you replace the containers as soon as possible. Also, in case you are qualified for SPCC, you must definitely conduct integrity testing while also judiciously examining bulk storage containers with an enormous capacity, as listed below:

1. Double-walled containers
2. Large bulk storage containers that are field-constructed or field-erected
3. Small bulk storage containers for shops
4. Vessels that are partially located/ buried/ bunkered/ vaulted in or off the ground wherever positioned

It's a smart practice to ensure that these containers are guarded with quality secondary spill containment, to avoid any unforeseen disaster.

3. CHECK AND EVALUATE YOUR COMPANY'S SPILL RECORDS

Ensure that you analyze your company's track record history concerning leaks, spills, and even slips and drops for each tool and device used in the work area and also, the surroundings of your department. Do study the data for identifying the major pain points, and then accordingly design a suitable plan of action based on your verdicts. Not every spill gets documented at all times. At times, only the EPA or the OSHA reportable spills get documented.



Nevertheless, some techniques can be implemented for ascertaining the records of spills in your company. For instance, you can analyze how many spill kits have been employed in your workplace for spill containment. Below are a few guidelines:

1. Whenever a spill kit or an absorbent is used, the safety supervisor should be informed about it.
2. When you employ various spill containment services, maintain records regarding their utilization.
3. Regularly speak with the different machine workers in your workplace to gather information regarding the non-reportable spills or leaks.

Going forward, it's the best practice to keep a record of all kinds of spills, big or small, to avoid manual hassles later on.

4. ANALYZE AND ASSESS THE SPILL CONTAINMENT PLAN

In case your primary spill containment solution, such as a storage container defaults, a qualitative secondary spill containment solution is your holy grail of a shield for containing accidental spills and leaks. In an unprecedented development of a leak or spill, a secondary spill containment solution will help counter the liquid from spreading. Hence, ensure that you have an active as well as a passive spill containment solution in place.

An active spill containment solution implicates a containment solution that needs an individual to take a relevant action when a spill transpires. This may entail using a spill kit or the mops to clean the spill, putting down the drain covers, or up a temporary containment wall, among others. Meanwhile, passive spill containment involves a solution that is already in place if and when a spill happens. This may include secondary spill containment berms, absorbent mats or pads, drip pads, and safety floor mats. ♦

Ensure to run a meticulous 360-degree inspection of all the storage vessels, and tanks, that may be prone to oil leaks or spillage of any other fluids. If there's a storage failure, ensure the secondary spill containment solution employed intercepts the liquid from reaching the drains or pathways.

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Estimating True Life-cycle Cost

By Ben Keiser, Applied Flow Technology

We all want reliable pumps and piping systems that meet requirements with a cost-effective design. The resulting design may come in under budget. But does that mean it is cost-effective? The reality is if you are neglecting the system's full life-cycle cost and only pushing design to meet or come in under the initial cost budget, you most likely do not have a cost-effective design. The reason why is because designs using smaller diameter piping to help reduce initial costs will require higher horsepower pumps, which lead to significant energy costs in the long run. The energy costs can easily be many times more expensive than the initial cost of the system itself.

A BETTER UNDERSTANDING OF ENERGY COSTS

When designing a system, it is best to base the design off the system's full life-cycle cost, which considers energy costs as well as initial costs. However, we often find this is not regular practice. Engineering companies typically design a system to stay within some budgetary limit and do not consider energy costs.

Why are energy costs often ignored? Engineering companies are not responsible for the energy bill and may not pay attention to the energy costs. Their primary goal is to stay within budget. This usually means smaller piping, fittings, and equipment. The plant owner/operators are the ones that should pay attention to what they spend on energy costs, but they often do not pay much attention either.

Although better efficiency and lower energy costs are important to some, plant owners/operators care more about better reliability, minimizing repair and maintenance costs, minimizing downtime and product losses, and increasing overall profitability. In previous articles (see "Going Beyond Efficiency Standards," MPT: June and July 2020), I described how flow analysis software can easily help

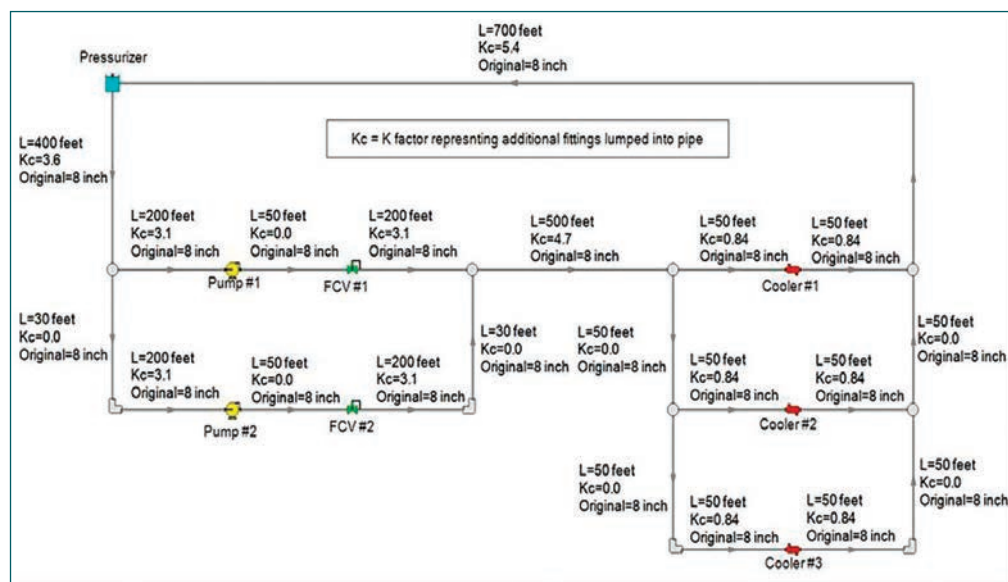
improve all of these aspects from better reliability and efficiency to reduced energy costs and increased profits.

CONSIDERING DESIGN INFLUENCES

When a piping system is designed, pipe sizes and pumps are often selected based on the system requirements and various rules of thumb. This is a very iterative and difficult process when done by hand or with spreadsheets. Engineers do not have time to try different combinations of pumps and pipe sizes that can result in a lower cost. Flow analysis software with cost calculation and automated pipe sizing capabilities can aid the design process greatly. In addition to simply determining the pressure, flow, and temperature distribution among many other advantages, it can help the engineer evaluate many more pump and pipe size combinations that can result in a much lower cost than anticipated.

Consider a new design for a simple cooling water system example as shown in the piping system flow model in figure 1. Two pumps operate in parallel pump through flow control valves, followed by a flow split that delivers cooling water through three heat exchangers. The cooling water recirculates through this closed system.

To determine the required pipe size and pumps needed to meet system requirements, one would start with a guess on pipe size. The system in figure 1 starts with a pipe



size guess of 8 inches for all piping. Manually, the user would change the pipe sizes individually, run the model, compare results with design requirements, and continue iterating. This process will be repeated until all design requirements have been met. The initial cost of the system would be whatever results from the material and installation costs of the size and length of the piping, fittings, pumps, heat exchangers, control valves, etc. For the sake of simplicity, this example only considers the material and installation cost for the piping, fittings, and pumps (costs for the pressurizer, control valves, and heat exchangers are neglected).

UNDERSTANDING PIPE SIZING

To do this manually would be difficult and could take a lot of time. If the resulting costs are within the initial cost budget and design requirements are met, the sizing process for the design usually stops there. If there is any time left over, the user might be

able to make some small changes to see if a lower cost is available. But this would usually only consider the initial costs.

The powerful advantage to using a flow analysis software tool that has automated sizing capabilities is that the simulation process will dramatically speed things up by sizing the piping system for the user. This allows the software engine to consider even millions of possible combinations of pipe size to help find a design that truly results in the lowest cost. The other advantage is that the pump energy costs over a system's lifetime can be easily considered concurrently with the initial costs. This provides the user a powerful ability to truly obtain the lowest cost design with a full life-cycle cost analysis.

But this is where the challenge lies. If the user only considers the initial cost of the system, the simulation will determine smaller pipe sizes that will result in lower up-front costs. If this is

done by hand, the user will often be blind to what the associated energy costs would be. As mentioned before, smaller pipe sizes require larger pumps that result in higher energy costs in the long run.

For the system in figure 1, I have assumed a system life of twenty years and an energy cost of \$0.11 per kW-hr. Material and installation costs for piping change with diameter and are considered on a \$/length basis, costs for fittings vary based on diameter, and pump costs are functions of horsepower.

MODIFYING DESIGN TO REDUCE COSTS

There are three ways the flow analysis software solver can modify design to reduce cost. The goal of the first case is to determine pipe sizes that will minimize initial cost. The goal for the second case is to minimize the entire life-cycle cost, which considers energy costs to drive design. The third case will be

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a hybrid that minimizes life-cycle costs while keeping the initial cost within a budgetary limit. Table 1 contains the resulting costs for all three scenarios.

The first scenario modified pipe size to minimize initial cost. This is more typical because as described previously, neither the engineering contractors nor the plant owners/operators pay as much attention to energy costs. The total material and installation costs for the piping, fittings, bends, and pumps is \$750,802. With a flow analysis software tool's cost calculation and automated pipe sizing capabilities, it is no extra work for the software to perform an additional calculation to determine energy cost based on selected sizes. Assuming a system life of twenty years and \$0.11 per kW-hr, the energy costs here is \$3,293,986. Almost 4.5 times

more than the initial cost of the system itself. The total cost of the system is \$4,044,788.

In the second scenario to minimize life-cycle cost, larger diameter pipes might be selected and although this will increase the initial cost of the system, the larger diameter pipes result in less pressure losses. Smaller pumps can be used due to lower horsepower requirements. This will have a dramatic effect on the overall energy costs. There is an increase in total initial costs by \$315,626. But the savings on energy costs is \$1,017,693. The total cost of the system at \$3,342,720 represents a total system savings of \$702,068. That is 21 percent total savings!

WORTH THE INVESTMENT

With significant savings like this, who would not choose to base their design off life-cycle cost instead of

reducing only initial costs? Spend more initially and save a lot in the long run. The major constraint is obviously the budget. It may not be possible to spend more than the budget allows, even if it can save much more in the long run. This is where you can implement a hybrid approach where the design is modulated to minimize life-cycle cost first, until the budget is met.

A quality software tool will do this for you by allowing the specification of an initial cost budget, and then will size the pipes accordingly. In case three, an initial cost budget of \$900,000 was specified. The solver iterates through the millions of combinations of pipe sizes and finalizes on sizes that meet budget while minimizing life-cycle cost. It provides the best of both worlds.

Comparing the third case with the initial case, we reduced energy cost and total life-cycle cost by \$727,361 and \$577,123, respectively while meeting the initial cost budget. Although this is about \$1,000 over budget, that can perhaps be adjusted with the software tolerances. In the end, this still saves 17 percent in the long run in comparison to cases where full life-cycle costs are ignored by minimizing only initial cost.

Overall, it is important to consider total life-cycle cost by accounting for energy costs in the design process. This allows dramatic savings in the long run. With flow analysis software that has cost calculation and automated pipe sizing capabilities, the massive savings is truly realized with the click of a button. ♦

DESIGN TO MINIMIZE INITIAL COST

TABLE UNITS: US DOLLARS	MATERIAL	INSTALLATION	NON-RECURRING SUB TOTAL	OPERATION/ ENERGY	TOTAL
Pipe Subtotal	\$388,405	\$229,113	\$617,518	\$0	\$617,518
Additional Fittings Subtotal	\$37,055	\$52,946	\$90,001	\$0	\$90,001
Bend Subtotal	\$900	\$1,778	\$2,678	\$0	\$2,678
Pump Subtotal	\$31,038	\$9,566	\$40,604	\$3,293,986	\$3,334,590
Total of All Costs	\$457,398	\$293,404	\$750,802	\$3,293,986	\$4,044,788

DESIGN TO MINIMIZE LIFE CYCLE COST

TABLE UNITS: US DOLLARS	MATERIAL	INSTALLATION	NON-RECURRING SUB TOTAL	OPERATION/ ENERGY	TOTAL
Pipe Subtotal	\$613,327	\$291,912	\$905,239	\$0	\$905,239
Additional Fittings Subtotal	\$58,313	\$72,300	\$130,613	\$0	\$130,613
Bend Subtotal	\$1,648	\$2,772	\$4,420	\$0	\$4,420
Pump Subtotal	\$20,309	\$5,847	\$26,155	\$2,276,293	\$2,302,448
Total of All Costs	\$693,597	\$372,831	\$1,066,428	\$2,276,293	\$3,342,720

DESIGN TO MINIMIZE LIFE CYCLE COST WITH \$900,00 INITIAL COST BUDGET

TABLE UNITS: US DOLLARS	MATERIAL	INSTALLATION	NON-RECURRING SUB TOTAL	OPERATION/ ENERGY	TOTAL
Pipe Subtotal	\$493,379	\$260,987	\$754,365	\$0	\$754,365
Additional Fittings Subtotal	\$50,908	\$63,638	\$114,547	\$0	\$114,547
Bend Subtotal	\$1,418	\$2,197	\$3,615	\$0	\$3,615
Pump Subtotal	\$22,106	\$6,408	\$28,513	\$2,566,625	\$2,595,138
Total of All Costs	\$567,810	\$333,230	\$901,041	\$2,566,625	\$3,467,665

Table 1: Cost comparison of three automated pipe sizing design scenarios. First case sizes pipes based on initial costs only, resulting in smaller pipe sizes while allowing energy costs to be calculated. Second case minimizes total life-cycle cost by allowing larger pipe sizes to reduce energy cost. Third case minimizes life-cycle cost while keeping initial costs within an initial cost budget.

Ben Keiser is technical sales consultant at Applied Flow Technology. With a primary focus on developing high quality fluid flow analysis software, AFT has a comprehensive line of products for the analysis and design of piping and ducting systems. For more information, visit www.aft.com.



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Seal-less Magnetic Drive Pumps for Chemical Processing Applications

Part 2 of 2

By Colin Guppy, Sundyne LLC



As we mentioned in last month's installment of this series, standards play a key role in the chemical industry. The characteristics they define assure customers that performance and safety requirements are met, while also guaranteeing interoperability for equipment throughout a plant.

STRICT ADHERENCE TO INDUSTRY STANDARDS

The ANSI/ASME B73.3 standard specifically addresses centrifugal pumps for the chemical industry. The standard covers 27 pump sizes and specifies dimensions for height, length, nozzle, and shaft diameters, plus the location and spacing of mounting bolts. The ISO 5199/2858 standards cover the same type of industrial pumps as ANSI B73.3.

The pumps deployed for chemical processing applications should meet all relevant ISO, ASME/ANSI standards. They should be available in metallic options to withstand extremely high temperatures (such as stainless steel with silicon carbide internal bearings, or Alloy 20/Alloy C with PTFE gaskets). Pumps should also be available in non-metallic configurations, for highly corrosive applications.

ADDITIONAL PROTECTION AND PEACE-OF-MIND FOR HANDLING HARSH AND HAZARDOUS CHEMICALS

Seal-less pumps offer the best solution to fugitive emission regulation. But every pump can use help defending against unstable process conditions. Sensors and monitors alert operators to potential problems and secondary containment systems ensure that problems do not escalate.

"Gas-in-liquid" Detectors

To avoid the risk of damage and dry running, ultrasonic signal technology is available to instantaneously detect the presence of gas in a liquid stream from outside the confines of the pump pressure boundary.

Traditional temperature and power control monitoring solutions sense the secondary effects of a gas build-up in the pump—but in most cases, pump damage occurs before any change is registered. By using ultrasonic technology, the build-up of bubbles in liquid can be identified early, and operators can be warned if a pump suffers from incorrect priming or venting, entrained process gas, or incipient vaporization.

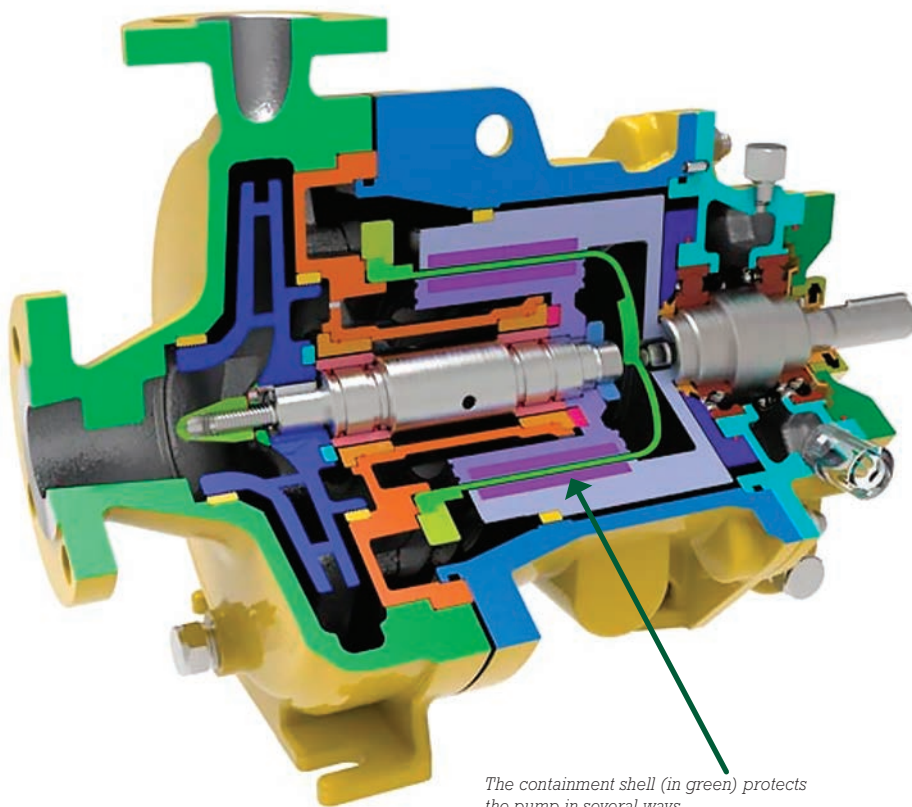
This ultrasonic technology—called VapourView—is adaptable to any application and can be retrofitted onto any seal-less magnetic drive pump. The system eliminates the potential for dry running and brings peace-of-mind against catastrophic failures and unexpected repair costs.

Eliminating Induction Heating and Eddy Current Losses

Applications that span the full hydrocarbon chain can pose



VapourView



The containment shell (in green) protects the pump in several ways.

challenges to pump seals by creating magnetic losses and by heating the process fluid. Pumps used in chemical processing applications can overcome these challenges with containment shells that eliminate induction heating and eddy current losses.

Most magnetic drive pump containment shells are made of metal. A preferred option for chemical processing applications are shells called ZeroLoss—which are engineered from a combination of poly-ether-ether-ketone (PEEK) and carbon fiber that was initially developed for military and aerospace equipment. Five times lighter than steel but just as strong, ZeroLoss Shells increase the pump's reliability, widen temperature ranges from -40 to 305 degrees Fahrenheit (-40 to 150 degrees Celsius), bolster the pump's resistance to thermal shock, eliminate potential vaporization of process chemicals near the pump's bearing, and provide greater

efficiency—by enabling a smaller motor to be specified (which also saves on power costs).

CHEMICAL PROCESSING PLANTS NEED ACCESS TO LOCAL AFTERMARKET SERVICE

Chemical plants run operations around the clock. If any part of the operation fails, it must be brought back on line immediately. A pump manufacturer's Authorized Service Centers (ASCs) must be able to support every pump, and bring engineering expertise and technical support to the customers' job site at a moment's notice. From routine maintenance programs and onsite troubleshooting to replacement parts and components, the service network must be able to provide everything it takes to keep chemical plants up-and-running—anywhere around the globe.

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MAKING THE CASE FOR SEAL-LESS PUMPS IN CHEMICAL PROCESSING APPLICATIONS

When it comes to handling harsh and hazardous chemicals, safety for plant personnel and the environment are critical factors—but bottom-line ROI is just as important. In summary, here are ten reasons for operators to choose seal-less magnetic drive pumps for chemical processing applications:

- 1. Design Simplicity:** seal-less pumps = no leaks and no emissions
- 2. Lower Installation Costs:** no need for seal support systems
- 3. Extensive Flow and Pressure Envelope:** supported via a wide range of pumps
- 4. Support for all Industry Standards:** in any geography
- 5. Construction Materials to handle any job:**
 - Metallic liquid ends for high temperature applications
 - Plastic liquid ends for highly corrosive substances
- 6. Monitoring Solutions:** to identify potential problems before they escalate
- 7. Secondary Containment Options:** to deliver peace-of-mind
- 8. Flexibility:** to handle solids and withstand dry running
- 9. Extended MTBF:** to decrease maintenance costs
- 10. Global Service and Support:** to deliver same day local support, anywhere in the world. ♦

MEETING OR EXCEEDING CHEMICAL INDUSTRY STANDARDS

- **Metallic Options:** HMD pioneered the seal-less magnetic drive pump for the chemical industry in 1947—and since that time, HMD's engineers have leveraged more than seventy years of experience to ensure that HMD Kontro seal-less pumps adhere to, and exceed the latest ASME and ISO standards.
- **Non-Metallic Options:** For highly corrosive chemical applications, ANSIMAG pumps are ASME / ANSI B73.3 compliant and are available in materials that can stand up to most abrasive or highly-corrosive applications.

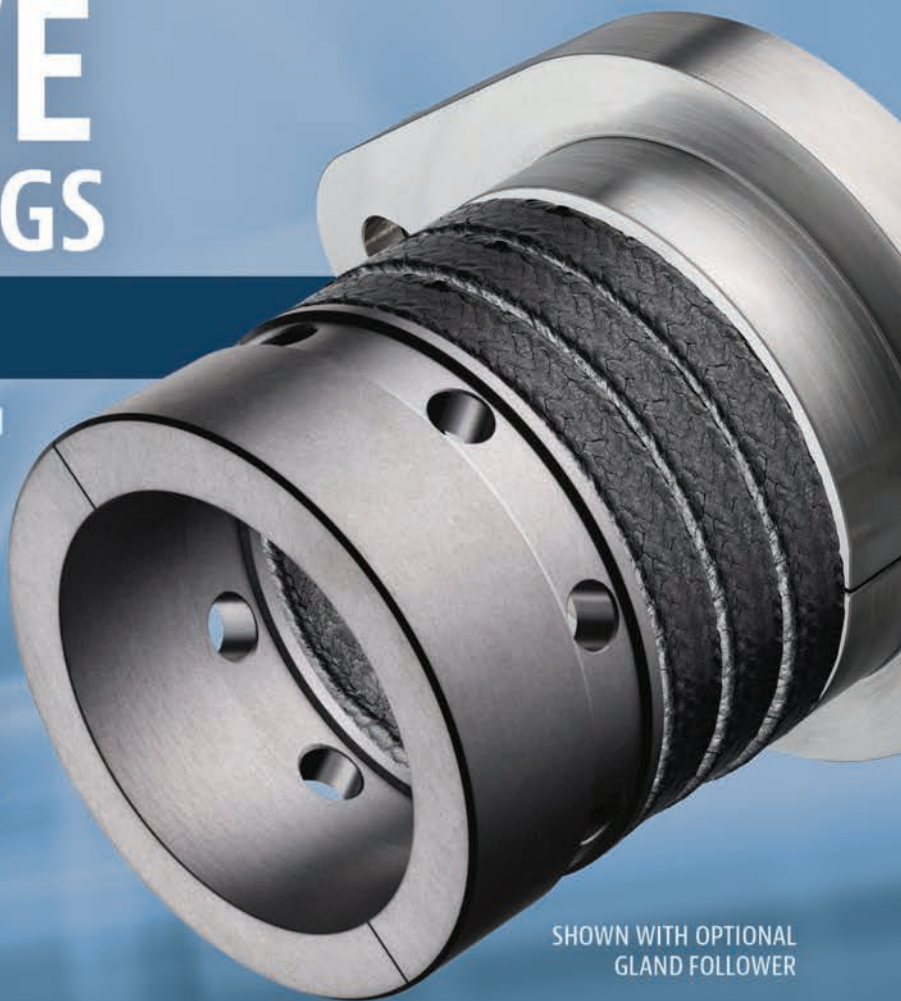
Colin Guppy is Sundyne's chief commercial officer. He is responsible for developing strategies and tactics for Sundyne's chemical industry sector. He can be reached at colin.guppy@sundyne.com. Sundyne has assembled industry-leading brands that provide customers with a wide range of fluid and gas handling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

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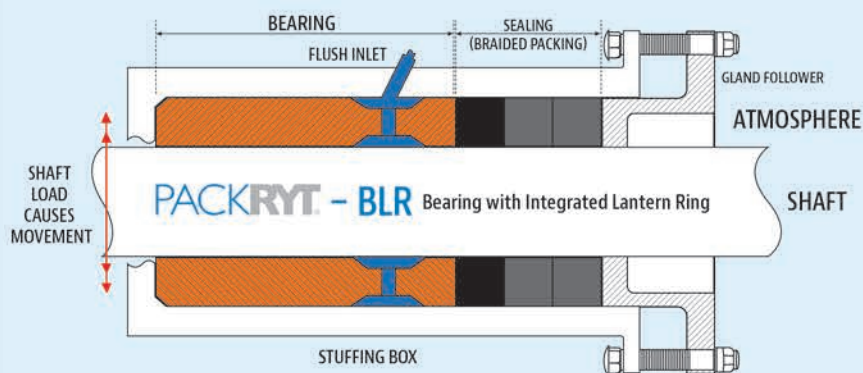
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Bridging the IoT Gap

Collaboration creates new line of Ethernet/IP controlled peristaltic pumps

By Rob Martindale, Watson-Marlow Fluid Technology Group



Cytiva, a global provider of technologies and services that advance and accelerate the development and manufacture of therapeutics, collaborates with Watson Marlow Fluid Technology Group (WMFTG) to develop a new line of Ethernet/IP peristaltic

pumps. The new pumps enable biopharmaceutical drug manufacturers to improve process control and access data using Ethernet networks. The pumps are well-suited for manufacturing biological drugs, including those used for cell therapy and gene therapy.

The new line of Ethernet/IP cased pumps offers easy network integration, which makes it easy to package data for making real time decisions during manufacturing. This ability to access more information helps customers improve the efficiency, quality, and safety of automated production processes, and improves speed to market—ultimately helping reduce the cost of the drug manufacturing process.

“At Cytiva, we choose to work with companies that have proven technology, high quality standards, superior product support, and a focus on innovation,” says Michelle Stafford, Cytiva’s global marketing leader for bioprocess solutions. “Biomanufacturers value speed to market, and they need flexible manufacturing platforms that comply with global requirements. We select to work with companies that support and deliver products on a global basis and that is exactly what we get from Watson-Marlow Fluid Technology Group.”

WMFTG’s Ethernet/IP 630 and 730 pumps are currently undergoing trials on a variety of liquid management applications, including managing the transfer of an entire batch of materials—from an Xcellerex bioreactor to a mixer. WMFTG’s smaller Ethernet/IP 530 pumps are being used to control pH levels in mixers and bioreactors, along with managing antifoam and glucose in bioreactors. Cytiva also uses the pumps for continuous processing for harvest and perfusion steps in some applications.

PRODUCT DEVELOPMENT

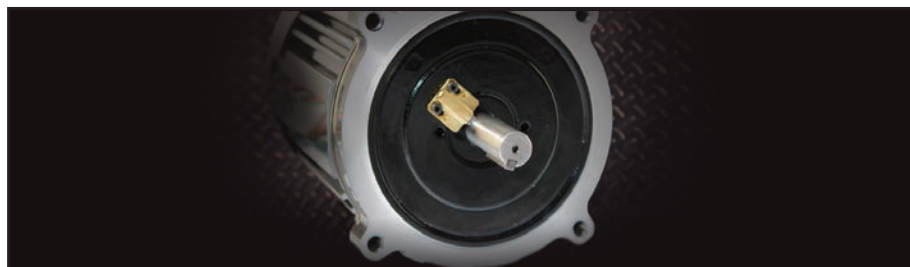
Cytiva requested WMFTG assistance in developing a pump as part of a product refresh initiative to address the movement towards automation and the internet of things (IoT) in the biopharmaceutical industry. A huge amount of data is coming out of the drug making process, including process parameters, set points, and output.

“Biomanufacturers face challenges managing the vast amount and different types of data collected, and we wanted a way to package the

data such that it is easier to make decisions with confidence in real time during manufacturing,” explains Stafford. “This information could ultimately affect the cost and delivery of the drug to the patient.”

Many legacy products had been developed using the well-established

but aging fieldbus (PROFIBUS) networking protocol. The automation team was seeking to develop products that could access the move towards online cloud-based big data analytics. They also had an eye on “future-proofing” products to the extent possible by selecting the right



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networking protocol—one that would hold up to the growing focus on security of IoT connected systems.

Jay Doherty, Cytiva control systems architect, worked closely with WMFTG to create a pump that moved from reliance on PROFIBUS. After a rigorous review of available options, the team selected the Ethernet control protocol. “We considered Ethernet to be the most likely way to access the IoT—at least for the next decade—based on the availability of components and the tremendous support for the Ethernet protocol in manufacturing as well as in the greater world of technology.”

Once the Cytiva-WMFTG team decided on Ethernet technology, they evaluated the most widely known industrial automation options, eventually selecting Ethernet/IP. “We conducted an audit of device compatibility with sensors, scales, and other devices that are used for measurement in biopharmaceutical manufacturing and determined they were more widely available in Ethernet/IP than Profinet, another possible option more widely used in Europe,” explains Doherty. “Also, the two control systems Cytiva currently utilizes (Rockwell and Delta V) integrate better with Ethernet/IP than Profinet.”

Customers using Ethernet/IP will be able to connect both pressure and flow sensors directly into the back of the pump, with data available on the network for factory/pump control. Warning and alarm limits will stop the pump if sensors limits are exceeded, and a leak sensor controls operations to prevent leaks.

SHARING DATA IMPROVES PUMPING

While peristaltic pumps are extremely accurate even at low speeds, feedback sensors are rapidly becoming more important as continuous batch manufacturing becomes the norm. “The new WMFTG Ethernet/IP peristaltic pumps can be used with flow meters that will enable the pump network controller to compensate for tube degradation as it ages,” says Doherty.

He adds, “As we move towards continuous processing, calculated flow simply won’t be enough. With the new pumps, a flow meter will be able to use positive feedback to maintain the necessary flow rate for the process.”

ETHERNET/IP CASED PUMPS OFFER SIGNIFICANT BENEFITS

Reduces Operational Costs and Improves Process Performance Using Modern Digital Networks

By switching to a modern communication protocol like Ethernet/IP, Cytiva can bring in a wide variety of data never before available. In addition, biomanufacturers will no longer need to rely on controllers as data concentrators, saving money on building large controllers for data that is not used. Instead, they can feature concurrent connections.

“That means users can run a pump exactly as required by the process and in real-time collect data from it, as opposed to gathering it from a controller. If a field operator wants to know the number of hours the pump ran, it can ask the device directly,” explains Doherty. “So, it’s really kind of a divide and conquer approach to the data stream, which is excellent for those who need to be mindful of what’s happening in the controller at all times.”

Plug in Local Pressure and Flow Sensors and Use the Pump as a Gateway to Sensor Data

This new functionality allows Cytiva to reduce hard input/output (I/O) count, enabling them to treat I/O points as remote I/O. In the past, taking a pressure reading would normally require an element with a transmitter and wiring back to a module. With the new WMFTG Ethernet/IP cased pump, biomanufacturers can plug a pressure transmitter straight into the back of pump and read it via Ethernet/IP. This reduces wiring, installation qualification, potentially operation qualification, and overall system complexity.

Easy integration using EDS files and a Rockwell Automation advanced device profile

The new pumps are equipped with a licensed EDS file from ODVA, which enables users to unlock an extremely beneficial extra feature—all information that comes into the controller is captured in its native data type. This means no typecasting or byte swapping needed to manage that data, significantly streamlining the workload and data transfer.

No Need for Adapters or Gateways, Saving Money and Space

The new pumps offer a huge amount of system modernization with a healthy dose of future proofing. In addition to saving money on adapters or gateways.

DIGITAL AUTOMATION SOLUTIONS FOR BIOPHARMACEUTICAL MANUFACTURING

“The new WMFTG Ethernet/IP cased pumps are an important tool for today’s biopharmaceutical manufacturers, who face challenges both from the risk of having their intellectual property compromised by insecure systems and the need to validate processes any time they make a change,” concludes Doherty. “The WMFTG Ethernet/IP cased pumps represent an important step forward and it was a pleasure working with WMFTG’s team to develop the product.” ♦

Watson-Marlow Fluid Technology Group (WMFTG) is the world leader in peristaltic pumps and associated fluid path technologies. The group comprises ten established brands, each with their own area of expertise. Together they provide leading engineering solutions across the food, pharmaceutical, chemical, and environmental industries. WMFTG is a wholly owned subsidiary of Spirax-Sarco Engineering PLC. For more information, visit www.wmftg.com.

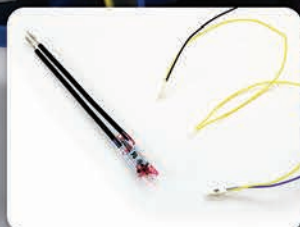
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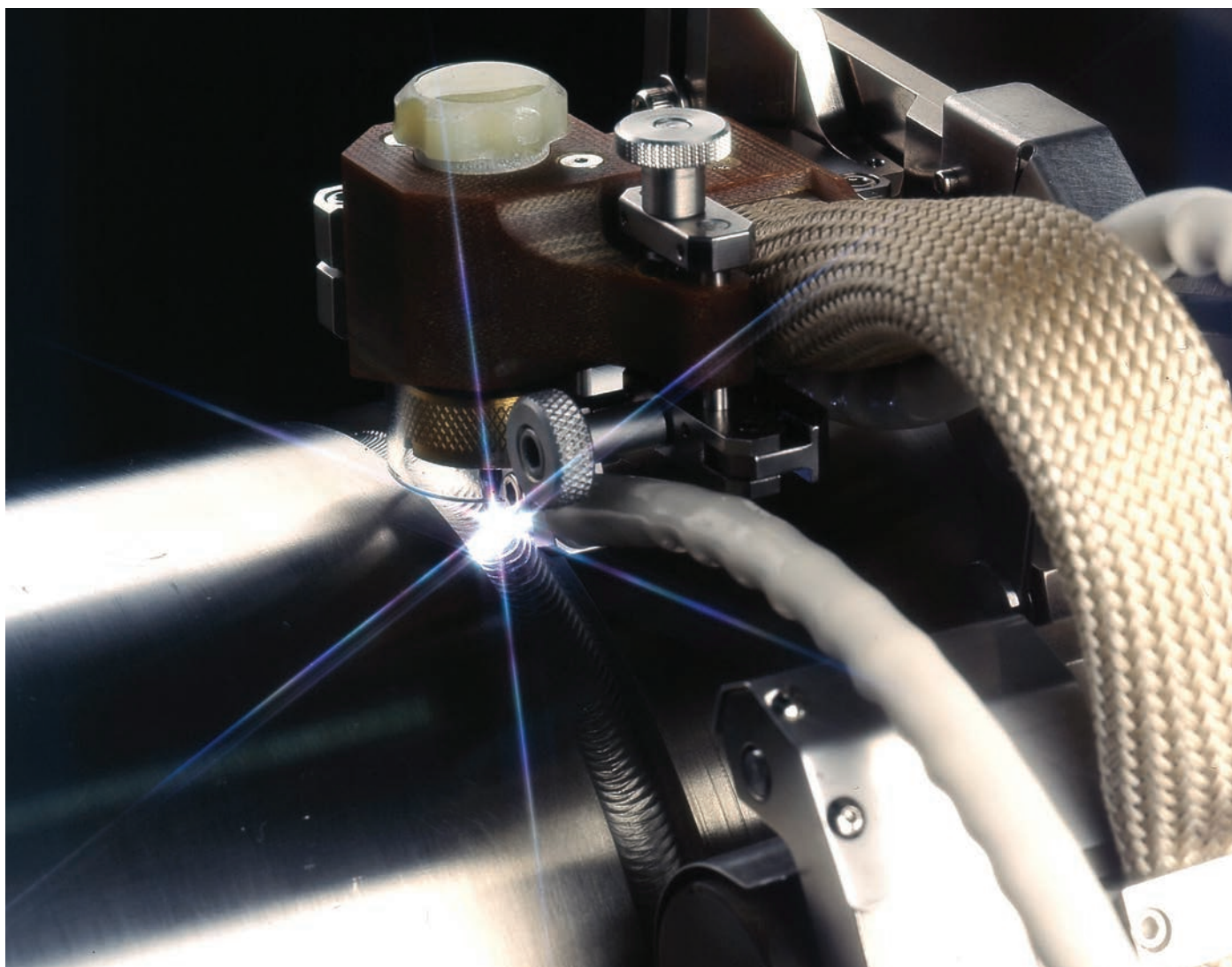
The Royal Discipline of TIG Welding

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

Part 2 of 2

See
Part 1
www.mptmag.com

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



Special emphasis is placed here on the high quality and reproducibility of the weld seams in the interest of occupational health and safety and to avoid possible consequential costs due to deficient processes.

In last month's introduction to this series, we demonstrated how, in order to optimize the electrode for the respective process, extensive know-how about the tool is just as important as extensive knowledge of the area of application itself. In the following article, we'll see how geometry also plays a critical role in tungsten electrode performance. It is significantly influenced by the grinding method used. For example, the surface is increased by abrasives with a coarse grain, which in turn ensures faster oxide evaporation. Furthermore, the roughness of the surface when processing with a coarse-grained abrasive varies from application to application.

GRINDING FOR A SMOOTH FINISH

Hand-operated and bench tungsten grinders are best left for preparing electrodes for manual GTAW applications, not mechanized processes. In an orbital TIG arc

welding system with a modern power source with inverter and good arc start behavior, companies should use pre-ground tungsten electrodes that have been machined by robot-controlled CNC systems. These machines are able to produce the desired very fine surfaces.

In order to influence boundary layers, voltage drop, cathode spots, evaporation rate, or the relative exposed functional surface, the surfaces can be Ra 0.01 μm (0.4 micro inches) low, with high edge sharpness of the contour or 3.2 μm (125 micro inches) with perfectly burr-free flanks. High-quality, pre-ground electrodes made of tungsten also offer a dimensional accuracy of ± 0.05 millimeters at the tip diameter and grinding angle tolerances of ± 1 degree.

On the other hand, if a manual grinding machine is used to flatten the end of a pointed electrode, this leaves a microscopic burr without exception. If this burr breaks off

during welding, it can get into the weld seam. For pharmaceutical, medical, nuclear, aerospace-related, and other critical applications, this often means that the workpiece has to be sorted out. To complicate matters, electrode point geometry affects the plasma cone's shape, which has an effect on the weld bead profile.

OUTLOOK ON CURRENT RESEARCH RESULTS

Much of the previous plasma research in the field of electrode geometry is carried out using the spot-on-plate technique (welding spot on plate), in which an arc strikes a plate at 200 amps for two seconds. This technique does not represent the fluid dynamics (molten weld puddle behavior) that occur during orbital welding. It does not take into account the welding head that moves into the cold material from the weld seam, nor does it take into account the thermal conductivity and the preheating of the tube during the welding process.

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While tungsten electrodes are frequently used in welding, their structure, sharpening and alloy have a previously underestimated influence on consistently good product results in TIG welding. A reproducible weld seam is only possible if the electrode quality and geometry are outstanding.



Newer research, conducted under actual orbital welding conditions, incorporated more than 500 electrode configurations. Polished cross-sections of the welds were examined with a scanning electron microscope. Based on these results, suppliers of electrode and orbital systems can now recommend suitable tungsten solutions for specific applications. Narrow welds with a weld seam of 2 millimeters in outer diameter, for example, benefit from the increasing and constant arc pressure from the tungsten electrode, which is achieved by a mixture of mixed oxides, in which different oxide properties are combined.

These research results also help to solve previously hidden problems.

For example, recurring deviations in the welding process at a company led to a significantly higher reject rate. To reduce this, extensive measures have been taken to find the cause. The investigation team re-calibrated the power source and welding head and inspected every point in the circuit. This did not improve the welding results though. However, the team never thought of the consumable component in the circuit: the electrode. The change to higher quality, pre-ground tungsten electrodes solved the problem.

Depending on the respective operating conditions, cumulative deviations caused by these factors can easily lead to a total heat

input that deviates by as much as 5 percent under otherwise identical ambient conditions. While that might be acceptable now, it won't likely be acceptable within the next decade when end users require component fabricators to provide more complete data records and analytics.

CONCLUSION: HIGH QUALITY TUNGSTEN ELECTRODES OPTIMIZE COST EFFICIENCY

With every orbital welding process, high-quality electrodes reduce the overall welding costs. Test runs under clean room conditions confirm that with optimized tungsten electrodes, more than 650 arc starts can be easily implemented without delays in arc development. Instead of changing the electrode at the start of every shift, welders can use an electrode for several days. For example, one company recorded an arc duration of twenty-seven hours with a single electrode.

Conversely, unspecific, second-class tungsten electrodes only deliver an average of about 110 arc starts and therefore have to be changed significantly more frequently. The associated labor cost alone wipes out any money saved on the purchase price. Taking into account scrap and welding defects, it is therefore desirable to carefully select an electrode. This is the only way to produce high-quality weld seams that are still cost effective. ♦

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



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2021 BUYERS GUIDE



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Adventech is revolutionizing the electric motor market—a market that has remained relatively unchanged for decades. Armed with cutting-edge technology and the vision to create products that transform both industry and the human experience through energy conscious solutions, Adventech developed the world's only complex-motor generator—the Maxeff Motor.

The Maxeff Motor is perfect for use in any induction motor application such as pump drives, cooling tower

fan drives, automation applications, baghouses, etc. With over 3,000 Maxeff Motors in use globally, we have garnered a reputation in the marketplace as THE efficiency solutions provider.

Allow our team to find the right solution for your application; we are dedicated to saving your team money through energy savings,

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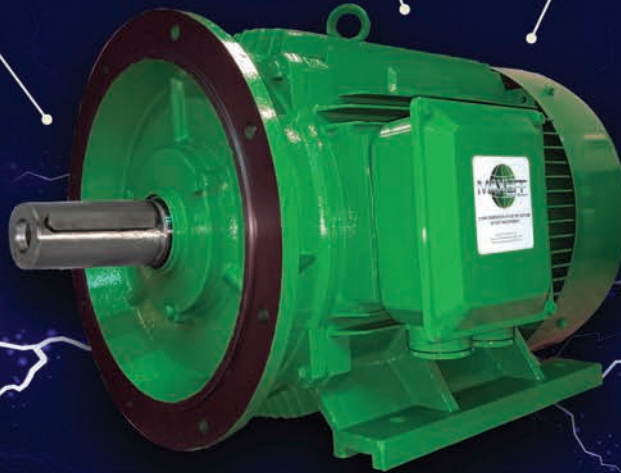
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Through the years, our continued growth has focused on superior pump design, engineering, and customer service. As a result, Gorman-Rupp has become a company known for market innovations and improvements that continue to set standards for the pump industry.

Gorman-Rupp operates two manufacturing plants, producing a full line of pumps and sewage pumping stations with custom-made fiberglass enclosures and electrical control panels.

Gorman-Rupp has over 1,000 distributors throughout the United States and the world that are qualified to give expert advice on pump selection and applications. If you have

a service problem, a factory-trained distributor is only a phone call away. Our distributors are backed by the fastest parts service in the industry. Gorman-Rupp stocks more than 60,000 pumps and parts and ships 99 percent of them within twenty-four hours so your parts will be there when you need them.



The Pump People®

CONSTRUCTION MARKET

Gorman-Rupp is the leading manufacturer of pumps for the construction market. Offering nearly 3,000 models, we have one of the largest selections of fluid-handling products in the world. We have built our reputation on the workhorses of the construction pump market: self-priming centrifugal trash pumps. These dependable, versatile performers help contractors move

large volumes of water quickly. We also manufacture an extensive line of submersible, diaphragm, and priming-assisted pumps that offer maximum reliability and service life.

INDUSTRIAL MARKET

You will find Gorman-Rupp pumps operating in the most hostile industrial environments—down in the sub-basements; in the waste sumps; in the heat, steam, grease, and grime; handling the corrosive and abrasive industrial wastes other pumps cannot. Performing reliably month after month, year after year, in all types of waste control systems, pumping solids and debris that would shut other pumps down, Gorman-Rupp industrial pumps are designed for the people who service them.

MUNICIPAL MARKET

Gorman-Rupp sets the industry standard for sewage pumping systems including pumps, motors, and controls (complete sewage lift stations). Our solids handling self-priming and submersible sewage pumps offer maximum dependability and ease of service. Our commitment to “total system responsibility” means you only have to make one call should you encounter a problem with your system, from pumps and controls to the lights and fans in our enclosure. We simply offer the best sewage pumps and pumping systems in the industry. ♦



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Hoosier Pattern

For over two decades, Hoosier Pattern has always been on the cutting edge of innovation. We're consistently raising the bar in our industry while maintaining the highest quality for our customers. In 2013, Hoosier Pattern was the first service center to own and operate a 3D sand printer in the United States. As of 2020, we have four 3D sand printers in-house as well as over twenty-five machining centers.

Hoosier Pattern started in 1997 in a 3,500 square foot space with just a couple of machining centers. Today, we operate a 90,000 square foot facility with state-of-the-art technology, allowing us to take on jobs from various customers across multiple industries. Our technology includes:

- Over twenty-five machining centers including vertical and horizontal machining
- CNC lathes
- Five-axis mill
- Plate saws
- Four 3D sand printers for sand molds and cores
- 3D plastic printer
- EDM
- Manual CMM
- Laser scanner

Hoosier Pattern delivers manufacturing capabilities to a wide variety of industrial and commercial pumps. Our customers can request centrifugal pumps, water, sewage pumps, turbine pumps, transfer pumps, fluid flow pumps, and the list doesn't stop there! Our advanced technology allows for pinpoint accuracy and fast turn-around times.

Within two weeks of submitting a product order to Hoosier Pattern, a sand mold of a pump part is made and is ready to ship to the customer's preferred foundry. Hoosier Pattern uses the latest technology from the start, so castings can be made quicker, and products can reach customers sooner.

In addition, Hoosier Pattern has a diverse list of industries we serve, such as consumer appliance, agriculture, and automotive industries.

There is no need to sacrifice design for manufacturability when working with Hoosier Pattern. Complex core designs are 3D printed as one piece, reducing or eliminating assembly errors and foundry casting defects. No internal fins or mismatches. 3D printed foundry molds do not need traditional parting lines and flask sizes. This process gives the foundry the freedom to gate, add risers, and feed the casting in the best possible way to produce the optimal casting.

Complex pump component castings produced quickly and at a known cost are why pump manufacturers turn to 3D printing as the solution to pump casting problems.

Our employees share our vision of excellence in every aspect of their jobs. Our shop reflects that dedication to precision and quality. Our staff is well-trained, well-educated, and stays up-to-date in the latest knowledge of CNC machines, sand printers, plastic printer, laser scanner, accounting software, hardware, and software, allowing us to cater to our customers' needs.

Several of our employees have experience working in foundries—and they are keenly aware of the urgencies that these companies face daily. Our expertise and in-depth knowledge give our team members the advantage of understanding and meeting our customers' needs and expectations. We always strive for excellence in every job. If we promise it, we deliver, no matter what the cost. We know that "every second counts," and we take that seriously as we work on specific deadlines to meet your project's demands.

At Hoosier Pattern, we believe that innovation drives productivity. We have always relied on these practices to deliver on-time and premium-quality products to our customers throughout the United States and worldwide. We understand that industries are evolving, and staying up-to-date with the latest technological advancements is an essential part of our success.

Even though innovation is the driving force behind our product development, our commitment to manufacturing excellence will forever remain our highest priority. ♦





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JWC Environmental

NEW WASTE STREAMS REQUIRE NEW SOLUTIONS

By breaking down solids into a manageable size, grinders allow pumps to work efficiently while avoiding downtime for cleaning and repair. However, not all grinders are the same. The equipment installed in most municipal wastewater treatment operations is designed to handle “normal” sewage, but there is nothing normal about the waste stream currently going to these plants. In addition to a surge in wipes, PPE, and other materials going down toilets, there is also the potential for other objects such as small animals and concrete from degrading infrastructure to become part of the waste stream.

While utility managers have attempted to mitigate these issues, their solutions are often less than ideal. For instance, more utilities are screening at pump stations, which were not designed for the task. This adds an extra removal and disposal step, as well as creates the potential for an odor problem. Additionally, some plant operators have installed pumps that incorporate impellers with grinding or chopping capabilities. However, this renders the pumps less effective for their primary purpose, while allowing for abnormal debris to get caught up and cause blockages. These pumps are also expensive to purchase, operate, and maintain.

By contrast, specialized equipment at a pump station that is purpose-built to condition solids before they are pumped allows the pump to run as efficiently as it was intended. This protects the pump and moves the

waste stream forward to a more ideal environment for treatment. To meet this need, JWC Environmental has developed a Wipes Ready® cutting technology that is now an option on its sewage grinders.

MUFFIN MONSTERS®—THE LEADERS IN PUMP PROTECTION

The latest innovation to JWC’s Muffin Monster line-up is its Wipes Ready technology. Municipal waste streams are being plagued by an invasion of so-called “flushable” wipes that ball together and shut down waste conveyance systems. The Wipes Ready technologies are designed to shred disposable wipes and rags into small pieces that are unable to reweave into ragballs. Conventional grinders shred wipes into long strips that may reweave into ropes and form ragballs, clogging pumps and other systems. The Wipes Ready technologies feature enhancements to the proven Muffin Monster® and Channel Monster® grinders—equipping them to better protect pumps and prevent unplanned maintenance and damage.

JWC’s Muffin Monster grinders are designed to quickly cut problem solids down to size, preventing costly pump problems and sewer backups. They utilize two rows of sharp steel cutters that rotate slowly toward each other to actively pull materials into the grinder while using high torque to breakdown the troublesome solids. Muffin Monster grinders have proven to be effective in dealing with the wide variety of solids that can be found in waste streams, including wood, plastics, and other inorganic materials.

The units are available with a variety of cutter configurations, and the design quickly adapts to existing pipeline and in-channel installations with little modification.

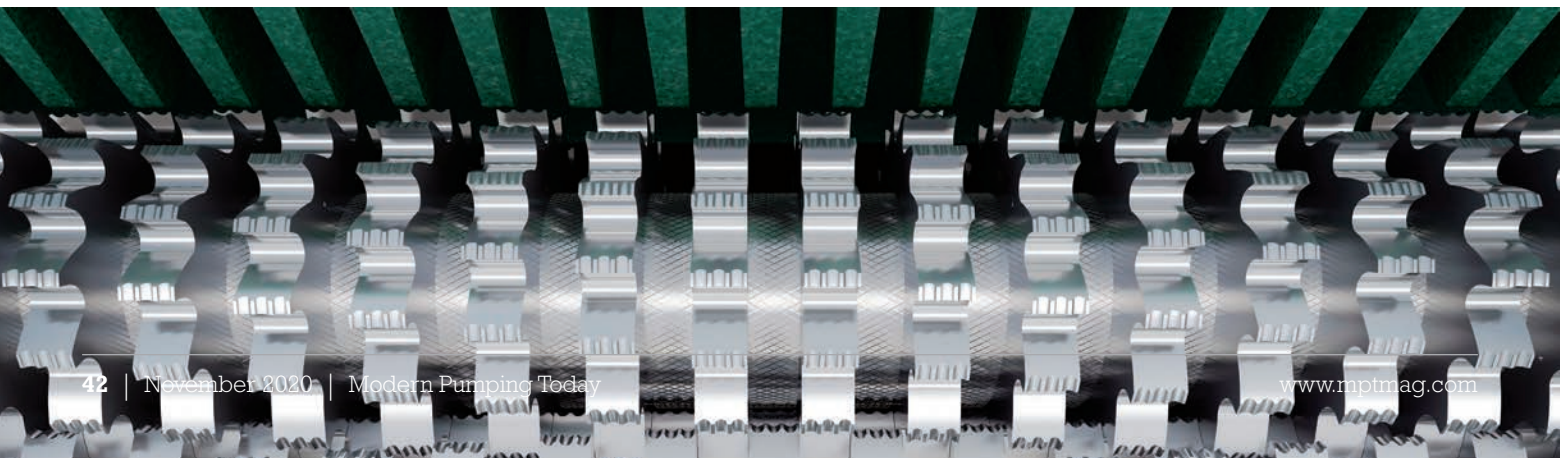
The business case for investing in grinders with new cutting technology is strong. Deploying grinders at pump stations helps protect pump integrity, leading to longer maintenance cycles and fewer breakdowns, as well as more efficient pumping operations and less labor needed to remove clogs. The most advanced products are also low maintenance, so operators can “set it and forget it” for extensive periods.

SERVICE SOLUTIONS TO HELP YOU GET THE MOST OUT OF YOUR EQUIPMENT

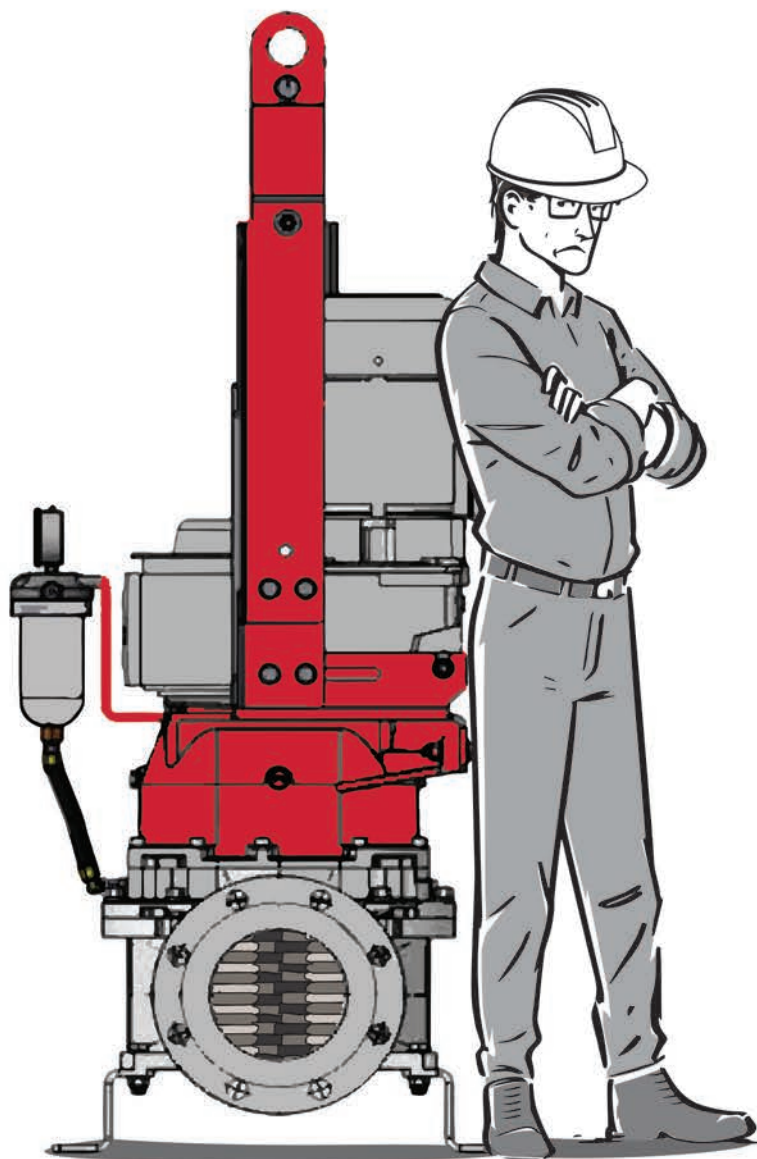
The expert JWC Service Solutions team is responsible for keeping JWC Environmental equipment running at peak performance. This team of professionals is specially trained to help customers get the most out of their equipment and extend the life of their investments. JWC Service Solutions tackles system startups, upgrading equipment to the latest technology, on-site screen rebuilds, and simple replacement parts.

ABOUT JWC ENVIRONMENTAL

JWC Environmental is headquartered in Santa Ana, California. The company is supported by a worldwide network of representatives, distributors, and regional service centers to meet local customer needs. More information on JWC Environmental is available at www.jwce.com or by calling 833.240.0117. ♦



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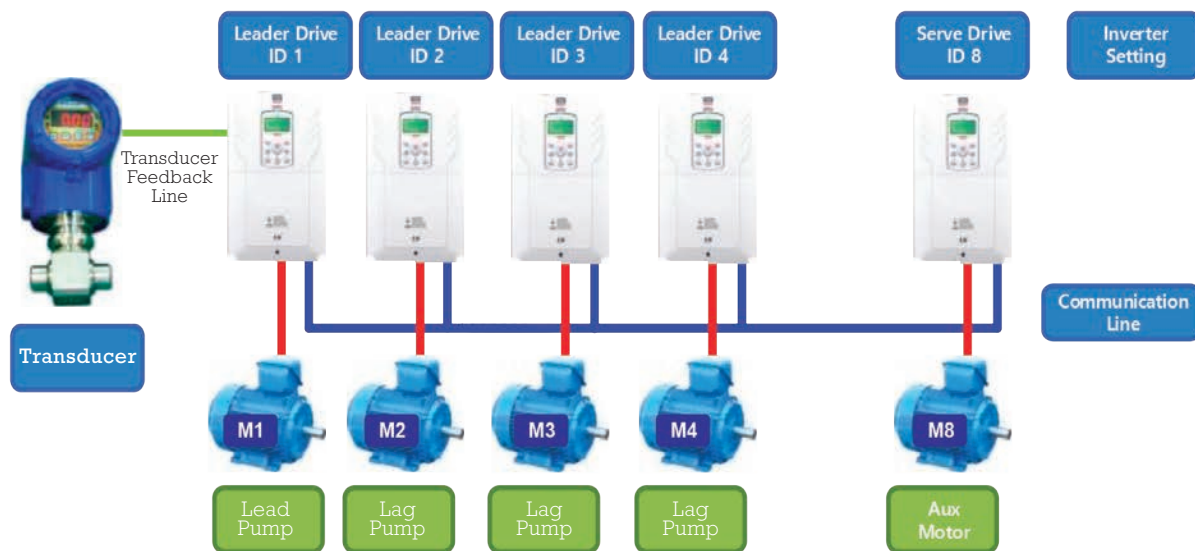
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- Setup parameters are shared across the connected VFDs for streamlining and reducing startup time.

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- Redundant setup eliminates downtime!
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- Automatic pump alternation based on operation time or sequencing (FILO/FIFO).
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- Supports up to eight H100 VFDs! ♦



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THE MEGALERT SAFETY ADVANTAGE

At MegAlert, safety and reliability is in our culture. Our mission is to manufacture and provide high quality insulation resistance testing and monitoring devices incorporating leading-edge technologies. This ensures safety for personnel, and reliability for motors and generators based on proven MegAlert patented technology.

With an estimated five to ten arc flash accidents occurring daily—far too often resulting in fatalities—motor and generator safety is more important than ever. Our devices allow for required testing to be done from outside of the cabinet, protecting personnel from exposure to potentially deadly arc flashes. Our devices save lives by enabling electrical workers to operate safely in hazardous conditions.



At MegAlert, we know that lives depend on the quality of our devices. That's why MegAlert's production facilities manufacture products that comply with the highest possible standards and regulations.

THE MEGALERT RELIABILITY ADVANTAGE

Our products are designed with your need for reliability in mind, ensuring that you experience minimal downtime from your motors and generators. Our devices test automatically when they detect your motor or generator is offline to ensure improvement in plant and machine reliability. Having a highly reliable indicator of a motor or generator's probability for failure on startup is crucial, allowing you to reduce unscheduled downtime and save on potentially disastrous repair costs.

Any successful company requires operational dependability and reliability otherwise it cannot maximize its productivity. MegAlert is dedicated to helping businesses reach optimal



functionality by installing systems to warn against critical motor failures. By installing our systems on motors and generators within a business, companies can feel confident that their operations are dependable and safe.

Our insulation resistance testers are unique in that they are the only true dielectric insulation resistance testers in the world. Our protection systems save companies valuable time by eliminating critical failures within their machinery, but also save expensive repair costs on potentially disastrous malfunctions.

THE MEGALERT COST-SAVINGS ADVANTAGE

Our commitment to bringing you products that create a much safer and more reliable work environment comes with the added benefit of cost savings in crucial areas of operation.

There are huge benefits to knowing that a motor or generator is beginning to fail before it actually does. One of the main reasons that this is crucial is that it can save a company thousands of dollars in repairs, lost productivity, and insurance liability. At MegAlert, we understand that saving money is an important focus for all companies, and our products save our customers lots of it. Our resistance testers and other MegAlert products are indispensable. ♦

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MEGALERT manufactures the MotorGuard and GenGuard patented testing and protection systems designed to detect insulation breakdown in critical motors and generators. The system senses when the motor or generator is offline and then performs a continuous dielectric I/R test on the winding insulation until the equipment is started again and will provide an early warning signal in time for corrective action to be taken to prevent a failure.

» Eliminate Arc Flash Exposure

» Reduce Repair costs

» Prevent Unexpected Downtime

» Tests Equipment up to 15KV

» 500-5000 VDC Test Outputs



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Plast-O-Matic Valves

REDUNDANT ANTI-SIPHON CAPABILITY: COMBINED USE OF RELIEF VALVE AND VACUUM BREAKER

An engineering firm recently specified two seemingly unrelated valves to provide redundant siphon prevention in a ferric chloride piping system.

In many piping systems, when the pump is shut off, vacuum occurs as liquid drains from the highest point to the lowest point in the piping system. This downstream flow creates a vacuum, and as flow continues, it often creates a siphoning effect and drains the supply tank.

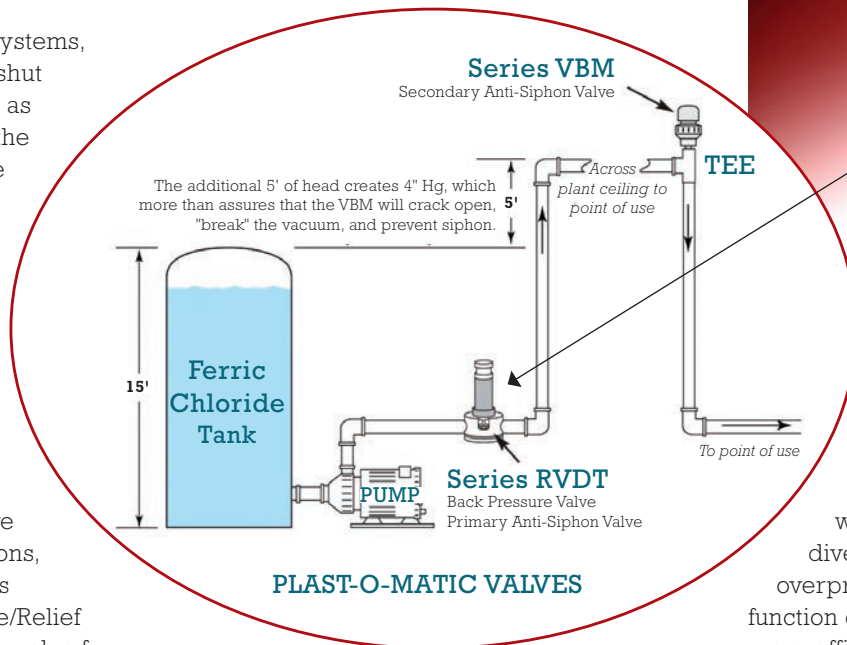
In many corrosive chemical applications, Plast-O-Matic Series RVDT Backpressure/Relief Valve is the leading valve for preventing siphon. It was the first state-approved thermoplastic valve for anti-siphon use in municipal water treatment systems, selected for its PTFE diaphragm and normally-closed design.

HOW IT WORKS

The RVDT uses a non-wetted spring to keep the valve closed. The set pressure (or opening pressure) is determined by pre-setting an adjusting bolt. When the pump is activated, and pressure builds above the set point, the RVDT opens and allows flow. The set point is based on the total feet of head in the tank plus a safety factor. When the pump is shut off, pressure drops below the set point. This causes the RVDT to automatically close bubble tight, and siphoning due to tank head pressure is prevented.

REDUNDANT SIPHON PREVENTION

Because of the critical nature of the application, system designers required a back-up to the RVDT—just in case. The valve selected? Series VBM vacuum breaker—and here's why:



system. Most important of these is providing pump backpressure, as well as downstream (or diverted) relief in the event of overpressure. The backpressure function enables the pump to run more efficiently, as well as smoothing out turbulence.

Bypass relief enables some or all of the flow normally discharged from the pump to be bypassed or piped away to either the suction side of the pump or back to the feed vessel when an obstruction occurs in the piping system. In this case the valve is usually installed on a tee, or a three-way version is used.

When the obstruction is cleared and normal flow returns, the pressure in the line returns to normal and the valve closes. The key benefit is to prevent deadheading and costly rebuilds or replacements.

The valve is available in a variety of engineered thermoplastics, as well as stainless steel. For more information on these key piping system components and to safeguard your system, visit www.plastomatic.com. ♦

The most sensible plan was to use a normally-closed vacuum breaker that would positively seal bubble tight under even the lowest pressure, but open at minimal vacuum should the primary anti-siphon valve fail. Plast-O-Matic Series VBM, by virtue of its patented diaphragm, was the only product available to meet this requirement. Most vacuum breaker designs rely upon a floating ball for closure, but these are highly prone to distortion and leakage is common. Series VBM design is tested to over 1,000,000 cycles in laboratory conditions, and the diaphragm is easily replaced if necessary.

BONUS PUMP PROTECTION

In addition to siphon prevention, the series RVDT valve provides a number of additional benefits to the

3 VALVES IN 1

AIR RELEASE • DEGASSING • VACUUM RELIEF

- Air Release Valve, which releases air during system start up.
- Degassing Valve, which provides continuous degassing.
- Vacuum Relief Valve, which prevents pipeline vacuum in case of leaks or siphon.



When a pipeline is being filled, the valve allows the air to escape through a large orifice. As liquid rises in the valve, a float seals against the large valve orifice. During operations, unwanted air will collect in the valve and cause a second, smaller orifice to open and close, allowing continuous system degassing. And finally, if there is a break in the pipeline causing sudden loss of liquid, the valve body will drain, drop the float and open the large orifice. This allows air into the pipeline and prevents implosion damage.

Innovative Patent Pending Design Provides
Three Critical Venting Functions

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OUR COMMITMENT TO YOU—RELIABILITY

As a pump user, you count on your equipment performing well every day. Who wants to worry about pump operations, especially when the pump is submerged in a greasy sump or stinky manure pit, or is otherwise difficult to reach?

Whether you operate a treatment plant that needs a cost-effective means of mechanical hydraulic mixing of sludge tanks or you're a dairy farmer or corrections facility manager who needs to avoid clogged pumps to keep the wastewater flowing, Vaughan has you covered.

WE CHOP-AND MIX-IT ALL

We could simply tell you, "trust us, our pumps can chop—and mix—it all," but here's a real-world story that shows how our pumps can handle the most demanding challenges.

The three standard pumps in the main lift station serving the wastewater treatment plant in Morgan's Point, Texas, often became clogged with shop rags, lumber, plastic bottles, gloves, and wet wipes when rainfall exceeded two inches. The city spent about \$100,000 to maintain and service those pumps over seven years. After the city installed a Vaughan Company SE-Series Submersible Chopper Pump in July 2016, they have experienced over 100 inches of rainfall with no plugging incidents or other issues. And, during 2017 Hurricane Harvey, the Vaughan pumps ran continuously for seventy-two hours with no plugging incidents and no problems while pumping more than 2.5 million gallons of unscreened sewage through the lift station.

"I just wish we had purchased these pumps years ago to eliminate the maintenance headaches we endured, and the costs we incurred keeping our previous pumps in operation," says Brian Schneider, city administrator for Morgan's Point.

WHY YOU SHOULD CARE THAT WE'RE FAMILY OWNED AND MADE IN THE USA

Adding to exceptional pump reliability and performance, with Vaughan Company you get the advantages of buying from a family-owned, made-in-the-USA company. We source nearly all of our materials in the United States and manufacture 100 percent of our pumps here. We support American jobs and American companies, and by sourcing U.S. materials and making our pumps here, we reduce the costs incurred from international suppliers.



SIXTY YEARS OF BENEFITING CUSTOMERS

In 1960, company founder Jim Vaughan invented the world's first chopper pump to solve the problem of clogged manure pumps for local farmers in Washington. Sixty years later, Vaughan Company is still making the world's most reliable chopper pumps and pump systems—and providing unique solutions for farmers, treatment plant operators, and other pumping professionals.

Today, we continue to live Jim's philosophy of "what could make this better?" From in-house 3D computer modeling to computational fluid dynamics (CFD) analysis, Vaughan Company remains committed to giving our customers outstanding service and the most dependable product solutions in the world.

Further, all of us at the Vaughan Company understand the importance of exceptional customer service; take time to understand your needs; and work closely with you to tailor pump solutions that solve your unique challenges.

Contact us to learn how Vaughan Company can help you ensure reliable operations. ♦

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CONTACT US TO SEE HOW WE CAN HELP YOUR NEXT PROJECT

Blacoh Fluid Control

BLACOH CHATTERLESS VALVES

Blacoh's team of engineers have recently released the SENTINEL™ line of chatterless back pressure and pressure relief valves designed to eliminate valve chatter. These valves are CNC precision machined in sizes up to 2 inches (50 millimeters) and can withstand operating pressure up to 350 psi (24.1 bar).

Back Pressure Valves enhance the performance of pumping systems by applying a continuous back pressure to the system pump, while also acting as an anti-syphon valve.

Pressure Relief Valves protect pumping systems from over pressure damage caused by defective equipment or blockage in the pump system line.

Offered in a full range of options, Blacoh's chatterless valves are in a league of their own. The union-style

construction and threaded ring design provide superior sealing for maximum fluid containment. A variety of plastic and metal materials are available to meet your chemical resistance requirements. Find out more at www.blacoh.com/valves. ♦



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We were one of the first American pump companies to attain ISO 9001 certification, the most recognized standard for quality in the world: your assurance that our commitment to quality includes not only our hardware, but also superior customer service, leading-edge R&D, and continuous improvement in everything we do.

So whether the job is refueling fighter jets on the deck of an aircraft carrier, supplying paint to an auto assembly line, or bringing water to the fountain in a city park, we put our

reputation on the line everyday with every pump we build.

CUSTOM-ENGINEERED SOLUTIONS

Our specialty is addressing the most challenging performance requirements using advanced design tools: the latest solid modeling software for analyzing structural problems, and exceptional hydraulic design capabilities.

We've refined our expertise by delivering tens of thousands of pumps into a wide variety of applications, routinely developing new products for very specific usage. Many of our standard products can be highly customized for specific OEM applications, such as parts-washing systems and boiler/heat-exchanger cleaning systems.

Whether the challenge is pump efficiency, difficult suction conditions, or extreme environments, we'll engineer the best solution to meet your goals for reliability, quality and performance.

THE LATEST TECHNOLOGY

Every new pump design undergoes a series of rigorous tests using computer simulation, as well as in-laboratory testing. Using the latest finite element analysis (FEA) and computational fluid dynamic (CFD) software and advances in processing speed, we optimize our designs and troubleshoot before building a prototype. ♦

BUILT FOR PURPOSE



We build pumps for handling water, oil, chemicals and slurries for both the public and private sectors. We offer a full industrial product line with horizontal, vertical, single, and multistage pumps. Our pumps are engineered to handle high flows, high pressures, extreme temperatures, aggressive materials and/or entrained solids.



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Check-All Valve Mfg. Co.

Since 1958, Check-All Valve Mfg. Co. has manufactured a complete line of in-line spring-loaded piston-type check valves. With worldwide service, Check-All Valve serves a wide range of industries including the chemical, petrochemical, pharmaceutical, food and beverage, water treatment, OEM, MRO, and many others. Lightweight, efficient, and rugged, every Check-All valve is designed and built to perform to exact needs and specifications. The company is ISO 9001-2008 certified and manufactures product lines compliant with CE/PED requirements, Canadian Registration Number guidelines, 3A Sanitary Standards, and others.

Check-All valves are engineered for silent operation. They close quickly and smoothly to eliminate hammer noise. They are designed

to function equally well in either a vertical or horizontal position, with proper spring selection. They are also designed to reduce installation costs. The insert series check valves easily fit into existing line components, which reduces initial cost and installation time. The seating surfaces are parallel to each other thereby eliminating the excessive wear occurring in plug, cone and ball seats. Check-All valves can also be used as low-pressure relief valves and vacuum breakers.

With many styles available, Check-All Valve provides check valves for practically every service application. Valves are offered with metal-to-metal or soft seats in sizes ranging from 1/8-inch NPT to 20-inch flange connections. Pressure ratings are available from full vacuum to 10,000 PSI. Standard or exotic materials are

available and you can choose from a wide variety of spring settings and seat materials for any valve. Most options are available with fast delivery. Specially designed valves are another option that Check-All Valve performs on a regular basis. Check-All Valve Mfg. Co. is staffed to supply you with a quality product as well as personal technical services. ♦

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SPRING-LOADED!
Multiple spring settings as well as seat and body materials available to meet your application needs.

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Dickow specializes in supplying centrifugal pumps with a seal less magnetic coupling. Our model NMWR/ NMWB are specifically designed for high temperature heat transfer fluids (hot oil) up to 750 F without any water cooling. The series NMWR/ NMWB are sealless with no shaft duct to the atmosphere. The containment shell forms a closed system with a hermetically sealed liquid end replacing double acting mechanical seals with external fluid reservoirs and necessary control equipment. Additionally, the containment shell is not used as an additional bearing holder meaning no dynamic stress occurs.

As in all Dickow sealless pumps the magnets are permanent rare-earth Samarium Cobalt with unlimited life. The driven rotor is completely encapsulated as to not come into contact the pumped liquid. Power is transmitted through the containment shell by a bank of external magnets. The inner and outer magnets are locked together by magnetic forces and operate as a synchronous coupling. The inner magnet transmits the power to the impeller at the same speed as the motor.

The bearing housing has been designed as a cooling devise with cast on fins that dissipate heat to the atmosphere. This keeps the temperature inside the containment shell below the system temperature in the volute casing.

The pump shaft is carried in the wetted end by pure Silicon Carbide (SiC) with a diamond layer that allows for limited dry running. The SiC components are elastically fitted in their holders which eliminate any concern of thermal shock and stress at high pumping temperatures. SiC is highly resistant to wear and corrosion.

The NMWR is long coupled. The drive shaft is carried in generously dimensioned oil lubricated antifriction bearings that are rated for 25,000 hours of operation. The oil bath is protected against the atmosphere and separated from the magnetic coupling by two

labyrinth seals. The level of the oil is controlled by a constant level oiler and a site glass.

The NMWB is closed coupled eliminating the requirement of the oil

bath and bearings. Additionally, the closed coupling shaft misalignment issues. The maximum capacity of these pumps is 4,000 gallons per minute with differential head 500 feet. ♦

DICKOW Pump Company

Dickow Pump Company has manufactured centrifugal pumps for more than 75 years, always with an emphasis on precision, longevity in service, and hydraulic efficiency. Today we offer the broadest and most technologically advanced range of magnet drive pumps, and have solid in-plant experience

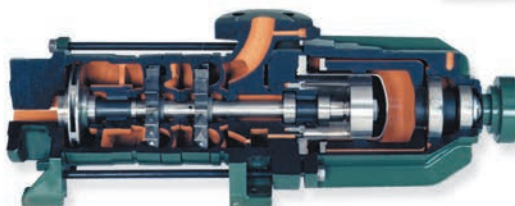
In fact, Dickow ranks first among all sealless pumps in customer satisfaction and has the longest interval between required maintenance. Local representation? The Best. ISO 9001 approved? Of Course.

Dickow Pumps don't sit on the shelf – although parts are there when you eventually need them – because Dickow Pumps are engineered products for optimum performance in your specific application.

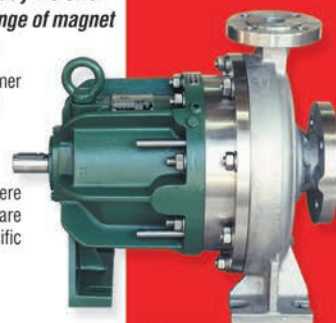
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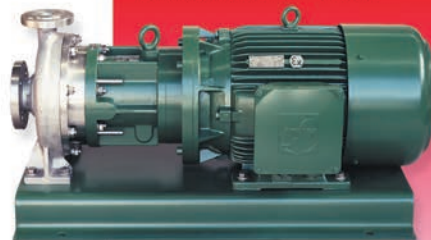
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Established in 1922 in Bergamo, Italy, Lovato Electric is a private company, managed by the same family of entrepreneurs for four generations.

Among the first companies in Italy to obtain ISO 9001 certification in 1992, Lovato Electric has a range of over 10,000 products complying with the strictest requirements of international standards including UL and CSA.

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and energy management software are the types of products and solutions designed and produced by Lovato Electric.

To provide competitive products and services in the industrial automation and energy management fields is our company's mission.

Our thirteen branches abroad and a network of over ninety importers guarantee the availability of Lovato Electric products in more than 100 countries all over the world.

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Scalewatcher

Developed and patented in the Netherlands by Mr. Jan P. de Baat Doelman, Scalewatcher technology was introduced to the European market in the 1980s. With immediate market success, Mr. Doelman brought the technology to the United States and applied and received a patent in 1991. From that moment on, Scalewatcher North America has been on the forefront of environmentally-sensitive water treatment. Located in Oxford, Pennsylvania, Scalewatcher North America continues to lead the industry in descaling products that do no harm to the environment.

Scalewatcher North America focuses on the elimination of scale and the problems associated with scale build up. Industries know the costs involved in keeping their capital investments running smooth. Scalewatcher is there to help.

Scaled cooling towers, chillers, and associated equipment can negatively impact a company's bottom line, and not just in cash. The caustic chemicals used to remove scale only create more problems with the environment. Your company can "GO GREEN" and stay within your budget.

If our product does not work for your application, we will buy it back! With our "Performance Guarantee," you never have to worry about losing cash on a product that does not work.

Scalewatcher North America Inc. manufactures its products in Oxford, Pennsylvania, so you know they're MADE IN THE USA! We can treat pipe sizes from ½ inch up to and including 120 inches. Cooling towers, chillers, evaporative condensers, and boilers can all benefit from Scalewatcher water treatment. If it scales up, we can break that scale bond and show you cost savings on maintenance. No plumbing required!

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SEEPEx Inc.

SEEPEx is a leading worldwide specialist in pump technology that provides progressive cavity pumps, macerators, systems, accessories, and services. We take a consultative approach to offering innovative products and customized solutions. Each pump we supply meets the specific needs of an industry, a company, an application and the product being pumped. For more than forty years, SEEPEx has been offering customers in environmental, chemical, food and beverage, oil and gas, pulp and paper, and numerous other industries, optimal, economical pumping solutions.

SEEPEx Inc. is an ISO-9001-2008 certified, 82,000 square feet manufacturing facility situated on ten acres of land in Enon, Ohio, USA. We have a larger presence in North America than any other progressive cavity pump manufacturer! Our large in-house inventory enables us to ship 80 percent of parts orders in twenty-four hours.

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SCT is SEEPEx's unique maintain-in-place design. It has been around for over a decade and continues to provide customers with lower maintenance times, reduced

costs, and operating efficiencies compared to other pumping methods. SCT is an easy, cost effective, drop in solution for the replacement of all older or obsolete pump brands. SCT pumps eliminate the need to remove any pipework for maintenance, do not require special tools, and have lighter components for easier and safer lifting.

The SCT design offers easy access to the split stator and quick release rotor, reducing maintenance time by up to 85 percent compared to traditional PC pump designs. The SCT design also allows for the stator to be adjusted and tightened as wear progresses. SCT stators last on average twice as long as traditional stators, save time and money on parts and maintenance, and improve performance efficiency.

MAKE THE SEEPEx SWITCH

Customers who make the SEEPEx SWITCH and replace any brand of conventional progressive cavity (PC) pump or retrofit a SEEPEx pump with a SEEPEx maintain-in-place Smart Conveying Technology (SCT) PC pump will receive a three-year performance guarantee on wear parts. ♦

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ALL THINGS FLOW

**3 YEAR WEAR PARTS
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SEEPEx is so confident in the high quality of our products that we offer a 3 Year Performance Guarantee on wear parts when you make the **SWITCH** to a SEEPEx SCT pump. This is the only industry **guarantee that includes wear parts: rotors, stators, seals and universal joints.**

USE PROMO CODE: 0456

For a limited time get the **3 Year Wear Parts Performance Guarantee** when you:

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- **Retrofit: SWITCH** an existing SEEPEx pump to SCT
- We will help to coordinate installation.



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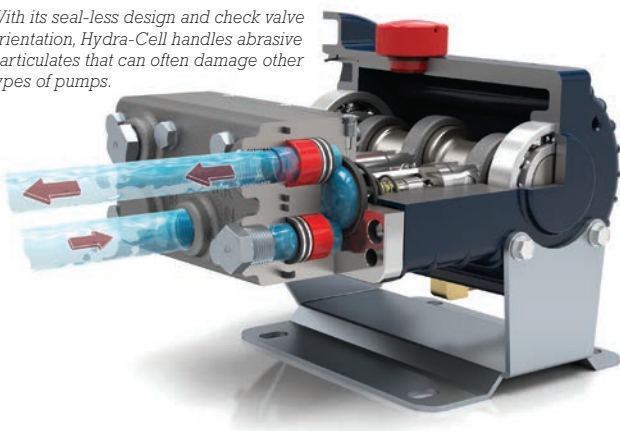
When William Wanner patented the "Hydra-Cell" positive displacement pump he invented more than forty years ago, he hit upon a concept for seal-less pumping technology that would develop into one of the most versatile and reliable pumps on the market today.

Hydra-Cell pumps provide dependable performance in applications as varied as oil and gas field transfer, precise metering for chemical injection, pumping high-pressure machine tool coolant, reverse osmosis, boiler feed, and many other plant and processing operations. Its seal-less design and patented diaphragm protection control enable the pump to run dry without damage.

COMPREHENSIVE PRODUCT LINE

- Hydra-Cell seal-less pumps including the enhanced D15 vertical and D17 horizontal models
- T100, T200, Q155, and new Q330 Series large-capacity pumps
- Hydra-Cell P Series and MT8 "pulse-free" metering pumps
- S Series solenoid metering pumps
- Stan-Cor ANSI centrifugal pumps and Vector peristaltic pumps

With its seal-less design and check valve orientation, Hydra-Cell handles abrasive particulates that can often damage other types of pumps.



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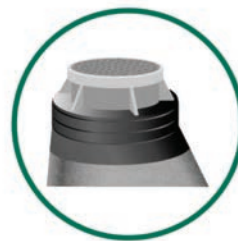
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P2

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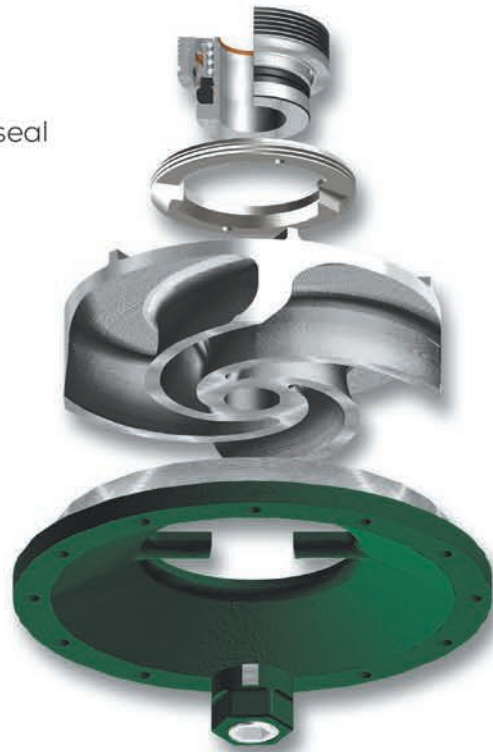
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