

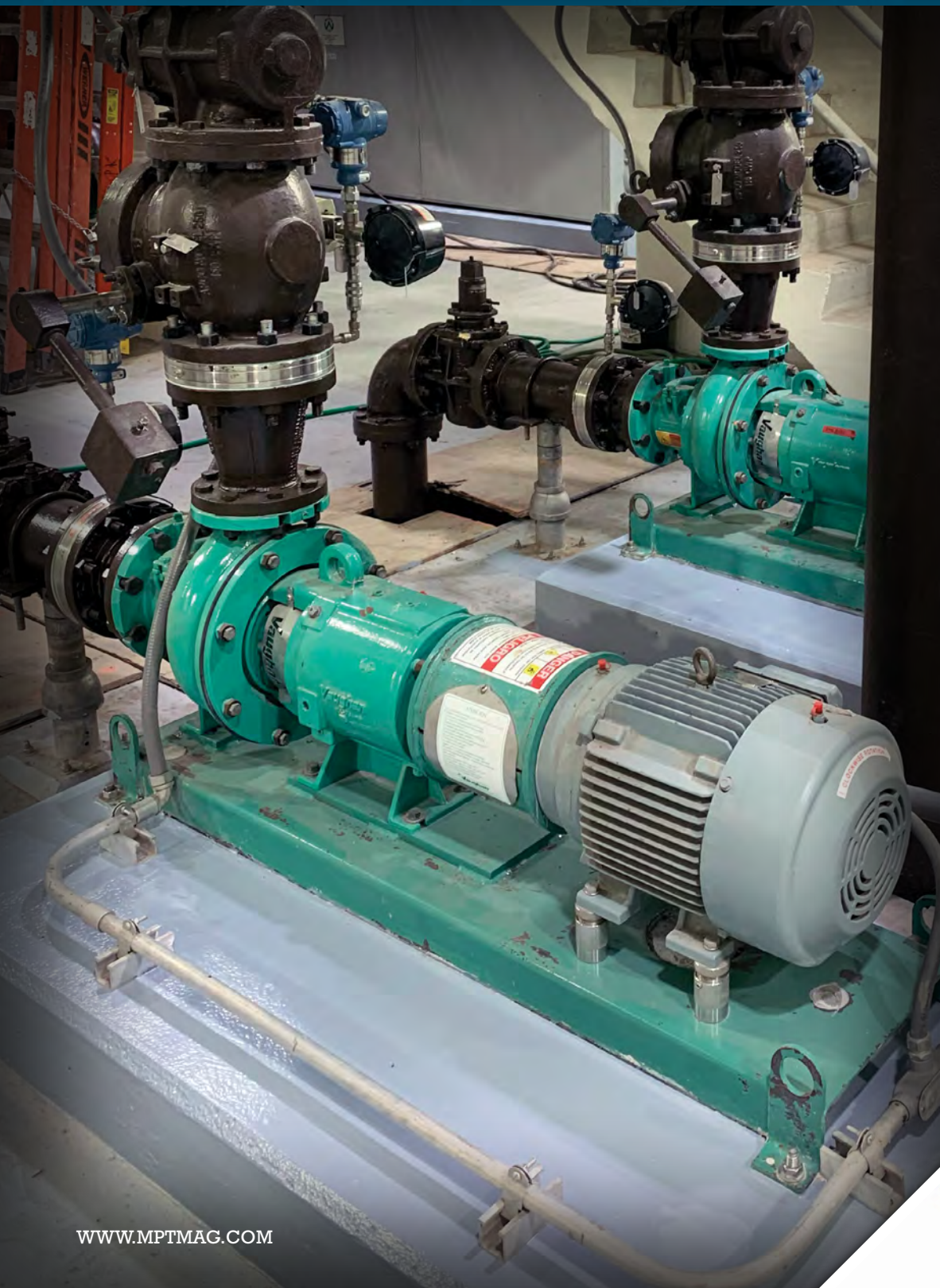
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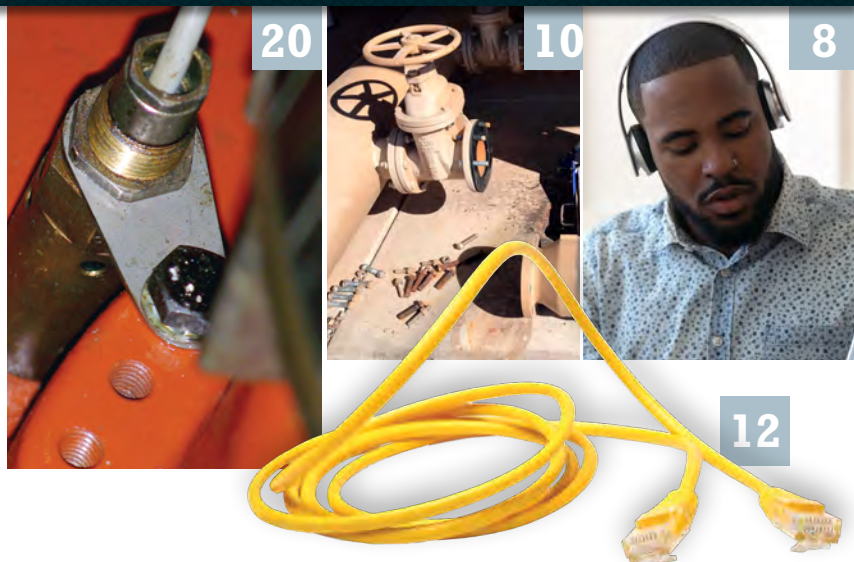
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CIRCOR RELEASES REMOTE DATA ACCESS APP FOR OPERATORS

Circor International, Inc. announces CircorSmart, a free mobile app designed for use by operators of a variety of Circor Pipeline Engineering products. Using QR codes and NFC technology, CircorSmart accesses essential and specific product data instantly. CircorSmart is available for download from both the App Store for Apple devices and Google Play for Android.

PHMSA'S new Gas Mega Rule has changed pipeline operations related to traceability and verification of essential data. With the CircorSmart app, operators have constant access to detailed product specifications for their Circor technology, all product-specific instruction manuals, FAQ, and troubleshooting tips, an array of instructional videos, a spare part requests feature, material records, as well as instant access to the expertise of product specialists who are available live.

CircorSmart is also an invaluable tool for keeping track of Circor Pipeline Engineering products and their maintenance schedules. CircorSmart allows operators to track maintenance on each product, take detailed notes and store them, and attach photos and important files for future use. The ability to keep track of product maintenance information at all times contributes to reduced downtime for technology.

PIEZO MOTION PARTNERS WITH ELECTROMATE TO EXPAND DISTRIBUTION

Piezo Motion Corp. announces a partnership with Electromate, a premier source for high-performance automation and motion control components and systems in North America. Electromate is expanding its precision motion product line with Piezo Motion's versatile rotary and linear motors. Piezo Motion's precision motors are engineered with minimal components enabling economical products for small- and large-scale applications while having a stable and reliable final result. Designed explicitly for manufacturers that require precise control in a small and economical package, Piezo Motion's product line is the solution to the motion control industry's needs.

"In the world of 'motion control,' there is no automation technology more differentiated than piezo motor technology," explains Warren Osak, CEO and founder of Electromate. "Piezo Motion's line of rotary and linear piezo motors address many of the must-have requirements we see in our OEM marketplace—accuracy, repeatability, reliability, and cost reduction. Canada has a thriving medical, biomedical, and life science market, and we predict Piezo Motion's products will be well received and applied in many new equipment designs. Introducing this unique technology will enable our customers to build better machines and compete globally."



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GRIFFCO VALVE APPOINTS NEW EASTERN REGIONAL SALES MANAGER

Griffco Valve, Inc. announces the appointment of Craig Wolsten to the position of eastern regional sales manager. He will be responsible for providing training and sales support for the company's channel partners as well as managing the company's distributor network in the eastern United States and Canada.

"Craig has a strong background in fluid handling products and a history of enabling companies to increase their market share," says Colin Black, president of Griffco Valve.

Donelle Capriotti, Griffco Valve director of sales and marketing, adds, "Our channel partners are certain to benefit by his familiarity with the industry and customer service skills."

Wolsten joins the company from Hays Fluid Controls, where he managed sales for a territory covering eleven states in the United States and four provinces in Canada. During his industrial sales career, he also held sales and customer support positions at American Valve, where he gained experience working with end-users, engineers, contractors, and others to help contribute to company growth. Wolsten also served on the board of directors of the American Supply Association and Midwest Wholesalers Distribution Association.

CYPRESS INDUSTRIES EXPANDS PRINTED CIRCUIT BOARD AND HIGH LEVEL ASSEMBLY

Cypress Industries has added additional printed circuit board assembly (PCBA) lines and expanded its high level assembly (HLA) footprint at its Mexico plant in order to handle additional volume.

"As part of our expansion, we have hired VP of Operations Thomas Hardt to enhance our expertise and facilitate our growth," says Cypress Industries CEO Tom Lonsdale. "I am excited to have Thomas on board as he brings decades of relevant management experience. Thomas is also a fit with our corporate culture which focuses on customer and employee satisfaction."

"Our capabilities provide us with a competitive advantage in both PCBA and HLA," Hardt says. "Being able to manufacture and populate circuit boards, sheet metal and cables and then integrate all those into electromechanical assemblies, all in one facility, provides many advantages for our customers."

"These competitive advantages position our PCBA and HLA groups strategically for our customers looking to reshore to North America by providing a competitive cost structure while, in most cases, avoiding tariffs. We are able to do this through a transformation on products sourced from China that are integrated into finished goods," says Hardt. ♦



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The Role of Online Training for Pump Professionals

Even in a virtual environment, continuous education allows for greater collaboration

By SWPA Executive Director Adam Stolberg

Due to the ongoing global COVID-19 pandemic, the last year has presented many industries with uncertainty and a need to adapt. As many of the traditional training events—from educational seminars to trade shows—in the pump industry faced those challenges, online options emerged as viable alternatives to face-to-face learning opportunities. Below, SWPA Executive Director Adam Stolberg discusses some of the ways his organization has addressed the ever-present need for continuous training in continuously changing times.

In light of the restrictions on in-person gatherings from the past year, how has online training stepped in to fill the gap?

First, let me say that in my opinion, face-to-face training will

never be replaced. It has tremendous value and some of the demonstrations, hands-on interaction between participants and instructors, and the networking aspect add a great deal of value. However, the COVID pandemic has forced some changes and some may become a permanent addition to previous training.

At SWPA, we offer training that meets everyone's busy schedule and needs, while still utilizing expert instructors and up-to-date content. We are offering "something for everyone," including on demand training through our website—especially, via the virtual classroom training through our SWPA University, which is ten weeks of virtual classroom training every week for one hour over a ten-week period. This ten-week course is offered in the spring and fall. We are also offering an advanced "200" level full day virtual training in May.

How was the role of online training expanding even in pre-pandemic times?

Online training was an “up and comer” before the pandemic, but quarantine, travel bans, and so on have forced it to become mainstream, as industry professionals still needed a way to receive PDH, CEU, and, contact hour credits. Before COVID, online training was “in addition to” live training, not necessarily an “instead of” option. We believe live training will always be an integral part of what SWPA does, and the future will include online training as another option for industry professionals.

How have industry experts modified their instruction to better fit an online model?

At SWPA, we have tried to include “hands on” as part of our training. This is, of course, difficult if not impossible to do in a virtual setting. However, we try to encourage and

foster good Q&A and interactivity with participants and instructors.

Good training in a virtual setting can't just be the presenter reading from a slideshow presentation. Without being able to see the live audience reaction, it is difficult to gauge their interest or if they are falling asleep. Instructors have to be more upbeat, more direct with questions, and more engaged with problems to solve to keep the audience engaged as well. Demonstrations are still a key way to present materials as well.

What are some benefits we gain with an online learning environment? Where do you see online training headed in the future? Who has the most to gain?

Cost is a key one. Online training allows participants to learn from anywhere without travel costs, hotels and meals, and without missed opportunities from being away from the office or the clients.



As I said, online training will be here to stay. I believe it will serve as a compliment to live training, not a substitute for it. And we all will gain if our industry is better by being more easily and properly trained. ♦

The mission of the Submersible Wastewater Pump Association (SWPA) is to enhance the global wastewater environment by informing, educating, and providing leadership in the design, procurement, and operation of submersible wastewater pumping systems. For more information, call 847.681.1868, email swpaexdir@sbcglobal.net, or visit www.swpa.org.



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Creating a Customized Piping Solution

Flexible options for better hydraulic flow in Queen Creek, Arizona

By Stan Pachorek, Mueller

Hymax dismantling joint eccentric product installation.

Queen Creek, Arizona, is a town of approximately 26,000 located 40 miles southwest of Phoenix. Brian Quill is Queen Creek's utilities supervisor, water production and compliance, with more than thirty-five years' experience within water utilities. Queen Creek had a range of solid steel piping that was connected on one side of a booster pump for water suction and on the other side for water discharge.

After twenty years of use, the piping needed to be replaced as it was rusting. The problem was that each of these connecting pipes were custom-made and varied in length. To replace each pipe, a new customized pipe would need to be constructed on site with high associated costs in terms of money, time and effort. The utility was looking for a more cost-effective solution to replace the rusted sections without using tailored pipes for each repair.

NOT JUST A PRODUCT, A SOLUTION

Queen Creek Utility had used Hymax® products before to repair their pipes and approached Mueller to find a solution to the problem. Avi Chiproot, Hymax's vice president of engineering and R&D, consulted his engineering team to see what they could design and manufacture to solve the problem.

"We were looking to not just provide Queen Creek with a product, but rather a solution that addressed Brian's specific pain points," says Chiproot. "Making customized pipe repair products takes up a lot of time, and we were looking to

create a telescopic product with the flexibility to make the repair, regardless of the distance between the connections."

After considering the project's specifications, Chiproot's team developed a unique eccentric dismantling joint with flange connectors on either end that could be telescoped to be anywhere between 10 to 14 inches in length.



Variations in distances made it challenging to find a connecting solution.

Instead of fabricating each connection on site, a costly and manpower intensive process, the product could be adjusted exactly to match the length between the booster pumps and the discharge piping and installed by just one person in about thirty minutes.

FROM PLAN TO PROTOTYPE TO PROBLEM SOLVED

The two ends of the coupling could also be rotated independently of each other so that the holes of the joint's flange could match up with the holes of the connecting pipes flanges. Once the design was completed, Chiproot sent the plans over to Quill to review who gave the thumbs up. Within a few weeks, a prototype was shipped to Queen Creek and the team was immediately able to install the easily adjusted product for a perfect fit and ensure a strong and solid connection.

An added benefit of the new dismantling joint was that water flow increased approximately 40 to 60 gallons per minute with the new installation. "We found that the design featured better hydraulic flow as the old pipe was very rough on the inside due to rusting," says Quill. "With better water flow, less energy is required to ensure proper water movement." With the successful prototype, Quill ordered finalized

versions of the product so that future repairs could be made immediately as the need arose.

CUSTOM-MADE, READY TO GO

Most Hymax products are standardized solutions but sometimes custom-made solutions are required. This is made possible by an in-house R&D department that has developed numerous unique and patented technologies, including a progressive pressure-assisted hydraulic gasket that allows dynamic deflection to absorb pressure caused by ground shifts, and a gripping system with universal teeth, to easily restrain connections without thrust blocks or rodding. All products have a lightweight yet durable construction featuring a simple design to enable easy and safe installations by one or two people in order to minimize time in the ditch.

"Avi and his team helped us enormously," says Quill. "They took a very hands-on approach to solving

the problem, and the results were great. Now we have a ready-made solution to replace these pipes anytime we need to." ♦

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

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The Water/Wastewater System Manager's Guide to Remote Telemetry and Remote Maintenance

Part 2 of 2



By Dave Eifert and Eike Wedekind, Phoenix Contact

In last month's introduction to this article, we mentioned how all installations in remote distribution and collection systems, such as water, gas or electricity supply, pipelines or even transportation technology applications, must be connected to a central control system. And although this connection presents new challenges for the technology, remote control and remote maintenance have since become the established standard in communication.

Below, in the following conclusion, we'll examine the differing protocols for remote control as well as those not for remote control. Also, as cellular communication network and the internet provide a solution for transmission over long distances and on a global scale, we'll look over the history and future of these continuous connections.

PROTOCOLS FOR REMOTE CONTROL

Various remote control protocols are listed and described as follows:

IEEE 1815: Distributed Network Protocol

Distributed Network Protocol (DNP3) enables communication between a substation and control room via a serial connection as well as via an Ethernet connection. DNP3 was developed between 1992 and 1994 and is based on IEC 60870-5. However, the protocol is more restrictive and offers less room for interpretation than its European counterparts.

Over time, DNP3 has been extended to include authentication. Authentication means that external stations check the authenticity of the control system before executing critical operations. They do this by exchanging encrypted data.

Protocol IEEE 1815 is the standard protocol for serial and data transmission via TCP/IP. It is used in North, Central, and South America, South Africa, the United Kingdom, Australia, and Asia. As noted earlier, DNP3 is one of the two remote control protocols that IEEE recommended.

IEC 60870-5-101

IEC 60870-5-101 is an official communication standard for remote control technology in infrastructure sectors. This protocol is used as a general transmission protocol between (network) control systems and substations. Messages are transmitted via serial connections. This standard enables devices and systems for remote control and station control technology from different manufacturers to communicate with one another without the need for fundamental adaptations. Protocol IEC 60870-5-101 is the standard protocol for serial data transmission in Europe and is also used in Asia.

IEC 60870-5-104

IEC 60870-5-104 enables communication between the control center and substation via a standard TCP/IP network. The TCP protocol is specifically used for connection-oriented, secure data transmission. As the name of the standard suggests

("Network access for IEC 60870-5-101 using standard transport profiles"), the protocol follows standard IEC 60870-5-101 with respect to the application layer. The biggest advantage of IEC 60870-5-104 is communication via a TCP/IP network, which enables simultaneous data transmission with multiple devices and services.

Because the internet can be used for communication, security by means of data encryption is an important topic. In addition, this is an event-oriented protocol where the substation can send data to the control system automatically. Protocol IEC 60870-5-104 is the standard protocol for data transmission with TCP/IP in Europe and the United States and is also used in some Asian countries.

PROTOCOLS (NOT FOR REMOTE CONTROL)

In addition to the remote control protocols listed, a number of other protocols have become established.

These protocols are frequently used; however, they do not save any data in the event of a connection interruption. Data that does not reach the control system can no longer be reproduced.

Modbus

Modbus is frequently used to allow devices from different manufacturers to communicate with one another based on a standard protocol. The Modbus protocol is a communication protocol based on a master/slave or client/ server architecture. It was developed in 1979 by Modicon for communication with programmable logic controllers.

Modbus has become a de-facto standard in the industry, as it is an open protocol. Modbus can be used to connect a client (e.g., a PC) and several servers (e.g., measurement and control systems). There are three versions of Modbus: Modbus ASCII, Modbus RTU, and Modbus TCP. The last two are by far the most popular.

Modbus is probably the most widely used communication protocol in the world.

SMS

SMS, which most of us are familiar with as text messages on our phones, stands for "short message service" and is also used for communication between an external station and the control system—usually as an alarm message. The SMS can be used by any receiver: mobile phone, landline, fax, or email account. In addition, several programmable logic controllers can be networked together. The provision of an acknowledgment function ensures that the SMS reaches the receiver. Otherwise, the SMS is sent to another address.

SMS Function in Remote Control Technology

In addition to its function as a means of communication, the SMS service is also used to control and monitor technical devices and equipment.

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In applications where only alarm messages are to be transmitted or where control commands are sent relatively infrequently, the SMS service of the GSM network is a viable option for reasons of cost.

For example, industrial modems offer configurable warning and alarm inputs and are therefore ideal for monitoring small applications. An alarm SMS can be sent directly to a service technician's mobile phone, informing them directly of the type of error and its location. When dealing with an increased number of messages or control commands, GSM modems can also be connected to programmable

logic controllers. This allows the I/O area of the PLC to be linked to text messages.

It is also frequently the case that an SMS alarm message is not only intended to be sent to a mobile phone, but also to the alarm management of a control system. When a PLC is combined with a GSM modem, SMS messages can, for example, be received, decoded, and forwarded to a control system in a variety of ways.

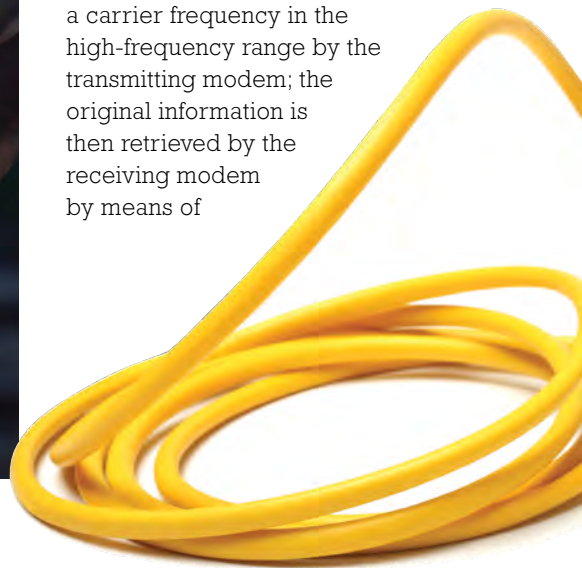
WIRED TRANSMISSION

When a dedicated data line is used for the remote control technology

connection, e.g., in the power supply network of municipal works, it should be noted that if the copper cable is longer than a mile, the signals to be transmitted must be modulated in order to increase the range. Whether based on copper cables or fiber optics, this means that process information can be exchanged with a central control system over long distances.

Permanent Line Modem

Serial interfaces (RS-232, RS-485) are often available at the remote control substations and in the control system; these interfaces should be used to transmit standard protocols such as IEC 60870-5-101. Analog permanent line modems, which are specifically tailored to industrial requirements, are used to transmit this serial data. A digital signal is modulated to a carrier frequency in the high-frequency range by the transmitting modem; the original information is then retrieved by the receiving modem by means of



demodulation. This technology has a maximum transmission speed of 33.6 kbps.

SHDSL Modem (Ethernet Extender)

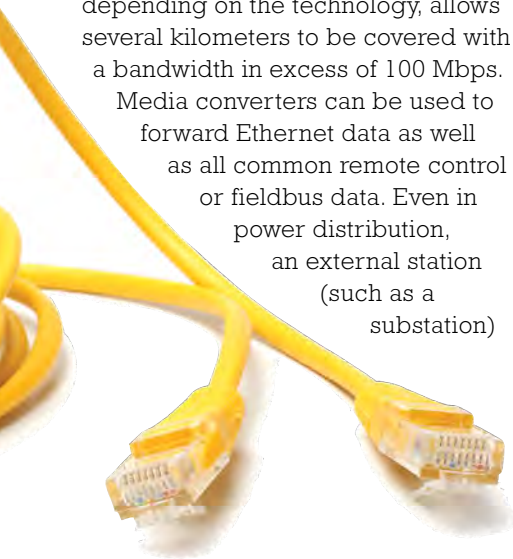
It is not usually possible to remotely program external stations that are connected in series. An Ethernet-capable network is required for this. An SHDSL modem can be used to make a serial communication network Ethernet capable. Modems based on the newer DSL standard operate with higher carrier

frequencies and larger bandwidths for the phone line than the models based on the older standard (narrowband). With industrial SHDSL permanent line modems, existing cables can also be used for modern Ethernet applications. Transmission speeds of up to 30 Mbps are possible via in-house cables. Automatic detection of the DSL data rate, as well as automatic adjustment to the Ethernet cable (1:1, crossed) and protocol transparency simplify startup considerably. In addition to point-to-point connection, a line structure (daisy chain) is also possible. With respect to transmission, there are modems for Ethernet, fieldbus, or serial interfaces

Fiber Optics

Today, when new trunk lines are laid, they are usually fiber optic (FO) lines. FO communication is immune to electromagnetic interference and, depending on the technology, allows several kilometers to be covered with a bandwidth in excess of 100 Mbps.

Media converters can be used to forward Ethernet data as well as all common remote control or fieldbus data. Even in power distribution, an external station (such as a substation)



is usually connected to the central node point via fiber optics.

NON-WIRED CONNECTIONS (WIRELESS)

If no cable is present, other means of communication must be found. Depending on the distance and the required bandwidth, it is also possible to use wireless connections. Depending on the requirements, one of the following three connections can be used:

Trusted Wireless

The application of Trusted Wireless was developed specifically for industrial use. As a result, it can cover distances of up to 20 miles from one serial interface to another. For example, Trusted Wireless is used for communication between the control center and a pumping station. There should be a line of sight between the systems. Communication over distances of more than a couple of miles will typically require directional antennas and towers.

With visual contact, it is possible to transmit over a distance of up to 20 miles, for example, when networking well fields. In the event of failure, a new communication path is selected and data transfer is still ensured. Two-hundred fifty-five devices can be connected per network. Multiple networks can be operated in parallel without any restrictions.

Bluetooth

Bluetooth is a standard for wireless transmission over short paths involving up to seven devices. Bluetooth operates over the 2.4 GHz ISM frequency band, which does not require a license and is free of charge worldwide. It allows serial data to be transmitted even if another network is already active.

Slip rings are frequently used to transmit measured values or process data from the scraper bridge of a wastewater treatment plant to the PLC. This technology is very high maintenance, resulting in high costs for the operator. Additional signals are often required, but there are no slip rings available for them. By using Bluetooth devices, maintenance costs can be saved and any number of signals can be transmitted over a distance of up to 1,200 feet with line of sight.

WLAN (WiFi)

WLAN, or wireless local area network and commonly referred to as WiFi, is recommended in applications where, in addition to process-specific data, data from webcams or IP phones is

also transmitted. WLAN describes a local wireless network with a data rate of up to 300 Mbps in the wireless application, which can be used by a large number of devices. Wireless is particularly suitable for mobile monitoring, operation, and data acquisition as it can be easily integrated into IT networks.

LTE / 4G Cellular

Due to the ever-increasing use of smartphones and tablets, as well as the networking of stand-alone machines and devices with the control center, increasing strain is being placed on the network. To ensure accommodation of this high level of demand in future, a new technology like LTE is required. LTE (long term evolution) is also referred to as the fourth generation (4G) of mobile communication technology. The technology is the new standard in mobile communication and is the successor to GSM UMTS (Universal Mobile Telecommunications System, 3G) and CDMA 3G.

This technology enables a high-speed connection of up to 300 Mbps and, unlike conventional standards, it supports different bandwidths. A peak data rate of up to 300 Mbps for download and 75 Mbps for uplink with 5-millisecond latency is theoretically possible. 4G LTE will soon be superseded by widespread 5G adoption. However, 4G is regarded to have acceptable longevity for the deployments of remote telemetry systems being installed today. ♦

Phoenix Contact develops and manufactures industrial electrical and electronic technology products that power, protect, connect, and automate systems and equipment. Our products are used in many industries, including automotive, water/wastewater, machine building, power generation, oil and gas, and many others. For more information, visit www.phoenixcontact.com.



The Art of Mobilization

Ensuring the continuity of industrial production

By Del Williams

Industrial manufacturers require production reliability and continuity. However, a wide range of conditions can make this challenging—from unexpected emergencies, power grid failures and blackouts to partial plant shutdowns for maintenance, upgrade, replacement, or expansion.

Therefore, when uninterrupted power, power storage, water pumping, filtration, treatment, etc. is necessary for production, safety, or regulatory compliance, a growing number of manufacturers are looking to mobile trailer and containerized units. These modular units can complement, supplement, or replace such functions on a temporary or permanent basis. Notably, the units can be customized to meet specific needs and delivered in a fraction of the time and cost that it usually takes to build on-site or off-site.

COOPERATION IS THE KEY

With a collaborative approach and flexible design options, such modular systems can quickly be taken from concept to turnkey asset. When necessary, supplemental support solutions can even include mobile offices, command and

control centers, and foodservice kitchens. Organizations with multiple sites can transport the mobile units wherever needed at any time.

"Custom built trailers can be configured to act as rapidly deployable mobile units to provide remote power generation and distribution, water treatment, and battery energy storage systems (BESSs). The units can be designed to a variety of specifications and sizes with high output capabilities, sound mitigation, and minimal environmental impact," says Mark Steele, CEO of St. Charles, Missouri, based Craftsmen Industries, a rapid designer and fabricator of mobile, containerized units for temporary or permanent use.

Since 1982, Craftsmen has fabricated mobile units for organizations such as Verizon, AmerenUE, Dell, and the U.S. Department of Veterans Affairs along with dozens of others

OVERCOMING CONVENTIONAL LIMITATIONS

Traditionally, adding capacity to an existing industrial facility has been constrained by the limited amount of

available space near production or processing lines. Even when space was available outside, constructing structures outdoors to house and protect equipment needed for functions such as power, pumping, and water treatment is expensive, slow, and usually not feasible if the need is temporary.

While utilizing industrial equipment in mobile trailers has been an option, the solutions are rarely tailored to specific applications. Additionally, the lead time to receive a mobile solution can be excessive. This is a concern when the mobile units are built by firms that outsource much of the work to off-site subcontractors, each with their own production lead-time constraints and potential bottlenecks.

Building supplemental systems and delivering them to remote locations can have significant schedule and cost benefits. This is true where locations may have limited access to local skilled labor or where getting labor to the installation site. This

is also beneficial when a schedule requires that many systems be installed in parallel by allowing subsystems to be built and delivered ahead of schedule.

SCALABLE SOLUTIONS

Fortunately, more nimble, vertically integrated design and fabrication firms that can scale up for larger projects are now meeting the need for fast, flexible, collaborative construction of mobile assets. This ensures continuous industrial production capacity, even on short notice.

"Manufacturers may not always have much advance notice when they realize that supplemental or replacement power, water, or energy storage is required due to emergencies or unplanned repairs. So, expediting delivery and tailoring it to their process is often critical," says Steele.

To speed mobile unit delivery and customization when it is necessary, Steele recommends that manufacturers work with a firm that

ON THE GO

Rapid deployment of mobile production and processing equipment in modular trailers or containers can be customized and outsourced from concept to turnkey asset.

offer in-house design, engineering, and fabrication capacity. This can cut traditional delivery time in half. In practice, this means that a partially customized mobile unit in a trailer or container can be received in about twelve weeks versus an industry typical twenty-four weeks, or a fully customized unit in about twenty weeks versus over a year elsewhere in the industry, if available.

CUSTOM FABRICATION

Also important is working with a firm that is not only an integrator but also a fabricator with full engineering

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capabilities. This helps to resolve any issues that can occur at the drawing board as well as any difficulties that occur on the fly, according to Steele, whose firm is ISO 9001:2015 certified and fabricates with a wide variety of materials including carbon steel, stainless steel, aluminum, and alloys.

"To avoid delays and other issues down the road, I would also advise working with a firm that allows the design and fabrication teams to directly interact and communicate on the shop floor on a routine, preferably daily basis. This can safeguard against misunderstandings that could otherwise take the project off track," says Steele.

Because circumstances can vary and change, Steele says that flexibility and collaboration should also be emphasized.

"Sometimes the manufacturer will provide the equipment and we will integrate it into the mobile unit. At times, they will specify and we will source it. Other times, we might design a portion of the project or most of it," he says.

SIMPLER SOLUTIONS FOR COMPLEX PROJECTS

For more complex projects, however, it is important that the units are designed to be easily connected.

"The modular units are like Lego blocks that can be combined to optimize function in a minimal spatial footprint. If you have a generator unit, a power storage unit, a pump unit, and a filtration unit, you could link them all together wherever needed," says Steele.

When necessary, additional mobile units designed for support purposes are required. For centralized control, a mobile command center can be utilized. This eases information flow and distribution through data, voice, and video through the center.

For example, with the use of mobile assets AmerenUE, an electric and natural gas utility provider to approximately 1.2 million Missouri customers, developed a creative way to enhance its effectiveness while responding to system power outages when major storms occur.

INSIDE A MOBILE COMMAND CENTER

AmerenUE relied on Craftsmen to build two mobile command center trailers to improve its coordination and communication with field personnel during restoration efforts. Both command centers are 53-foot single drop trailers with custom modifications. The trailers are self-sustaining dispatch offices equipped with a

communications room, custom antenna housing, conference room, field commander's office, six work stations, satellite dish, and 30-kilowatt generator.

The mobile assets provider also printed and "skinned" the trailers with a dramatic photograph of line workers on poles and the message "Help is on the way." The trailers stay at an AmerenUE operating center in west St. Louis County until the units are dispatched. This occurs during incidents requiring the restoration of a large number of customers, when a communications center needs to be close to the action.

According to Steele, almost any requirement can be supplied as a mobilized solution. Mobile office trailers and training vehicles can also be used as temporary onsite work locations with specific seating, technology, restroom, and kitchen facilities available. If space is at a premium, single and double expandable trailer units can be designed with hydraulic bump-outs so that up to 980 square feet of space is available.

PLAN FOR THE UNEXPECTED

In the marketplace, manufacturers have long been subject to excessive production downtime due to power failures and other unexpected occurrences.

With the availability of rapidly deployable, customizable mobile equipment trailers and containers, manufacturers today have a ready means to ensure reliable production despite emergencies like blackouts as well as necessary maintenance for upgrade, replacement, or expansion, which could otherwise lead to extended plant shutdowns. ♦

Del Williams is a technical writer based in Torrance, California. Craftsmen Industries, Inc. has fabricated mobile units for numerous companies meeting needs across several industries. For more information, call 800.373.3575 or visit www.craftsmenind.com.

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Working with Moisture Sensors in Submersible Pumps

By Eugene Vogel, EASA



Figure 1:
Control leads
and power
leads.

Submersible pumps may have any of several types of internal sensors or protective devices, including temperature sensors, vibration transducers and moisture sensors. Of these, only moisture sensors are unique to submersible pumps and deserving of special attention. To ensure that these devices work properly in the submersible pumps they repair, technicians need to recognize their presence and understand how they work.

MOISTURE SENSOR INDICATORS

When moisture sensors are present in a machine, commonly the power cable will have extra control leads connecting the sensor to the starter or controller. In some instances, the control leads may be in a separate cable. Generally, though, the presence of control leads entering the pump with the power leads indicates moisture sensors may be present (see figure 1).

An important initial step in disassembling a submersible pump is to remove the cable seal housing (aka pot housing) and inspect the incoming leads. Since the cable or

cord usually enters at the top of the submersible pump stator and any moisture sensors will naturally be below the stator, it is necessary to disconnect any moisture sensor leads before removing the stator from the pump. Attempting to remove the stator without disconnecting the moisture sensor leads will break those leads or possibly damage the moisture sensor.



Figure 2: Conductivity sensors.

SEPARATE SEALED CAVITIES

Submersible pumps have two separate sealed cavities—the motor stator cavity and the seal cavity. Industrial models have two seals with a seal cavity between them filled with

a barrier fluid, usually oil or a glycol solution. Each of these two cavities is subject to possible moisture ingress and may have moisture sensors. In one common configuration, a pair of dual-purpose moisture sensors may protect both the stator and seal cavities. In other configurations, individual sensors may protect either or both cavities. The arrangement and purpose of the sensors should be obvious from their locations, but not from the control leads at the cable or cord connection where testing may be done.

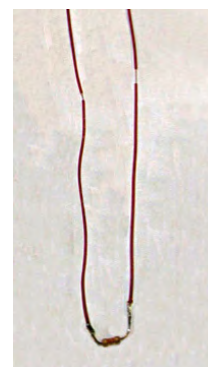


Figure 3: Bare resistor sensor.

COMMON TYPES OF MOISTURE SENSORS

The most common types of moisture sensors are conductivity probes (see figures 2 and 3). These usually consist of an exposed metal conductor mounted in

an insulator, but some are simply a length of tinned lead wire.

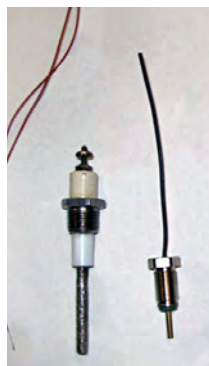


Figure 4: Dual-purpose conductivity sensor pair.

Conductivity probes (figure 2) may employ a single sensor with an electrical potential to ground or a pair of sensors with the electrical potential between them. In either case, the presence of moisture will

reduce the resistance in the circuit, prompting the pump controller to indicate a moisture failure.

Note that there is a resistor between the probe terminals in figure 3. The pump controller is set to recognize that resistance value, allowing it to detect if a sensor lead is open. To determine a resistor's nominal value from its color band markings, consult an electrical reference such as EASA's Electrical Engineering Pocket Handbook.

Figure 4 illustrates a pair of dual-purpose moisture sensors that have the sensor circuit between the two conductivity probes rather than from one sensor to ground. The probes mount through holes in the bottom of a well in the stator cavity and extend into the oil-filled seal chamber



Figure 5: Float switch sensor.



Figure 6: Proximity probe moisture sensor.

beneath it. When moisture collects in the stator cavity well, it closes the circuit between the terminals on the top of each probe. If the outer (lower) seal fails and pumpage enters the oil-filled seal chamber, that moisture will mix with the seal oil, reducing the resistance between the immersed portions of the probes. Thus these probes sense moisture in the seal cavity or moisture in the stator cavity.

FLOAT SWITCH SENSOR

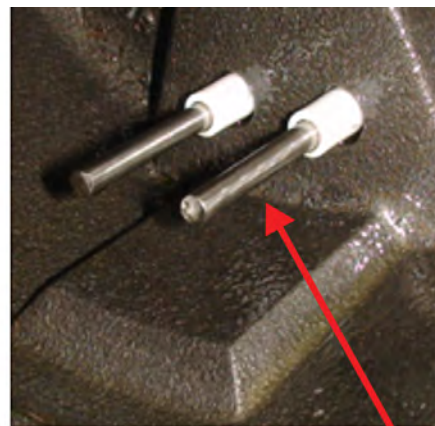
Perhaps the simplest type of moisture sensor is a float switch sensor (see figure 5). The float is magnetic and closes (or opens) an isolated reed switch when the float rises. Unlike other types of sensors, float switches are functional only when the pump is vertical—i.e., the normal operating position for submersible pumps.

PROXIMITY PROBES

Figure 6 illustrates an unusual proximity probe moisture sensor. When moisture accumulates as water in the well at the bottom of the stator cavity, the proximity sensor detects the change in density near the tip of the detector.

TROUBLESHOOTING IN THE FIELD

Evaluating and testing individual moisture sensors during the repair process is a simple matter. Troubleshooting fault indications on an installed pump can be more difficult.



Top of probes in the stator housing well.

Probes extend down into barrier fluid in the seal housing.

In some instances, manufacturers connect various temperature and moisture sensors in series, bringing out only two leads. To test that series circuit, the resistances of individual sensors and trim resistors must be known. Programmed controllers may report a high temperature fault or a moisture sensor fault, depending on the circuit resistance change. But a faulty sensor can trick the controller; a faulty moisture sensor could trip a temperature fault or vice versa when the only fault is with the sensor.

CAUTION DURING REPAIRS

Repair technicians should recognize the presence of moisture sensors in submersible pumps and be familiar with how each type operates. During the disassembly and repair process, they also should handle moisture sensors carefully to prevent damage and test them to ensure they function properly. ♦

Eugene Vogel is a pump and vibration specialist at EASA, Inc., the Electrical Apparatus Service Association. EASA is an international trade association of more than 1,800 firms in nearly seventy countries that sell and service electromechanical apparatus. For more information, call 314.993.2220, fax 314.993.1269, or visit www.easa.com.

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PRODUCTS AND SERVICES GUIDE



Environment One Corporation

E/ONE BACKGROUND

For more than fifty years, Environment One Corporation has manufactured 1 horsepower SPD grinder pumps designed specifically for use in pressure sewer systems. From the 200 Series in the 1970s to the 2000 Series in the 1990s to today's Extreme model, almost two million end users in over forty countries rely on E/One grinder pumps daily.

SPD GRINDER PUMP FOR WASTEWATER APPLICATIONS

In a low-pressure sewer system, constant, predictable pump output is the foundation for proper hydraulic design. It enables the engineer to minimize retention time, pump wear, and keep scouring action at effective levels.

The system pressures to be overcome by any given grinder pump in a low-pressure sewer system vary dramatically over the course of a day. E/One's progressing cavity pump readily accommodates these pressure variations while maintaining a nearly constant flow without ever operating at "near shut off"—thus avoiding the wear and motor burnout suffered by other pump types.

E/One's SPD pump has a nearly vertical H-Q curve. It is by far the most "forgiving" pump design—providing predictable flow over the full range of

typical system pressures; strengths critical in large-scale, low pressure sewer systems.

E/One's superior high head capability allows a system to have few, if any, lift stations. And, it easily accommodates additional future connections without compromising system performance. E/One grinder pumps offer reliable operation from negative heads to 185 feet of total head.

SEWER ANYWHERE, IN ANY TERRAIN

Pressure sewer systems are cost-effective and can be installed in any terrain—flat, wet, rocky, even on sites with dramatic elevation changes. They are much more affordable than conventional gravity sewers, which require major excavation, and much safer for communities than septic systems, which can eventually fail, polluting ground and recreational water and endangering public health. Pressure sewer systems can cost as much as 80 percent less to install vs gravity sewers and reduce the number of lift stations required—or even eliminate lift stations altogether.

SEPTIC TO SEWER CONVERSION PROJECTS

E/One sewer systems have been chosen for septic-to-sewer conversion projects both in the United States and

abroad, especially in coastal areas where the soil is not conducive to septic tank usage and as sea levels rise. At Rincon Point in California, failing septic tanks at oceanfront homes polluted the ocean. Surfers were getting sick and avoided the water after rainstorms. One resident could see the tide rise and fall inside his septic tank. Septic tanks were replaced with the E/One sewer system, resulting in a cleaner ocean.

PRESSURE SEWER SYSTEM UPGRADES

E/One offers its grinder pump as a replacement for existing pressure sewer systems. E/One grinder pumps use integrated pressure switches instead of floats, which are less susceptible to grease buildup and eliminate nuisance alarms that result from stuck floats. The Upgrade is a one-piece pump that installs quickly and easily into the existing tank.

Environment One's Upgrade, the aftermarket grinder pump that works and goes on working without any preventive maintenance. It's the original grinder pump design, the one others have tried to copy but they just haven't gotten it right. Maybe that's why E/One's Upgrade has been the pump of choice for many pressure sewer upgrade projects in the mountains of Tennessee, the lakes of the Midwest, and many coastal communities. ♦





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Through the years, we have designed and supplied pumps and accessories for a wide variety of applications and industries. The construction and sewer industries heavily utilize our portable trash pumps capable of handling solids up to 4.5 inches. Mines, quarries, and the oil industry, which require the ability to move clean water up high elevations or over long distances, utilize our high-head pumps capable of over 700 feet of head. Our hard metal CD4MCu pumps are commonly used by the environmental and industrial sectors, while municipalities value our Global SafeGuard backup pumps and our trailer-mounted units, which are easy to use and maintain and offer low operating costs. The disaster relief and recovery industry, which urgently demands all hands and equipment on deck when nature calls, relies on Mersino to respond 24/7/365 with our extensive fleet and resources, twelve branches nationwide, and a distributor network throughout North America.

With the exception of our rotary and piston style pumps, the Global Pump product line utilizes an enclosed impeller design which results in greater fuel efficiency than pumps with an open impeller. These fuel savings accumulate over the course of a year of continuous operation and may even add up to



the cost of the brand new pump itself! For example, at a duty point of 2,500 gallons per minute at 105 feet of TDH, our 8-inch Global Standard Trash Pump (8GST) performs at an efficiency of 80 percent! That translates to an 82.8 Brake horsepower requirement and a fuel consumption of approximately 4.5 gallons per hour. How much does your pump cost you per project?

For over twenty-four years, Mersino has been the largest end-user of the Global Pump product line. Mersino's direct channel for feedback to the engineering and development teams and in-the-field research and development allows pump designs to continually evolve to meet market demands. This evolution includes maintaining our supreme quality, durability and ease of use—which lend to a project's, and participating parties', profitability and success. For instance, the removable suction spool and placement of the mechanical seal on our SAE-mounted pumps allow for front removal and eliminate

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Whether you are involved with construction or mine dewatering, pipeline bypass, water transfer and supply, or emergency response, we have the pumps and expertise to meet your needs. If you dream of a purple pump on a trailer with baskets for fittings and various bells and whistles, our in-house design team can make it a reality! We have the ability to customize a pump to your specific requirements—diesel or electric, trailer or skid, trash-handling or high-head. Our applications specialists will work with you to find the right solution, customized to your situation.

Mersino is a full-service contractor with experience in design, engineering, installation, service, and on-site project management. Global Pump designs, tests, manufactures, services, sells, and rents equipment to customers around the world that is made in the USA. If you are unsure of your project needs or have a list of required dewatering/pumping equipment, the Mersino and Global Pump teams are only a phone call away. ♦

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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

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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

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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
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- 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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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 20,000 products complying with the strictest requirements of international standards including UL and CSA.

Manual motor protectors, contactors, overload relays, electro-mechanical starters, softstarters, variable speed drives, pushbuttons and selector switches, signal towers, limit switches, cam switches, disconnect switches, miniature circuit breakers, time relays, protection relays, level control relays, general purpose relays, micro PLCs, power supplies, battery chargers, metering, automatic power factor controllers, automatic transfer switch controllers, engine and generator controllers, supervision, 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 fifteen 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.

Lovato Electric, Inc. (USA) is headquartered in Chesapeake, Virginia, and supports the U.S. market through authorized distributor partners. ♦

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SOFT STARTERS

ADXL... SERIES

- two phase control
- UL rated current 30A...320A
- UL rated motor power 20HP...250HP (480VAC)
- rated operational voltage 208...600VAC
- torque control (included)

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- backlit LCD display
- reduced voltage starter with torque control and built-in bypass relay
- maximum starting current
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- NFC technology for parameter programming
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ENERGY AND AUTOMATION

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LS Electric America, Inc.

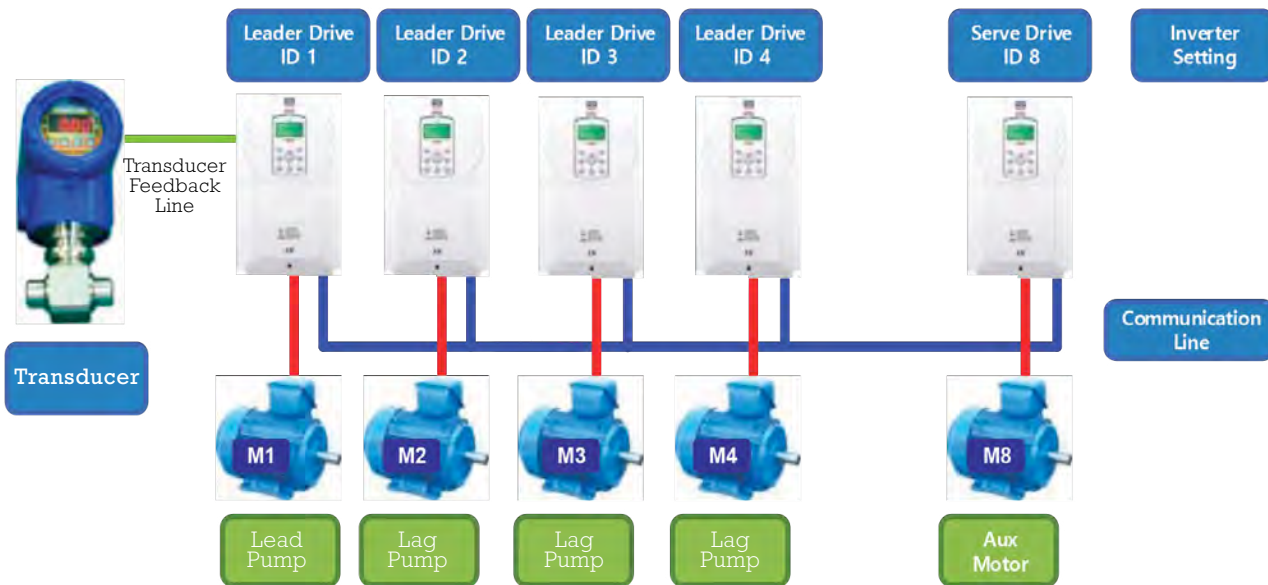
LS Electric is committed to innovation—investing significantly in R&D to deliver cost competitive, industry leading solutions, which exceed our customers' expectations. LS Electric America's mission focuses on variable frequency drives (fractional to 800 horsepower) and electrical power components (contactors, relays, manual motor starters, miniature circuit breakers, molded case circuit breakers, and air circuit breakers), and solutions from agricultural pumping to wind renewables! The H100 VFD features the capability to operate lead-lag pumping applications without the need for external control devices such as a SCADA system or PLC. This feature can reduce pump wear, increase system efficiency, and improve reliability.

SIMPLE SETUP

- Uses the H100 standard keypad and parameters.
- Dedicated lead-lag macro makes programming easy. Setup in minutes!
- A two-wire RS485 connection is all that is needed between each VFD!
- Setup parameters are shared across the connected VFDs for streamlining and reducing startup time.

FLEXIBILITY

- Redundant setup eliminates downtime!
- New lead VFD automatically continues operation in case of failure or outage.
- Automatic pump alternation based on operation time or sequencing (FILO/FIFO).
- System can use a single transducer (shared of the network) or have multiple for redundancy.
- Supports up to eight H100 VFDs! ♦



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Improved PID Control: (enhanced response, Simple PID setup, +++)

New Pump Protection Functions: (No-Flow, Over-cycle, Setpoint timeout, +++)

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MegAlert

Save money, save time, and increase safety

MegAlert manufactures the MotorGuard, GenGuard, and CableGuard patented electrical insulation testing and protection systems designed to detect the first signs of insulation breakdown in critical equipment operating up to 15 KV. The MegAlert system senses when the equipment is offline and then performs a continuous "True Dielectric" I/R test on the winding insulation until the equipment is started again. This allows for corrective action to be taken in time to prevent failures on start up and increase plant uptime. The MegAlert's "hands off" testing capabilities increase personnel safety by eliminating exposure to dangerous arc flash conditions and electrical accidents.

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.



GP2500-MU-AS-D1
GP5000-MU-AS-D1
GP5000-MU-HV-AS-D1

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



Model GP5000-MU-AS-D1 Motorguard installed in MV MCC.

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. ♦

MEGALERT, INC.

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**Save Money, Save Time,
and Increase Safety**

**with the One and Only Automatic
Inline Megging/Monitoring Systems**

BEFORE »



« AFTER



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.

Our new Digital megohm meter has an optional 4-20 mA output for remote trending and tracking the I/R readings.

» Eliminate Arc Flash Exposure

» Reduce Repair costs

» Prevent Unexpected Downtime

» Tests Equipment up to 15KV

» 500-5000 VDC Test Outputs



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Mueller Water Products

Mueller Water Products, Inc. is a leading manufacturer and marketer of products and services used in the transmission, distribution, and measurement of water. Since 1857, Mueller has been helping municipalities increase operational efficiencies, improve customer service and prioritize capital spending demonstrating why Mueller Water Products is "Where Intelligence Meets Infrastructure®."

COMMITTED TO SAFE DRINKING WATER

From life-saving fire protection to data intelligence, we are committed to developing products and solutions that help cities and water utilities deliver clean, safe drinking water. Our broad product and service portfolio includes engineered valves, fire hydrants, pipe connection and repair products, metering products, leak detection, pipe condition assessment, and software technology that provides critical water data.

When you invest in water infrastructure, smart really matters, from the products themselves to the people behind them. Using rock-solid materials and ground-breaking technology, our products and services are designed and engineered for the long run. That means lasting value for the communities and contractors who choose solutions offered by the Mueller brands—value that ultimately can translate into cost savings.

SERVING ALL YOUR WATER DISTRIBUTION NEEDS

Mueller is one of the only companies that can fulfill your water system needs from end to end—at the source, at the plant, below the ground, on the street, and in the cloud. Built on a solid legacy of innovation, we have the expertise and vision to provide advanced infrastructure and technology solutions for transmitting, distributing, measuring, and

monitoring water more safely and efficiently than ever before.

Mueller brands provide products and solutions for:

Flow Control Solutions

Mueller offers a full line of products for controlling water safely and efficiently across your distribution system, including valves and control systems. And for easy and effective maintenance and repair, we offer superior service line connection products and equipment.

Products in this category include:

- **Valves:** resilient wedge gate, butterfly, check, plug, cone, air release, knife gate, slide gates, and more
- **Service line connections:** drilling and tapping machines, service brass, and pipe repair
- **Control systems**

Fire Protection Solutions

Safety is built into every Mueller solution. All of our fire protection solutions are compliant with Underwriters Laboratories and Factory Mutual requirements.

Products in this category include:

- Valves
- Hydrants
- Hydrant security
- Indicator posts

Pipeline Management Technology

Proven technology that enables utilities to assess and optimize water networks.

Products in this category include:

- Condition assessment
- Pipeline leak detection
- Correlation

Metering and Communication Technology

Smart metering paired with the Mi.Net® system allows municipalities to enhance how they serve the community. Our Mi.Net system is a flexible communication network that grows as your needs change.

Products in this category include:

- **Meters:** residential, commercial/industrial, fire service, registers, valves, setters, and boxes
- **Communications:** nodes and data collectors
- **Software:** utility dashboard, customer service dashboard, consumer dashboard, and monitoring services
- **Services:** field operations, network operations center, and network-as-a-service.

THE MUELLER ADVANTAGE

Mueller solutions are born from the collective products, services, and professionals in our family of the most trusted companies in the industry. Together we are a consultative, dedicated team of engineering, sales, support, and distribution experts working collaboratively toward one goal—your success.

We go above and beyond what's expected to help your water infrastructure system work harder, smarter and last longer, now and in the future. And we continue to invest in innovative ways to help you see insights across your system so you can proactively address concerns, extend the life of your operations and improve your customer service and bottom line.

Mueller Water Products' brands include Mueller®, Echologics®, Hydro Gate®, Hydro-Guard®, HYMAX®, Jones®, Krausz®, Mi.Net®, Milliken®, Pratt®, Pratt Industrial®, Singer®, and U.S. Pipe Valve & Hydrant. ♦

For more information visit
www.muellerwaterproducts.com

Zero Compromise

The **Singer® Pressure Reducing Valve** with integral back up (PR-SM) is two valves in one. With a secondary independent valve chamber and pilot system, it keeps on working without any interruptions if the primary system fails. It's the only control valve that accepts zero compromise.



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MUELLER

SCHENCK USA CORP.

SCHENCK USA CORP. is a subsidiary of SCHENCK CORP. Its parent company is Carl Schenck AG of Darmstadt, Germany; whose shares are ultimately held by Dürr, AG of Bietigheim, Germany.

SCHENCK USA CORP. is the company's new name as a result of the merger of Schenck Trebel Corp. and Schenck RoTec Corporation into one entity that comprises Schenck's Balancing and Diagnostic Systems Group for North America under Schenck RoTec GmbH.

SCHENCK USA CORP. is on four acres in Deer Park, New York, that includes a 22,800-square-foot manufacturing and assembly plant, and 17,000 square feet of office space for sales, service, administration and engineering personnel. The company's Southfield, Michigan, location is also a manufacturing and assembly plant serving the automotive customer base with a local engineering and service support staff.

SCHENCK USA provides a range of balancing and vibration analysis equipment for the production, maintenance and repair of rotating components. The company's engineering staff offers a range of experience for any balancing application and maintains a close presence on the balancing committees of the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE), to ensure the latest practices and procedures are applied. The company is ISO 9001:2015 accredited.

The service team is available for the commissioning and calibration of balancing equipment from multiple North American service points, in addition to leveraging a

global service support structure. With the company's recent acquisition of Test Devices Inc., of Hudson, Massachusetts, it has expanded its capacities in the spin testing and balancing services areas.

The company provides production, sales and servicing of balancing, filling, assembly and test systems, vibration and monitoring systems as well as accompanying services for the automotive industry and their suppliers, for the electrical industry, turbomachinery, general industries, and aviation and space.

In order to maintain its current role as a market and innovation leader in these fields, the company is dedicated to the following points:

- Thoroughly understanding customers' needs and exceeding expectations through partnership interactions
- Ensuring high quality by continuously improving the effectiveness of the company's processes, products and services in accordance with its quality management system (QMS)
- Contributing to the global success of SCHENCK by observing and proactively anticipating market developments
- Ensuring a safe workplace for the company's employees and visitors
- Complying with laws and regulations applicable to the company's operations
- Treating vendors fairly in partnership arrangements
- Creating a rewarding and challenging environment of integrity and ethics



- Constitute a positive environment, where the company encourages internal improvement suggestions

HM-Series Machine Advantages at a Glance

HM-Series machines are designed to:

- meet most balancing requirements in single-unit or in high volume production
- solve many horizontal, hard-bearing balancing tasks
- be fitted to many individual applications because of its modular design
- be well suited for the industrial work in a repair shop due to their sturdy construction
- make fast and accurate balancing possible due to permanent calibration
- have a measuring sequence with digital measured value processing that makes them stable
- enable balancing of a large spectrum of rotors with variable rotor support and adaptable drive
- offer a comprehensive safety package for the protection classes B and C, which will protect operating personnel ♦

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Sims Pump Valve Company, Inc.



For one hundred years, Sims Pump Valve Company has been a leader in pump technology. Sims Pump has an excellent reputation for offering innovative solutions for marine and industrial pump applications. Sims specializes in solving balance, cavitation, corrosion, electrolysis, erosion, and radial thrust problems by upgrading existing pumps and impellers to the patented Simsite® structural graphite composite technology.



These two impellers operated for eighteen months in salt water. The Simsite® impeller is unaffected by corrosion, erosion, cavitation, or electrolysis!

THE SIMSITE® ADVANTAGE

Sims Pump manufactures Simsite® structural graphite composite engineered pumps, impellers, casing wear rings, guide bearings, mechanical seals, and many other

pump components. These unique and patented Simsite® pumps and pump parts are "Technology Upgrades" for new or existing pumps. Sims Pump has the ability to make any centrifugal pump energy efficient and long lasting. Simsite® pump products outlast and outperform traditional metallic pumps by many years! All Simsite® pumps and pump components improve performance, longevity, and efficiency. They eliminate corrosion, erosion, electrolysis, and cavitation problems! Simsite® pumps and parts are light weight, self-lubricating—the Simsite® advantage—the capability to adjust performance to maximize efficiency and performance—Sims can adjust the design of the impeller to maximize efficiency at the actual rated operating point required by the customer.

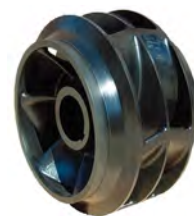
INDUSTRIES SERVED

Sims primary customer base consists of customers who are pumping corrosive products. These customers include the U.S. Navy (certified) and other navies around the world, the marine and offshore, chemical, power generation, wastewater, and oil and gas industries. Simsite® products are also used in a broad range of industries including, chemical, food processing, paper and pulp, refining, petrochemical, sewage treatment, mining, plating, skiing, steel, farming, water treatment, textile, and utilities.

PRODUCTS

Sims products include a complete range of precision machined and engineered pumps, (vertical and horizontal) impellers, casing rings,

guide bearings and sleeves wet ends, and other replacement parts for all centrifugal pumps. Sims specializes in upgrading impellers and rings, for any centrifugal pump. All products are 100 percent made in the United States!



TECHNICAL SERVICES

Application engineering, service, and support are provided from the corporate headquarters in Hoboken, New Jersey. Sims has hydraulic design, FEA, and CFD capability and Sims specializes in corrosion resistance, life-cycle extension, efficiency, and troubleshooting centrifugal pumps. All of the Sims design engineers are specialists in pump and impeller design, and in the design of structural composites. The Sims engineering service and support staff can design replacement parts and/or complete pumps to meet your specific needs and performance requirements. ♦

SIMS PUMP VALVE COMPANY, INC.

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Hoboken, New Jersey 07030

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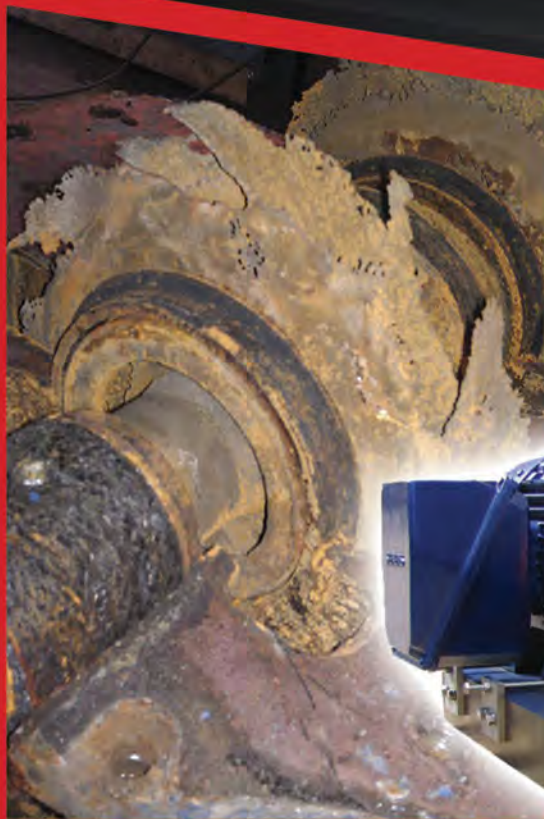
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SIMSITE® Pumps, Impellers & Rings
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of the pump, **NEVER CORRODE**,
and Do NOT Support Electrolysis!

Vaughan Company

Your source for reliable chopper pumps and pump systems

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 water 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 waste water 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, they have experienced over 100 inches

of rainfall with no plugging incidents or other issues. And, during 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.

A HISTORY OF CONTINUAL IMPROVEMENT BENEFITING OUR CUSTOMERS

In the 1950s, company founder Jim Vaughan invented the world's first chopper pump to solve the problem of clogged manure pumps for local farmers in Washington. Nearly 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 is committed to continuous product improvement to maximize pump performance for our customers.

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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Blacoh Industries SENTRY XP pulsation dampeners to 15,000 psi

With innovations in design, Blacoh's new generation SENTRY XP 316L stainless steel dampeners offer better performance and more options for high pressure applications.

The PTFE bellows in the new XP is oriented with the inside wetted and an internal support disk allowing PTFE models to be rated up to 15,000 psi. The cap and disk are the only wetted components in the new bellows design. In applications that require Alloy 20 or Hastelloy C, the larger non-wetted housing is constructed of 316L stainless steel and only the smaller wetted components use the more costly alloy.

The new generation XP also boasts an improved sealing feature. The seal is created by a taper in the body coming in contact with a matching tapered cap. The taper design allows the cap and body to come together with zero clearance.

SENTRY XP pulsation dampeners are engineered for high performance and reliability with 316L stainless steel solid shell housings and ACME threaded caps. XP models are offered with pressure ratings from 2,000 to 15,000 psi using PTFE bellows and Buna-N or EPDM bladders. Choose from a wide range of inlet options, including Blacoh's exclusive flow-through inlet design that effectively removes both hydraulic and acoustic pulses in high pressure

applications for exceptionally smooth pressure and flow. ATEX and CRN available on specific models. Like all Blacoh products, SENTRY XP pulsation dampeners are proudly made in the USA. ♦





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HIGH PRESSURE XP DAMPENERS

- ✓ NEW SIZES AVAILABLE IN 30, 36, 60, 90, AND 120 CUBIC INCH
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AVAILABLE!

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Over eighty years of pump experience

Since our inception, we've become recognized as one of the leading centrifugal pump companies, building to the most demanding engineering specifications and military standards in the world.

Carver Pump's quality management system is certified by Intertek to conform to ISO 9001:2015. 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.

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—for example, our tank-mounted 855 Series and new naval ship systems. 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. ♦

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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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More than a Check valve *It's a Check-All®*

SILENT OPERATION!

Our check valves close quickly and smoothly to avoid water hammer noise and vibration.

SPRING-LOADED!

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

UPSTREAM TRIM!

The upstream trim is protected from corrosive media mixing; thereby, extending valve service life.

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in the USA

ImpellerStore

Simsite® impellers and casing rings are the best impellers and casing rings in the marketplace! The reason our impellers are so good is because they are not

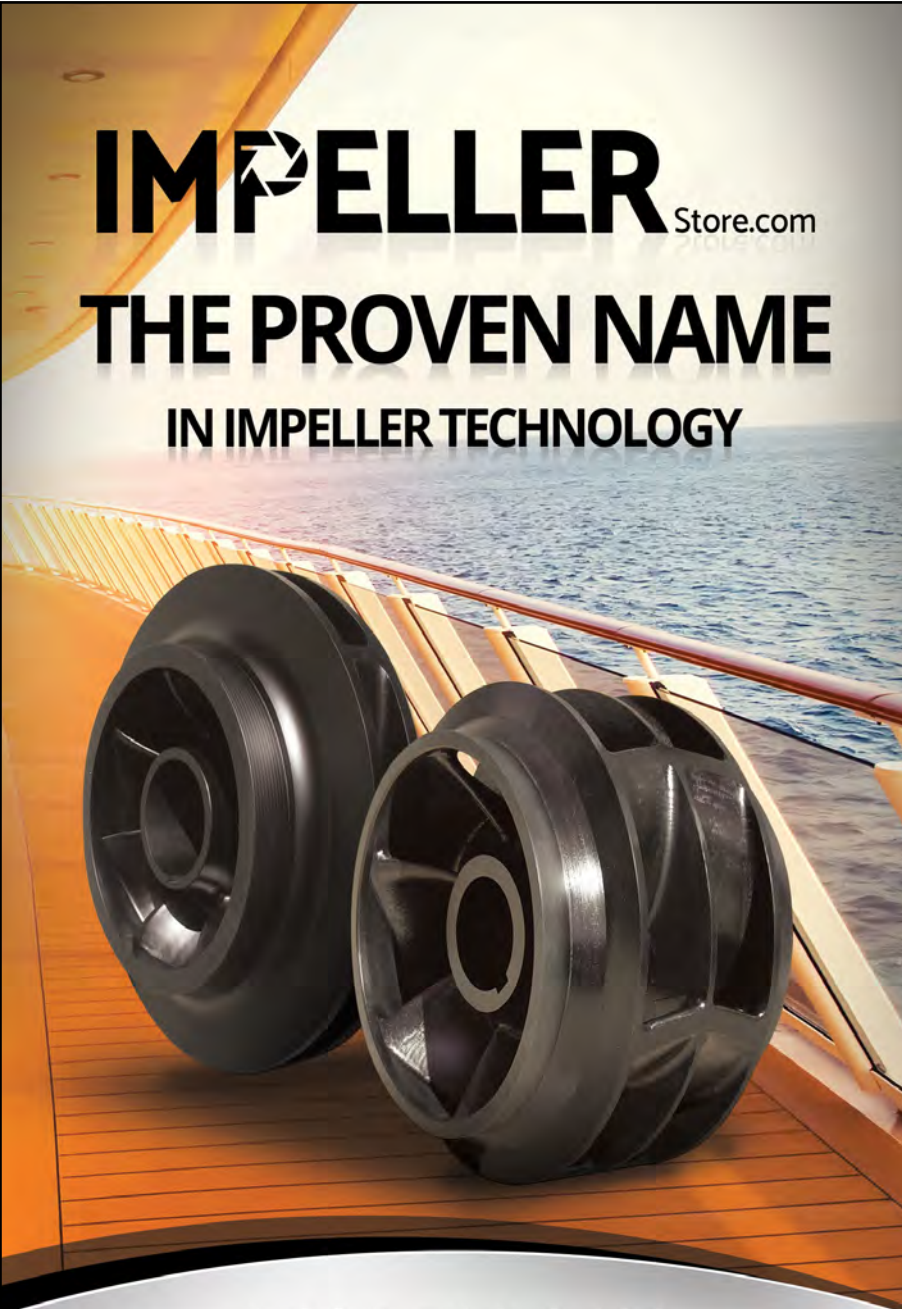
cast or molded. ImpellerStore manufactures high quality, precision machined, upgraded, efficient impellers and rings from Simsite®, a unique and patented structural

composite. ImpellerStore products are completely different from any other impellers and casing rings in the marketplace because they are fully machined from a solid block of Simsite®, which never corrodes in sea water, brackish water, river water, chlorinated water, wastewater, or many other chemicals.

Our ImpellerStore Simsite® impellers and casing rings are truly unique, because they are completely (100 percent) machined on the inside as well as the outside. The five-axis to eight-axis precision machining makes our ImpellerStore Simsite® impellers perfectly balanced both mechanically and hydraulically—if an impeller is machined from one center position, there is no imbalance! Therefore, they do not experience performance degradation like metallic products.

ImpellerStore Simsite® impellers and rings are excellent for new, repair, or retrofit applications. They are lightweight and virtually indestructible. Wear of other pump parts including the pump casing are greatly reduced because of the Simsite® impeller's perfect balance, light weight, self-lubricating, sealing, and corrosion, erosion, and cavitation resistance. This means far less expense for replacement of parts, reduced downtime, and years of trouble-free performance.

ImpellerStore Simsite® impellers and rings are designed for superior hydraulic performance because the Impellers are computer engineered, designed, and precision machined. The impeller vane geometry can be engineered to maximize efficiency and performance. Problems such as recirculation, radial thrust, and cavitation can be minimized or eliminated by upgrading to Simsite® impellers and rings. Impeller vane shapes can easily be modified to provide the best vane shape for specific applications and performance requests. ♦



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KROHNE

KROHNE offers a complete measurement instrumentation product portfolio including industry specific system solutions and complementary services for projects of any size, anywhere in the world. Since starting in 1921, we have amassed an enormous amount of application knowledge that is integrated into our products, solutions, and services.

The resulting innovative technologies are based on our extensive R&D with 10 percent of the work force dedicated that area. While sensor development for flow, level and other variables is the primary focus, we are also very active in advancing device communication and the Internet of Things (IoT) for the process industries including device diagnostics for analysis and process optimization.

If you buy a KROHNE product, you will get a measuring device that performs

most accurate with low uncertainty under real process conditions. To achieve this, we operate more than 120 calibration facilities for volume flow, mass flow, level, temperature, density, and pressure for every device we manufacture. For example, every flowmeter is wet calibrated using water or air as standard before leaving our facilities. We can also provide customer specific calibration such as:

- Multipoint calibrations
- Varying temperatures, viscosities, or pressures
- Specific fluids
- Specific pipe geometries or piping provided by the customer

For calibration we only use direct comparison. For example, we calibrate our Coriolis mass flowmeters with a gravimetric weighing system. Our

calibration rigs are the most accurate for measuring device production with reference accuracies 5 to 10 times better than that of the meter under test.

This goes for small (1 millimeter) or very large meter sizes since Krohne operates precise volumetric calibration rigs up to 120 inches with a certified accuracy of 0.013 percent based on a 144-foot-tall tank containing almost 132,000 gallons of water allowing for a maximum flow rate of 7,925,000 gallons per hour.

In North America, we have a brand-new manufacturing and calibration facility in Beverly, Massachusetts. We serve our markets through a network of representatives, distributors, and direct sales personnel. You can find your local contact on the web at us.krohne.com/en/company/krohne-usa/people-sales-contacts.

Our mission is to provide unparalleled application expertise, on-time delivery, and cost-effective quality products so that we can exceed our valued customers' expectations. We offer a technically proficient, KROHNE-trained sales force that gets involved in all aspects of technical sales and applications support.

Our dedicated technical support, field application, start-up and repair teams are located throughout the regions to provide timely and effective services at your site or at our factory. Our TASC (Technical Application Support Center) is the heart of KROHNE's technical support capability and is available by phone or email every day, at any time, day or night. This group of trained engineers and technicians is at your disposal for product application, installation, operation, or troubleshooting questions. You can reach our support team by calling our toll-free number 800.FLOWING (356.9464) or by email at tasc@krohne.com.

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Pumps 2000

Pumps 2000 was established in Australia in 1989 to offer pumps capable of handling abrasive, solid-laden, and corrosive fluids in underground mining environments, and to create an alternative to the heavy, maintenance-intensive diaphragm pumps that were used predominantly in mines. These pumps featured low weight, as well as improved pump life and performance.

Pumps 2000 America was established in 2007 to market Pumps 2000 products and solutions throughout the world. Today, our pumps continue to be used in coal and hard-rock mining throughout the world, as well as in general industry, marine, building and construction, food processing, chemicals, and pollution control applications.

Pumps 2000 pumps are assembled and tested at our facility in Pittsburgh, Pennsylvania. From this location, we

also provide comprehensive technical support to our distributors, agents, and end-users across North and South America, and operate a service facility and warehouse to ensure fast delivery of pumps and spares.

Several patented features make it possible for Pumps 2000 to offer market-leading low life-cycle cost, while handling difficult applications. A number of products are currently under development. The use of injection molding has given Pumps 2000 greater freedom in material composition and has led to the development of lubrication-free pumps and our own plastic blends. Our unique combination of in-house R&D and manufacturing enables us to offer pumps and pumping systems which are technically superior and significantly higher quality than our competitors.



All Pumps 2000 products are certified in accordance with ATEX Manufacturing processes are in accordance with ISO 9000 quality management systems standards. Our pumps also comply with ISO/IEC 80079-34 quality standards related to potentially explosive atmospheres.

Pumps 2000's experienced team is always ready to assist you with solving your pumping needs. Please contact us with your inquiry. ♦



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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!

Why keep adding chemicals when Scalewatcher can reduce your chemical dependency?

Break the cycle now and save on energy, water, and maintenance costs with Scalewatcher products!

For more information, call 800.504.8577 and visit www.scalewatcher.com. ♦

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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.

MAINTAIN-IN-PLACE WITH SMART CONVEYING TECHNOLOGY (SCT)

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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PERFORMANCE GUARANTEE.
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PROGRESSIVE CAVITY PUMP

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USE PROMO CODE: 0456

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For thirty years, W&A has worked to offer quality consulting, training, and products to meet the needs of our customers across the country. Our goal is to provide excellent service—whether through our books, manufactured products, representative products, seminars or speeches, customer satisfaction remains our priority. Nick Westerberg has been in the industrial community for thirty years, teaching, consulting, and servicing industrial equipment.

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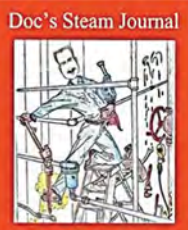
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P2

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Pulsation dampeners with higher pressure ratings

Griffco pulsation dampeners for use on pumping systems are now available with operating pressures up to 1,250 psi for metal models and up to 250 psi for optional plastic models. Higher pressures are also available for metal models, which come in a choice of 316L Stainless Steel, Alloy 20, and Hastelloy® C materials of construction. Plastic model materials include Noryl, PVC, CPVC, and Polypropylene.

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