The global magazine for pump users and suppliers

PUMP engineer

TYCON ALLOY

Pushing the Boundaries of Traditional Casting into the Future

Special Topic: Chemical Processing

In this issue of Pump Engineer magazine:

Volume 26, October 2020

www.pumpengineer.net

Corporate Golden Donor FAI
WE SUPPORT "FONDO AMBIENTE ITALIANO"
(ITALIAN ENVIRONMENT FUND ASSOCIATION).

ROTEN® srl
MECHANICAL SEALS

Via Ortica, 6 - 20134 Milano, ITALY - Tel. +39 02 76110157 - Fax +39 02 7385445 - info@roten.it - www.roten.it

Volume 26, October 2020

Pump Engineer is your essential link to the global pump industry

www.pumpengineer.net

Publishing Director
Andre Davanzo, a.davanzo@kci-world.com

Editor
Angelica Pajkovic (Canada/USA), a.pajkovic@kci-world.com

Editorial Team (Print & Online)
Sarah Bradley (Canada/USA), s.bradley@kci-world.com
Stephanie Matas (Canada/USA), s.matas@kci-world.com
Catarina Muia (Canada/USA), c.muia@kci-world.com
Brittani Schroeder (Canada/USA), b.schroeder@kci-world.com

Advertising Team (Print & Online)
Nilton Goes, n.goes@kci-world.com

Subscriptions (Print & Online)
Stephanie Matas (Canada/USA), s.matas@kci-world.com

Pump Engineer is published six times per year. Subscriptions are renewed automatically in accordance with Dutch legislation. ISSN: 1571 5329

Publishing House & Mailing Address
KCI Publishing Corporation, 36 King Street East, Suite 701, Toronto, ON M5C 1E5, Canada, info.toronto@kci-world.com
Tel: +1 416 361 7030, Fax: +1 416 361 6191
B.N 829876267RT

Netherlands Office
KCI Publishing B.V., Jacob Damsingel 17
NL-7201 AN Zutphen, The Netherlands
info.zutphen@kci-world.com, Tel: +31 575 585 270

Germany Office
KCI GmbH, Tiergartenstr. 64, D - 47533 Kleve, Germany
info.kleve@kci-world.com, Tel: +49 2821 711 450

China Office
KCI Shanghai, Room 603, 6F, #400 Zhejiang Mid. Road
Postcode 200001 | Shanghai, China, info.shanghai@kci-world.com, Tel: +86-21-6351 9609

Advertiser Index

www.twitter.com/Pump_Engr
www.youtube.com/user/kcipub
www.facebook.com/engineer.pump
www.linkedin.com/groups/4337439

COVER STORY

TYCON ALLOY: Pushing the Boundaries of Traditional Casting into the Future

Established in 1995, Tycon Alloy is dedicated to providing customers with highly precise and complex casting components. By offering casting components, machining, as well as surface treatments on castings, the company has earned a reputation for providing high grade engineered casting solutions.

Page 8

Dear readers,

The moment we have all been waiting is just a few short months away! The Pump Engineer team is looking forward to the highly anticipated series of conferences that will be taking place the week of December 7th 2020, at the Royal Sonesta Houston Galleria in Houston, TX. The Hose + Coupling World Americas Conference & Expo 2020, will now be taking place on December 7th and 8th, while the Managing Aging Plants USA, Heat Exchanger World Americas and Fugitive Emissions Summit Americas Conferences & Expos 2020, will all take place on December 9th and 10th, 2020.

The aim of the conferences is to bring together a community of end users, EPCs, distributors, manufacturers and suppliers that work with industrial hoses, couplings, heat exchangers, as well as those dedicated to maintaining and managing aging plants and facilities to ensure the safety of plant workers and operators. The informative conferences and exhibitions will address the ever-evolving solutions, technologies, and capabilities available to these industries. I hope to see you all there!

In this latest edition of Pump Engineer, we explore a diverse range of pump-focused articles. Our attention on Chemical Processing, which is this month's special topic, provides us with the opportunity to explore the types of pumps used to transfer a wide range of chemicals and liquids. The special topic articles, found on pages 18 and 28, provide an in-depth look at how using seal-less sliding vane pumps can help solve many of the major pump pain points for chemical applications, and the versatility of air operated diaphragm pumps.

In this month's Cover Story we discuss how Tycon Alloy is dedicated to providing customers with highly precise and complex casting components. By offering casting components, machining, as well as surface treatments on castings, the company has earned a reputation forproviding a high grade engineered casting solution. Its commitment to exceeding the expectations of its dynamic client base make its services continually sought after in a number of industries. Be sure to read the full article on page 8.

With many technical articles and case studies focused on topics spanning from cloud-based simulation in pump design, and fluid temperaturein seal chambers, to the considering the impact of milorganite and upgraded pumps, I am confident that there is something for everyone in this issue of Pump Engineer.

I encourage you to send me your technical articles, case studies and press releases and I look forward to meeting new industry professionals. Please feel free to contact me at a.pajkovic@kci-world.com, should you have any questions or would like to be featured in Pump Engineer magazine. Together, we can continue to explore all of the sectors that rely on pumps, and the ways that they enhance each industry's productivity. Thank you again for your continued support, stay safe!

Angelica Pajkovic
Editor, Pump Engineer
a.pajkovic@kci-world.com

EVENTS CALENDAR

DEC 7 *December 7th – 8th, 2020*
Hose + Coupling World Americas Conference & Expo
Royal Sonesta Houston Galleria,
Houston, Texas, USA
https://www.hosecouplingworldexpoamericas.com/

DEC 9 *December 9th – 10th, 2020*
Heat Exchanger World Conference and Expo Americas
Royal Sonesta Houston Galleria,
Houston, Texas, USA
https://www.heat-exchanger-world.com/hxw-americas-2020/introducing-heat-exchanger-world-conference-and-expo-americas.html

DEC 9 *December 9th – 10th, 2020*
Managing Aging Plants USA Conference & Expo
Royal Sonesta Houston Galleria,
Houston, Texas, USA
https://www.managingagingplants.com/map-usa-2020/managing-aging-plants-usa-conference-expo-2020.html

DEC 9 *December 9th – 10th, 2020*
Fugitive Emissions Summit Americas 2020
Royal Sonesta Houston Galleria,
Houston, Texas, USA
https://americas.fugitive-emissions-summit.com/

For more industry events, visit:
https://www.pumpengineer.net/

Pump Engineer 2020 Special Topics

December 2020: Material Selection

Global Highlights

NEW PROJECT

Cognizant & Grundfos Partner to Restore Sembakkam Lake

Cognizant and Grundfos have announced that they will offer funding support for the restoration of the Sembakkam Lake in Chennai. The lake flows into the Pallikaranai wetland, one of south India's last remaining natural marshlands. Cognizant will contribute more than USD $360,000, while Grundfos will contribute USD $230,000, and up to USD $10,000 in kind for civil works, wastewater treatment, and landscaping to rejuvenate the 100-acre lake. Expected to be completed in 2021, the work will involve cleaning the inlets and outlets, improving the lake's connectivity with upstream and downstream water bodies, building an eco-friendly wastewater treatment system, and constructing walkways and green buffer zones along the lake.

The project will benefit over 10,000 households living around the lake and conserve the local biodiversity consisting of around 180 plant species. One of the goals of the project is to provide a natural recreational space to the local community and involve them in the maintenance of the water body.

NEW DISTRIBUTION PARTNER

Xylem Selects Distributor in Iceland for Pump Lines

Iceland's Ásafl ehf has recently been named an official distributor of Xylem Inc.'s Jabsco and Rule branded marine pumps and equipment. Ásafl ehf specializes in the sale and service of machinery and equipment for fishing boats and small vessels, supplying marine engines, pumps, propellers, generators, gears and stabilizers, in addition to dock and boat cranes. Under an exclusive agreement, Xylem will supply Ásafl ehf with the two product lines for distribution to customers in Iceland.

NEW PRESIDENT

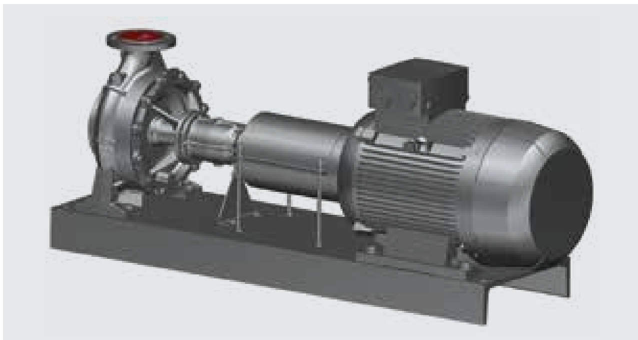
Flowserve Names New President for Pumps Division

Tamara Morytko will join Flowserve Corp as the new President of the company's Pumps Division. Morytko served as Vice President, Asia Pacific for Baker Hughes prior to her recent role as Chief Operating Officer and Senior Vice President, administration of Norsk Titanium.

"I am excited about the international experience Tamara brings to Flowserve in the areas of product development, engineering, as well as manufacturing and aftermarket services," said Scott Rowe, Flowserve President and CEO. "Her proven leadership in these core areas, along with her extensive background in operations will help to build upon our Flowserve 2.0 Transformation efforts as we build the Flowserve of the future."

NEW PROJECT

CIRCOR Brands Supplies NTT Thermal Oil Pumps for Medical Glove Production Line



CIRCOR International, Inc., recently provided three NTT 250-400 thermal oil pumps with variable frequency drive (VFD) for use on a medical glove production line in Yingke, China. The pumps, installed in the heat transfer system, control the temperature while the gloves dry in their molds. Specially designed for thermal oil applications, the NTT pumps can handle high temperature and avoid thermal expansion problems during heat up and cool down phases. High level cooperation between the application team in Germany and the sales team in China resulted in extremely quick customer response time and a delivery time of only 10 weeks, which is shorter than average.

Product Developments

Grundfos Philippines has launched Prefabricated Pumping Stations (PPS) to help meet the country's growing flood and wastewater management needs. The PPS is designed to be energy efficient and operate reliably over an extended period of time. Traditional pumping stations are made of concrete casted on-site, which means that it is susceptible to corrosion and leakage over time. As PPS is made of hard-wearing plastic, it has greater durability. Its advanced control system also allows for optimized operations which leads to greater energy savings. In addition to flood control, another key application for PPS is in wastewater management. The PPS' high durability ensures minimal disruption to any water system.

Almatec®, part of PSG®, has launched its new ADX Series Stainless-Steel Air-Operated Double-Diaphragm (AODD) Pumps for industrial applications. The ADX Series incorporates an array of design enhancements that provide simplified maintenance, improve cleaning, and increase safety. Engineered to meet the mass requirements of an oscillating pump, the ADX Series' wetted housing parts are constructed from stainless-steel precision casting while the non-wetted parts are available in three different plastic materials to accommodate a variety of applications and temperatures. The ADX Series is currently available in ADX20 (3/4") and ADX25 (1") sizes and in two variations that meet ATEX requirements. ADX Series pumps are also offered with Almatec monitoring systems such as stroke counting, diaphragm sensor and barrier chamber system.

Goulds Water Technology recently introduced a new GSD submersible sewage pump, designed for handling residential sewage systems, water transfer, heavy duty sump and dewatering applications. The pump features a cast iron design and a mechanical seal design for protection against sand and abrasive materials encountered in wastewater streams. The GSD's engineered motor is built for optimal hydraulic performance without the potential for overloading. The pump also comes with a built-in anti-siphon hole, which enables easy pump installation and prevents air locking. The GSD series is available in an automatic or manual design with 115 V, 0.5 horsepower, and a single-phase pump with 2" discharges.

Tsurumi's new GPN 837 model agitator pump can almost double the water output of the GPN 622 model. With an output of 9,000 L/min, it is designed for use wherever considerable amounts of solid matter are involved. The GPN 837 can be used in gravel pits to deal with sand, slurry, sludge, and bentonite. The agitator at the suction opening mixes mud and water so that it becomes more fluid. The new model also has a dry weight of 815 kg, a height of 1 m, and is driven by an electric motor with 37 kW (400 V). It pumps vertically up to 24 m and when submerged, is pressure-resistant to a depth of 30 m.

The Netzsch N.Mac twin shaft grinder extends the company's product range sizes for flow rates up to 400 m^3/h and is designed for breaking down different materials in wastewater treatment, biogas and biomass plants, food and animal processing, and industrial applications. The N.Mac can be installed upstream of a pump (inline version) or above the feeding screw of a hopper pump (channel version). The inline version is available in three sizes and can handle a maximum flow rate of 350 m^3/h; the channel version is available in four sizes, and is designed for a maximum flow rate of 400 m^3/h. The N.Mac is equipped with flushed and lubricated mechanical seals for to allow for dry-running.

KNF's new N 630 diaphragm vacuum/compressor pump series delivers high pressure and gas tightness with a durable, long-life design. Four versions are available for use in gas recycling, industrial coolant systems, gas and emissions measurement/analysis, and leak detection. The N 630 series delivers all the advantages of diaphragm technology: no seals to wear out, no oil to maintain or dispose of, and no contamination issues from either. With a long service life, vacuum down to 0.74 inHg, positive pressure up to 174 psig, and a flow rate up to 2.4 CFM (68 L/min), the N 630 series offers highly versatile performance. The cost-efficient and reliable diaphragm gas pumps are available in four variants: either one- or two-headed and connected in series or parallel, as a vacuum pump, or as a compressor.

Alfa Laval's new LKH Prime 10 UltraPure self-priming pump and upgraded LeviMag® UltraPure magnetic mixers reduce total cost of ownership while ensuring more responsible use of resources for sterile processing applications. The LKH Prime 10 UltraPure is the most compact pump in the LKH self-priming pump range. Perfect for duties up to 35 m^3/h, it is primarily engineered for Cleaning-in-Place (CIP) return, but also transfers product in sterile processes. This delivers savings of up to 50% in capital expenditures and installation, and 30% in annual operating expenses. Other advantages include up to 60% more energy savings than liquid ring pumps and up to 25% more than other airscrew pumps.

The Graphite Metallizing Corporation has found success in its iron grade bushings of molten sulphur pumps at a major refinery. Molten sulphur pumps require a high temperature bushing material. The refinery in question was using nickel chromium bearings. It opened up the bearing clearances to .020-.025 inch to avoid bearing contact with the shaft but this caused high vibration issues approaching 1.0-in/second peak. Due to its non-galling qualities, the refinery was able to rebuild the pumps using iron grade Graphalloy bushings with a running clearance of .006-.007 inch. The overall high vibration level decreased to a maximum of .21-in/second peak. The refinery has since rebuilt three additional pumps to the same standards using Graphalloy bushings.

TYCON ALLOY

Pushing the Boundaries of Traditional Casting into the Future

Established in 1995, Tycon Alloy is dedicated to providing customers with highly precise and complex casting components. By offering casting components, machining, as well as surface treatments on castings, the company has earned a reputation for providing high grade engineered casting solutions.

Pump Engineer recently had the pleasure of meeting with Mr. Michael Lo, General Manager of Tycon Alloy, at the company's new foundry in Zhongshan, China, to discuss Tycon's quality control system, market strategy, and management philosophy. He was joined by Mr. Charles Shen, a Senior Procurement Specialist from Emerson China, visiting the Zhongshan foundry as a customer, who shared his perceptive views.

By Xue Guanpu

As a leading casting enterprise with locations in Hong Kong and Shenzhen, China, Tycon is committed to introducing advanced technologies into its processes, as well as incorporating research into the development of special casting materials. In order to stand at the forefront of the casting industry, and become a leader in engineering casting solutions, it manufactures pumps, valves, flowmeters, and other castings applications for a number of industries. Tycon's pump-related castings, specifically, are widely used in the marine, petrochemical, and electric power industries.

In response to changing industry trends, Tycon began to build a new foundry in Zhongshan, Guangdong Province of China, in 2015. The finished foundry covers an area of 100,000 square meters and is the result of a total

investment of $500 million RMB. This project allowed the company to gradually transfer its production capacity from Shenzhen to Zhongshan, and produce an annual output of 10,000 tons per year.

Mr. Lo, who is now responsible for the business operations of two foundries, joined the company in 2001. "For the past few years, I have been preparing for the transfer of our processes to Zhongshan. This has involved a vast variety of tasks including foundry construction, right through to equipment procurement. It has taken a lot of effort to finally get our products to the production line here and we are very excited to offer them to our clients; it is our customers who measure the success of our products and service," said Mr. Lo.

Smart Plant with Digital Management

With the Zhongshan foundry operation entering the second phase of planning, Mr. Lo is focusing his attention on transferring Tycon's production capacity from Shenzhen to Zhongshan. "Precision casting experiments are currently taking place to test some complicated components and difficult-to-make products, while the sand casting automatic production line is ready for use. Our customers in Europe, the United States, and Japan are mainly involved in the pump and valve industry, so our production capacity will expand in accordance with changing market demands there," he stated.

To keep up with the ever changing market, Tycon has ensured that all of the equipment in the Zhongshan foundry complies with the latest environmental-protection, energy-consumption, and sewage treatment standards, required by the Chinese government. In recent years more stringent regulations have been introduced in China because of a general concern about the environment. "We have conducted a number of inspections to ensure that our equipment meets these standards. Moreover, the equipment here is all digitalized so that it can be networked in the future. Through digitization, workers and engineers can check the status and energy consumption of the entire foundry through the produced data," continued Mr. Lo.

As enterprises in China are now facing greater barriers to entering the casting industry, unqualified companies are more likely to be eliminated from the market. "From Shenzhen to Zhongshan, I have noticed that equipment has been digitized. Compared to traditional foundries, the biggest change is that we can now see if equipment is fully functioning, or not, by simply connecting it to a computer. Tycon has therefore laid a good foundation for the establishment of 'smart' plants and their future development," Mr. Shen stated.

The Importance of a Quality Management System

The casting industry is indeed a traditional industry, said Mr. Lo. "Simply changing the production mode cannot drive the entire industry forward. Only by upgrading our management philosophy and applied technology systems at the same time, can we keep the casting industry energized and on the move. This is where the real challenge is."

"The most important thing is to push this traditional industry forward by improving management's philosophy and outdated production systems. Whether working with colleagues or customers, Tycon values team spirit and I hope to make a contribution to the whole supply chain. The project cannot be completed until every segment exceeds expectations."

In order to accomplish this progressive movement, Tycon diligently maintains process controls. "We need to find out exactly where a potential problem is for any product in any process, then we will know how to improve it. At Tycon we therefore have monitors and engineers allocated to take care of each production section. I think that quality control depends largely upon strict process control, because the data and feedback provided from the back-end process and customer side is important to ensure traceability from the front-end," Mr. Lo explaind. "Only by improving the process can our engineers and employees give full play to their knowledge."

Mr. Shen added, "From the customer's point of view, strict process control is a vital part of a stable quality system because the quality of the sample product and that of volume production are of equal importance. Volume production requires a strong quality system and it cannot be achieved just by one particular person or a few people."

As Mr. Lo went on to point out, the casting industry is not a one-way deal or simply a case of selling a product. "From raw materials, to suppliers, to customers, we are all linked in a supply chain from a macro perspective. The supplier of each product is just one segment in the entire supply chain, no matter how closely every segment is connected with each other, communication between segments is highly significant."

In the past, pump factories had their own casting workshops. Although casting workshop and the pump factory have been separated over the last 20 years, there is still a need for them to be in close communication with one another. Therefore, Tycon always tries to understand the difficulties that its customers encounter in their production process, and works to fuse together to provide a highly interactive service. "For new customers, we are willing to keep products in storage according to their needs, and will promptly provide these products to them upon request." In Mr. Lo's opinion, the purpose of building a bridge between a foundry and its customers is to obtain a clear understanding of customer needs, as their needs are just as important as the product itself.

Business in the Pandemic

At present, Tycon has adopted a relatively balanced market strategy. "Personally, I think that Europe, the United States, and China are the three major regions for future industrial development. While Covid-19 is indeed an unfavorable factor for the global market, we still hope to achieve more in coming years, especially in the European and American markets. We intend to invest more resources in China because it has become a mature power in the industrial marketplace and many of its factories have grown into research centers," said Mr. Lo.

While continuing to make sustained efforts in traditional industry sectors, Tycon will also expand its footprint in the food and pharmaceutical sectors. "These are very promising industries and ones that have continued to grow at a rapid rate, despite the present

circumstances of the pandemic." By cooperating with colleges and universities Tycon is able to use its resources and equipment to experiment further with product development. It is perhaps a surprising fact that more new products have been developed by Tycon in the first half of 2020 than the same period last year. "One of the reasons for this is that our team have close communication ties with our customers. Although our colleagues cannot go on business trips to foreign countries at present, they never stop their conversations with customers. Apart from this, we are now looking for new communication methods through Internet technology. For example, through showing product simulations in software directly to our customers they are able to fully understand how we are going to solve their problems. Overall, Tycon is confident that it will find its own direction in the current, fluctuating global marketplace," stated Mr. Lo.

"Tycon benefits from young people. Each year I talk to our newly graduated colleagues and let them know how we value them. Attracting fresh blood and teaching them that working in a foundry is exciting is something we insist on."

People-Oriented Philosophy

For Mr. Lo, casting is not a 'sunset' industry, for without casting no product can be assembled. "Casting is an industry with on-going demand. The poignant question however, is, what is the value of casting enterprises nowadays if they remain a traditional industry? If a foundry merely produces an array of products but overlooks: environmental issues, the motivation of employees, and shortcomings in management, then it is bound to close." Ensuring that talented individuals are given the right opportunity, however, can lead to fresh ideas and higher work efficiencies. "Talented people are a key element in a good enterprise because everyone can show their own creativity and enthusiasm. However, a lot of foundries nowadays are short of talent because young people are unwilling to work there." To solve this problem, Tycon organizes student training classes almost every year. Mr. Lo loves to hear the sparkling ideas of students because they are not restricted to a fixed mindset. "Tycon benefits from young people. Each year I talk to our newly graduated colleagues and let them know how we value them. Attracting fresh blood and teaching them that working in a foundry is exciting is something we insist on."

During his 20 years in Tycon, Mr. Lo has explored the development and future of the casting industry. "The most important thing is to push this traditional industry forward by improving management's philosophy and outdated production systems. Whether working with colleagues or customers, Tycon values team spirit and I hope to make a contribution to the whole supply chain. The project cannot be completed until every segment exceeds expectation," he concluded.

What are Cv Values and How Can They Be Used?

Interview with Ed Edwards: Vice President, HBE Engineering

Ed H. Edwards is the Vice President of HBE Engineering of Three Rivers, Michigan, a supplier of centrifugal pump minimum flow valves and orifices. He has worked in the pump and related equipment field since 1972 and holds a BS from Western Michigan University. He specializes in materials of construction for corrosion and erosion resistance, the proper sizing, selection, installation and maintenance of equipment.

By Michelle Segrest, Contributing Editor

Ed Edwards had a third-party inspector in his office reviewing the test requirements he was contracted to witness. The product being tested was an automatic recirculating valve used to provide minimum safe flow and perform the reverse flow check valve function.

"The tests would consist of a hydrostatic test per ASME B16.34, a seat test per API 598, and a performance test which would consist of measuring the Cv of the bypass with -0- main flow and several modulating points until the bypass port closed and all flow would go forward," Edwards explained. "As an experienced inspector of mainly rotating equipment the third party gentleman was fine with the hydro and seat test, but as soon as Cv was mentioned he developed a confused look and had me repeat Cv at least two more times. I pulled a reference book for control valves and turned to the page with the Cv definition. After a quick review, he understood and we proceeded with the tests."

As liquid flows through an orifice, the square of the fluid velocity is directly proportional to the pressure differential across the orifice and inversely proportional to the specific gravity of the liquid. The higher the pressure differential the higher the velocity, the greater the specific gravity the lower the velocity. Logically the flow volume of a liquid can be calculated by multiplying the fluid velocity times the flow area.

Using the Cv value for a valve or orifice can assist in determining the effect a change in pressure differential, flow rate, or specific gravity can have in a system with a simple calculation.

Ed Edwards.

A Cv is numerically equal to the number of US gallons of water that will flow through the orifice or valve in one minute with a 1 PSI pressure differential.

Background and Experience

Edwards began his career with a pump and valve company in 1972 doing drafting work.

"In those days, we had equipment consisting of a T square, triangles, compass, soft lead pencils, and a slide rule that was used for all design and price calculations," Edwards remembered. "There was no email, no faxes, and no overnight courier services. The only fast nonverbal communication possible was to send a telex. Everything else went by normal postal mail."

Edwards' department supplied products to chemical industries that were often used on highly corrosive fluids, and required materials of construction made of exotic and high alloy materials including: pure nickel, Hastelloy, titanium, and zirconium, in addition to many grades of stainless steels.

"I found use of these materials very interesting and started taking every metallurgy course available at Western Michigan University," said Edwards. In 1977 he completed his education with a Bachelor of Science degree with majors in metallurgy and industrial business. "The company I was with at the time sponsored me to take the NACE (National Association of Corrosion Engineers) course and obtain accreditation."

Since graduating, he has worked as an application engineer, territory manager, sales manager, product manager, and vice president.

Now, Edwards works primarily on the technical and commercial review of bid requirements. He travels to plant sites to oversee maintenance and repair of HBE products and to review special or unusual product needs. He presents pump protection demonstrations at A&E firms, providing continuing professional development time for engineers to obtain or maintain a PE license. He also reviews and approves order quality documentation. He works for engineering and construction firms, universities, airports, and food processing facilities in a variety of industries, including oil and gas, pulp and paper, steel, power generation, and chemical.

"Knowing the history is an important aspect often overlooked in many businesses, and the 'brain drain' of many companies has been tremendous."

Solving Problems with Pumps and Valves

Incorrect materials of construction can result in premature failure and safety hazards to personnel and the environment, according to Edwards.

"Using incorrect valve technology for the application is a big problem in industry," he said. "I have witnessed large high-pressure gate valves become stuck by trying to close them under pressure. Other options, such as a parallel slide gate or metal seated ball or butterfly valves, would be better suited and the ¼-turn products are easily automated. Another big problem is when pumps operate outside of the manufacturer's intended range due to pumps being oversized or running multiple pumps when one will adequately handle the process needs."

$$C_v = Q\sqrt{\frac{S.G.}{\Delta P}}$$

$$Q = \frac{C_v}{\sqrt{\frac{S.G.}{\Delta P}}}$$

$$S.G. = \Delta P\left(\frac{C_v}{Q}\right)^2$$

$$\Delta P = \frac{S.G.}{\left(\frac{C_v}{Q}\right)^2}$$

Q = flow rate in GPM

ΔP = differential pressure in PSI

Mathematical depiction of Cv value.

Edwards offers simple tips for end users when trouble-shooting problems.

"Read the manufacture's IOM, and if you do not understand it, read it again," Edwards suggested. "If you still do not understand it, contact the manufacturer. Establish a MTBR (mean time between repair) rather than MTBF (mean time between failure). The cost to repair is always going to be less expensive than waiting until failure occurs."

When servicing equipment, cover any piping openings to avoid any debris from entering the system. "Some interesting items I have found in pumps and control valves include, but are not limited to: hex nuts, a 6-inch chisel, a 3-inch buffing wheel, plastic grocery bags, shop rags, and gloves," he said. "Regardless of the automation and control room technology, a critical service pump, such as a boiler feed, should have quality, calibrated, and clean pressure gauges on the suction, discharge, and minimum flow lines. Baseline pressure readings should be recorded when the pump is new or recently serviced. Pumps are extremely reliable and what is often referred to as a 'pumping problem' is often the result of a control valve failure, clogged strainer, or leakage in the piping. Changes in any of the three gauge readings should be investigated to determine and address the cause."

With regard to safety, Edwards recommended following or exceeding PPE (Personal Protection Equipment) requirements of the site and always buy the best.

"Replace safety glasses if they get scratched and make sure ear protection is functional when working around high energy pumps," Edwards said. "Disposable ear buds are okay in some situations, but muffs are much better when working near operating equipment. LOTO (lock out tagout), no doubt, prevents many accidents from happening. Most plants have a procedure in place and should have one if they do not. Once I was assisting in changing out trim on a control valve protecting a high pressure (3,800 PSIG) pump, and a worker that had been on site way longer than 12 hours started the pump before we had everything tight on the valve. As soon as the motor started, I was water blasted against a structural beam. My only injury was a cut lip, and I was glad to have been completely suited up in PPE and the water was ambient temperature! A LOTO would have prevented this accident that could have been much worse. Safety rules are only good if they are followed!"

"These days, everyone wants to obtain information online, but anyone involved with pumps and valves need a few good reference books."

Challenging Projects

Edwards travels 30% of the time. His favorite projects are those that require him to determine and define problems and then formulate out-of-the-box solutions for them. "I have been involved with several equipment failures due to unexpected corrosion in water services," he said. "If a service is a known substance, such a 98% sulfuric acid, 40% caustic, or a finished petroleum product, such as jet fuel or unleaded gasoline, it is easy to determine the material of construction for a pump, valve, or other piece of equipment."

Throughout his career, a few interesting material failures have occurred on raw water intake systems. "Even if water samples are taken and a close analysis is performed, variables from seasonal or other mother-nature influences can present a challenging surprise," he explained. "An interesting example occurred at a large facility in Nigeria in which carbon steel bodied

valves with internal parts of 304 and 17-4PH materials were fine for approximately seven years, then failed from corrosion. Replacements lasted less than one year. Upgrades were made in materials by changing from carbon steel to 316 stainless-steel bodies. The internal parts of 304 were also upgraded to 316, and 17-4PH parts were changed to Nitronic 60. Three years have passed without any corrosion failures. The site never reported if the root cause of the failure was determined but based on some other installations, I suspect the raw water being obtained directly from a river had some type of new actor that was biological in nature."

Current Industry Trends

Consolidation of companies at both the user and supplier level is trending in the industry, Edwards said. "Knowing the history is an important aspect often overlooked in many businesses, and the 'brain drain' of many companies has been tremendous," he said. "Supplier reductions by appointing middleman contracts adds to the confusion when the user does not understand what he needs and expects the middleman to work it out with a supplier employee that is inexperienced."

Edwards also predicts continued automation and instrumentation 'smart' technology advancements. "We will continue to improve the efficiency and safety in industry, however, as I mentioned earlier, the basics still need to be understood or all the information viewed and or recorded will not take the place of knowledge and experience. For example, a control room operator of a crude oil pipeline received a drop in pressure signal. The operator assumed the operating pump was sick and brought the standby pump online and shut down the pump that was losing pressure. The pipeline pressure continued to drop and to compensate. The speed of the pump was increased to increase the pipeline pressure, however, it continued to drop. The pressure loss was due to a pipe leak so the leak, plus the flow through the pipeline, resulted in the pump running out on its curve and operating at a lower pressure. This caused a massive spill due to the time it took to determine the reason for the pressure loss."

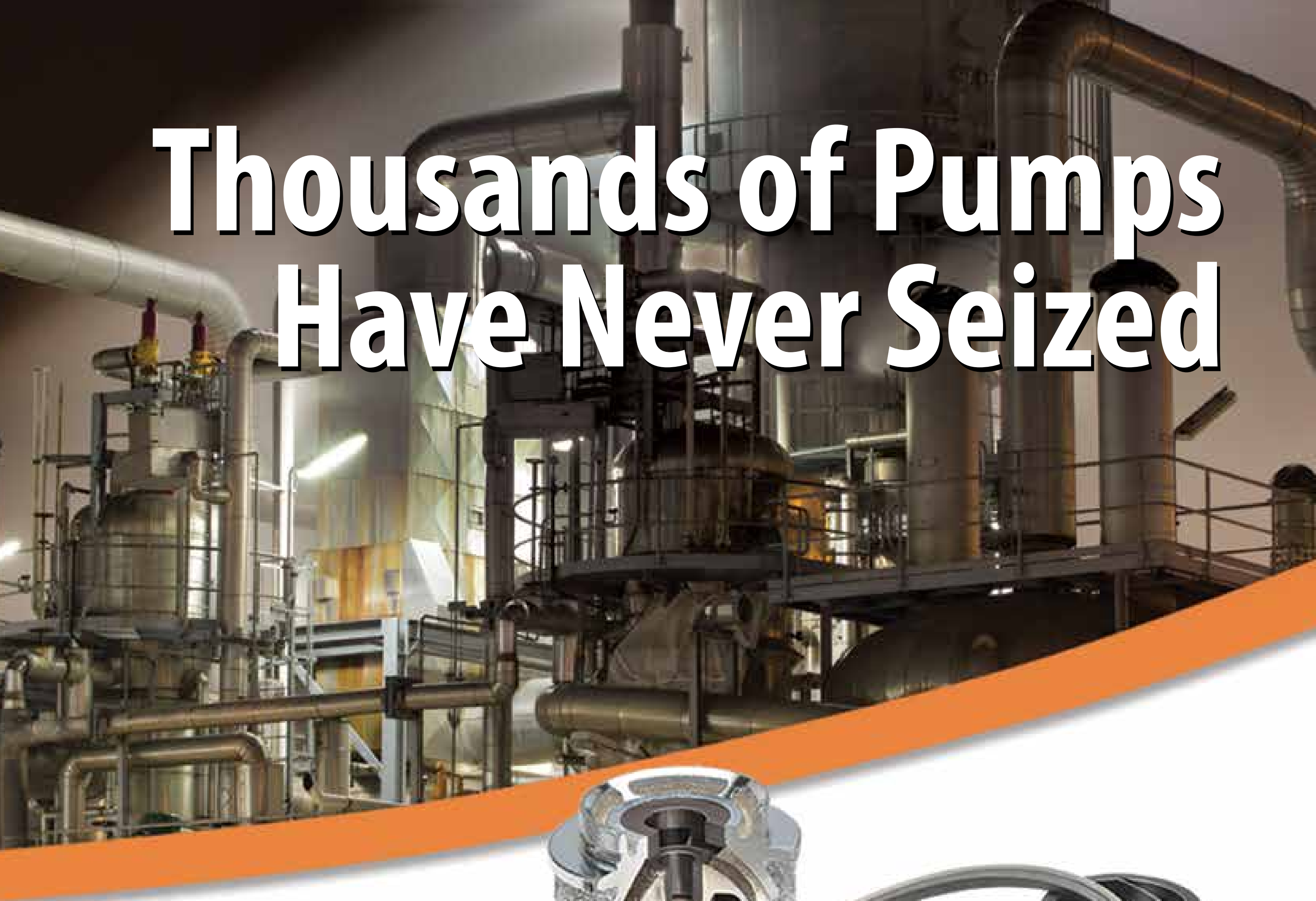
"Suppliers have a wealth of experience and knowledge. Use it! Attend seminars, lunch & learns, and trade shows, if possible, and never be afraid to ask questions. Seek out a mentor. I was blessed to have several very good ones early in my career, and I am sure glad I did."

Advice for End Users

Learn by starting with the basics until they are understood, Edwards advised young end users. "These days, everyone wants to obtain information online, but anyone involved with pumps and valves need a few good reference books," he suggested. "Some of my favorites include: Hydraulic Institute Standards, Pump Handbook by McGraw Hill, Lyons' Valve Designer's Handbook, NACE Corrosion Data Survey, Cameron Hydraulic Book, and ASME B16.34. Pump engineers, in general, need to know more about valves. Valves normally control the pumps output and many valve types protect pumps from damage, for example, check valves and minimum flow valves. Also, valves are key to safely servicing pumps.

Valve engineers also need to know more about pumps. "Both need to know about Cv calculations and values and how they can be used in determining the effect changes in pressure, flow, and how specific gravity can effect each other."

Edwards also recommends that end users do not specify requirements he or she does not understand. "Many specifications are developed by cut-and-paste of work done for a different item," he said. "For example, do not specify a magnetic particle test be done on a stainless steel part. It cannot be done. Suppliers have a wealth of experience and knowledge. Use it! Attend seminars, lunch & learns, and trade shows, if possible, and never be afraid to ask questions. Seek out a mentor. I was blessed to have several very good ones early in my career, and I am sure glad I did."



Thousands of Pumps Have Never Seized

Pumps fitted with GRAPHALLOY® wear parts survive upsets.

- Run dry and keep running
- Self-lubricating
- Non-galling
- Won't swell
- Corrosion resistant
- Dimensionally stable
- Improved efficiencies
- -400˚F to 1000˚F (-240˚C to 535˚C)

GRAPHALLOY®

GRAPHITE METALLIZING
CORPORATION
Yonkers, NY USA

P1

+1.914.968.8400 • www.GRAPHALLOY.com

Seal-less Sliding Vane Pumps to Solve Pump Pain Points

There are some things that cannot be avoided, including a pump's common operational pain points such as: leaking, solids handling, dry run, cavitation-causing NPSH imbalance operation off the BEP, and incomplete performance curves, all of which are inherent in chemical-transfer applications.

In the 1980s the first viable pump technology was created that could ostensibly deliver a leak-free performance, a crucial concern in applications where the handling and transfer of high-value hazardous chemicals was required. The pumps were made with a design that could also mediate or eliminate the negative effects of the common operational pain points. This technology was called seal-less, zero-leak, or leak-free.

By Geoff VanLeeuwen, PE, Director of Product Management for PSG® Grand Rapids

Many chemical-processing applications require pump technologies that are leak-free, dry-run capable, can handle solids, can operate off the Best Efficiency Point (BEP) and can run without any cavitation-causing net positive suction head (NPSH) imbalance occurring.

The seal-less, zero-leak, or leak-free technology had one important task: prevent the leakage of hazardous materials through the incorporation of a seal-less design. There are three reasons why leak-free performance in chemical-transfer applications is paramount:

1. Most raw chemicals are expensive, meaning that they are too valuable to leak, get flushed down a drain during a cleaning process after a product run, and/or get left behind in a storage tank, railcar, tank truck or piping system after an unloading event.

2. Many chemicals are too hazardous for humans to handle or be exposed to, which requires leak-free operation.

3. Many chemicals are caustic or corrosive, which makes them hard to seal and can lead to cracks, breaks or crystallization on the seal faces, resulting in leak-causing failures.

The first seal-less pumps appeared to possess the ability to meet these three challenges, but they were not readily embraced at the outset for two reasons: they were more expensive than traditional sealed pump technologies, and there was broad skepticism regarding whether or not the seal-less design could truly deliver on its leak-free promise.

It was not until the early 2000s that seal-less pump technology had evolved to the point where it could claim to be both a pain-point resolver and totally leak-free. A change in the mindset of the user also helped; leak-free pumps were not just being used when handling hazardous materials, they were being used for the handling of basic liquids like water. This combination of change in mindset and the field-proven capabilities of seal-less pumps have turned the pump industry on its head. Now, after steady growth over the past 15 years, the global seal-less centrifugal pump market is valued in excess of USD $4.5 billion. In fact, sales of seal-less ANSI centrifugal pumps have the potential to eclipse sealed-pump sales in the coming years. Despite all the success however, there remain challenges that seal-less pumps must overcome.

Pump Pain Points

While acknowledging that seal-less pumps have made a giant leap towards curing the chemical-leak conundrum, it is still important to delve deeper into the causes and effects of the common pump pain points and highlight how centrifugal pumps and internal gear pumps have risen as leading technologies in the ongoing battle to optimize pump performance.

The dominant technology for seal-less pumps in chemical-transfer applications has been centrifugal pumps, as centrifugal pump manufacturers were the first to embrace the technology and develop what has come to be recognized as the preferred leak-free pump style when handling a wide range of chemical products.

Similarly, the manufacturers of internal gear pumps quickly adapted their sealed and packed designs to accommodate a seal-less option. Keeping the internal pumping elements unchanged, the early seal-less gear pumps provided a basic leak-free technology that was attractive during the early development of seal-less pumps.

Despite their success in penetrating the seal-less market in chemical-processing applications, centrifugal and gear pumps have design and operational attributes that could create challenges for the user. Therefore, users should be aware of these pain points and characteristics when designing systems and selecting pump technologies. In short, chemical-transfer applications are rarely pristine and can be very unpredictable, often leading to pervasive system outages and equipment failures if the proper pumping solution is not deployed.

Dry Run

Dry run is defined as 'operating a pump without any liquid,' but while the definition may be simple, the consequences of doing it can be anything but. When a typical seal-less pump rotates without liquid inside, it generates heat that leads to potentially catastrophic failure of internal components. Gear pumps struggle because the internal components are constantly in contact, making them unable to handle dry-run operation without damaging internal gears, idlers, bushings and pins. Looking at centrifugal pumps, sleeve bearings are the weakest component. Various material options exist, such as silicon carbide, protective coatings, and composite blends, but each leaves the pump vulnerable to dry run failure.

Chemical Transfer Capabilities Comparison for Sliding Vane, Centrifugal and Gear Pumps

	Sliding Vane	Centrifugal	Gear
Indefinite Dry-Run Capability	YES	NO	NO
Solid & Abrasive Media Handling	YES	NO	NO
Cavitation & Vapor Mixtures Handling	YES	NO	NO
Low to Zero Required NPSH	YES	NO	NO
Full-Curve BEP Capability	YES	NO	YES
Leak-Free Pumping	YES	YES	YES
Seal-Less Technology	YES	YES	YES
Self-Priming Operation	YES	NO	NO
Product Recovery	YES	NO	NO

Solids Handling

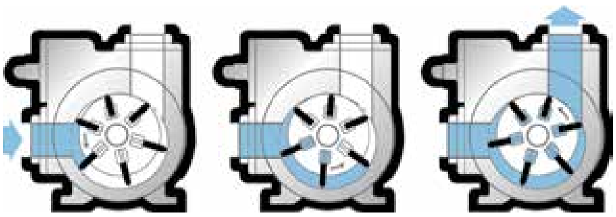
Most chemicals contain some level of suspended solids or particulates that come from either the process or supply tanks. The solids will rub against the pump's casing and other internal components, causing wear. Both centrifugal and gear pumps rely on internal circulation paths, which can be clogged by solids and cause failure. In the case of centrifugal pumps, the solids are thrown around at such high velocities that pitting and premature wear will occur even quicker. For gear pumps, the result of solids handling is the same as dry run: failure. Solids cause gear pumps to lock and fail. At best, solids wear down contacting gear components, resulting in reduced pump capacity.

NPSH Imbalance/Cavitation

Every pump consumes Net Positive Suction Head (NPSH). If a pump consumes more NPSH than the system provides, vapor forms and cavitation will result. Cavitation is the violent implosion of entrained vapor bubbles that sends shock waves and vibrations through the fluid. Depending on the intensity and frequency of the cavitation, the pump's internals degrade, leading to breakdowns, leaks and costly downtime and repairs or replacement. Gear pumps fail fast with vapor and thin liquids because of the galling of internal parts and failed bushings. Centrifugal pumps rely on converting velocity head to pressure head, which is not possible with compressible entrained vapor. In short, both centrifugal and gear pumps fail when operating under sustained cavitation and poor NPSH applications.

Inflexible Operating Range

Pumps are typically built to operate at a single specified design point. Meanwhile, specific pumps are installed in dynamic systems that operate across a wide range of operating points. This has an impact on centrifugal pumps, which have a Best Efficiency Point (BEP), or the single operating point, where they are most efficient. Maintaining operation close to BEP is critical to a centrifugal pump's reliability. A centrifugal pump that operates outside of its BEP will see amplified loads that result in excess stress on the bushings and shaft. This stress leads to deflection, rubbing contact, premature wear, leak-path development and compromised product containment. Unlike centrifugal pumps, positive displacement (PD) pumps do not require BEP-reliant operation because they function consistently with changing environmental and liquid conditions. In this way, centrifugal pumps have a narrow operating range, whereas PD pumps offer flexibility to operate across the full system range.



The operating principle of sliding vane pumps ensures volumetric consistency through a number of self-adjusting vanes that slide in and out of the pump rotor as it turns, creating chambers that carry the same amount of fluid to the discharge port.

Sliding Vane Pumps

Sliding vane pumps have been proven as an alternative to centrifugal and gear pumps in chemical-transfer applications because they are simple to use, reliable and flexible. These pumps do not require tuning to a single BEP; the vanes self-compensate for wear, sustaining like-new performance throughout the system's operational life. They can also easily handle pumping conditions that feature varying system pressure, zero NPSHa, liquid/vapor mix, suspended solids and regular dry-run operation. An example of an advancement in seal-less magnetic drive technology is the MAGNES Series Magnetic-Drive Sliding Vane Pumps from Blackmer®.

Sliding vane magnetic-drive pumps are able to solve pump pain points with functionality that's designed for chemical and severe-duty applications. Key attributes of this type of pump include:

Indefinite Dry-Run Capability: Magnetic-drive sliding vane pumps eliminate sensitivity to intermittent, extended and unexpected dry-run conditions.

Solids Handling: The sliding vane pump can effectively process liquids with suspended-solids levels of up to 20%.

The Blackmer® MAGNES Series Magnetic-Drive Sliding Vane Pump produces a combination of flexibility, functionality and reliability that solves legacy operating pain points while also delivering technically superior handling of hazardous chemicals in severe-duty applications.

Low Required NPSH: Performing as a zero-NPSHr solution, these pumps can handle challenging pump inlet conditions, and offer sustained performance with liquids featuring up to 20% vapor or air content.

Full-Curve Performance: Unlike alternate options that must be tuned to a single BEP, these pumps can handle multiple changing fluid and system conditions.

Zero Leakage: The containment shell is the foundation of a pump's leak-free capabilities. The sliding vane pump shell offers dry run, high pressure containment, maximum coupling rating and leak-free operation.

Zero Alignment: The optional close-coupled drive design enables quick and easy system setup, eliminating time-consuming alignment processes.

Conclusion

The evolution of the seal-less leak-free pump design has been advancing for decades. Innovative new pump technologies, such as the MAGNES Series Magnetic-Drive Sliding Vane Pumps from Blackmer®, can eliminate the pervasive pain points of legacy centrifugal and gear pumps in chemical-transfer applications. Some of the most important aspects are the indefinite dry-run capabilities, solids handling, and operating well with cavitation and vapor mixtures. Combining these features with a next-generation seal-less magnetic-drive design, chemical manufacturers have new options when searching for the best pump to deploy in their critical and severe-duty operations.

About the Author

Geoff VanLeeuwen is the Director of Product Management for PSG® Grand Rapids, and can be reached at geoff.vanleeuwen@psgdover.com.

RUHRPUMPEN

70 years THE SUPPLIER OF CHOICE

Keeping the chemical industry in motion

Engineered and standard pumping solutions for chemical processing.

Ruhrpumpen's broad product range includes highly-engineered and standard centrifugal and reciprocating pumps for the most difficult chemical processing applications. Additionally, RP offers an extensive line of fire systems constructed to NFPA standards and an extensive service network with spare parts and maintenance service to pumps regardless of the original manufacturer.

***CPO** ANSI B73.1 process pump*

***SCE-M** magdrive API 685 pump*

***VLT** vertical canned pumps*

RUHRPUMPEN PLANTS

GERMANY, Witten ▪ USA, Tulsa ▪ MEXICO, Monterrey ▪ INDIA, Chennai ▪ BRAZIL, Rio de Janeiro
ARGENTINA, Buenos Aires ▪ CHINA, Changzhou ▪ UNITED KINGDOM, Lancing ▪ EGYPT, Suez ▪ RUSSIA, Moscow

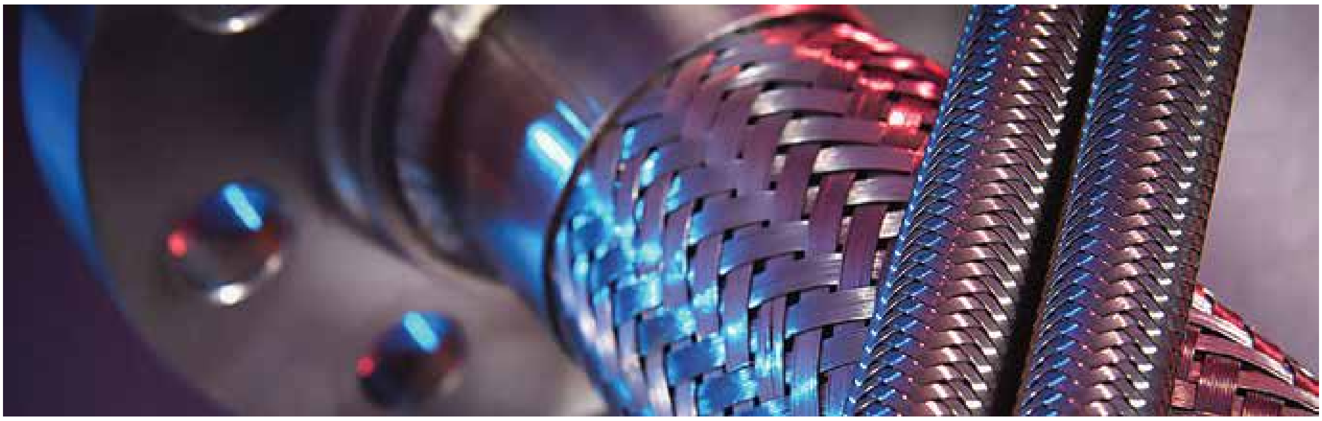
Contact us at info@ruhrpumpen.com

» www.ruhrpumpen.com

Increasing Pump Profits in the Power Industry Despite the Pandemic

The power industry's market for industrial pumps has been impacted by both COVID-19 and the ongoing wildfires. Investment in pumps by power industry purchasers will be down in 2020 due to postponement of both capital and repair projects.[1] This decrease in investments will be compounded by pump industry personnel's inability to meet in person or attend industrial exhibitions.

By Robert McIlvaine, President & Founder, The McIlvaine Company



Effects of COVID-19

The impact of the pandemic is affecting various segments differently. If looking at countries as a segment, they have each experienced unique difficulties which affect them in various ways. The impact on India and the US for example, will be negative while China is moving forward as planned.

When considering the effect of the pandemic on fuel types, nuclear projects are not impacted whereas renewable projects have been delayed in some countries. Similarly, the following sectors are experiencing various impacts as well.

- New companies are the most impacted. Very few pumps are being sold to new power companies who have never purchased the applications before.

Company	Planned MW	Installed MW
NLC India	6,700	3,990
TANGEDCO	6,640	4,320
J-POWER	6,356	8,482
Eskom	6,352	41,129
UPRVUNL	6,270	5,474
GCM Resources	6,000	0

Figure 1.

Coal Fired Capacity - MW

Country	2018	2019	2020	2021	2022	2023	2024
Romania	5,305	5,305	5,305	5,305	5,305	5,305	6,000
Slovakia	881	881	881	881	881	881	881
Bosnia & Herzegovina	2,073	2,073	2,073	2,073	2,073	3,000	4,000
Serbia	4,405	4,405	4,405	4,405	4,405	5,000	5,000
North Macedonia	800	800	800	800	800	800	1,200
Slovenia	1,069	1,069	1,069	1,069	1,069	1,069	1,069

Figure 2.

- The market for pumps for new power plants owned by existing operators is relatively small, but has been impacted.
- The market for replacement pumps is larger and less impacted.
- The market for repairs and service is large and the least impacted.

Activity	Present Approach	MPM
Sales Initiation	Sales Leads and Reps	Predicted Prospects
Market Research	Peripheral	Foundation of Approach
Sales Promotion	Unstructured and Reactive	Structured and Proactive

Figure 3.

In general, there are high performance and general performance pumps. With high performance pumps the decision can be made to delay replacement instead of repairing them. When general performance pumps fail they are normally replaced rather than repaired. There has therefore been a greater impact on high performance pump markets.

Effects of Wildfires

The wildfires in Australia, California, and elsewhere are being blamed on climate change and specifically fossil fired power generation. This ongoing danger has therefore led to the delay of gas turbine and coal fired plant projects.

Pump companies are therefore facing several years where revenues from the power industry will not be increasing. However, profits can be increased. Pump companies that adapt with new ways to target prospects, and communicate with them, will have an advantage which can lead to greater markets shares, margins, and profits.

90% of the power industry pumps are purchased by less than 1,000 companies. Pump suppliers can easily identify the prospects and even the processes used in each plant. Figure 1 shows an example of coal fired plant operators with planned additions between 6,000 – 7,000 MW.

With knowledge of the existing capacity at any point in time the expenditures for new pumps, replacements and repairs can be made. Figure 2 highlights some tabulations for Eastern European countries.

Using Market Research

Market research has been used as a peripheral tool by pump suppliers for many years. Now it can be used as the foundation of a program to successfully pursue the Most Profitable Market (MPM). There is already enough information available through media, associations, conferences, and internet resources, to determine the best prospects. Figure 3 highlights the difference between the present approaches to navigating a market, versus the MPM approach; it is an approach based on customer knowledge and not sales leads.

Ending Note

The Coronavirus and climate change present challenges to pump companies. Those that best meet these challenges can increase market shares, gross margins, and profits.

Reference

1. *Pumps: World Markets published by the McIlvaine Company*

About the Author

Robert McIlvaine is the President and Founder of The McIlvaine Company, which publishes reports across worldwide pump and valve markets. He was a pollution control company executive prior to 1974, when he founded The McIlvaine Company. He oversees a staff of 30 people in the USA and China.

A Time to Learn:

An Interview with Jonathan Whitlock

Jonathan Whitlock was an instrumentation engineer for over four decades. For the majority of his career, he volunteered to share his knowledge with engineering students and now teaches full time.

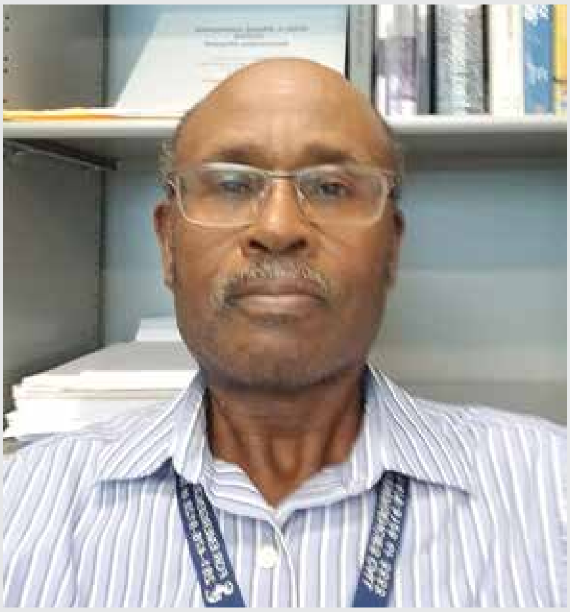
Pump Engineer had the opportunity to sit down with Whitlock to talk about his vast industry knowledge, his goals as a teacher, and what he hopes for the future of the industry.

By Brittani Schroeder, Sarah Bradley and Angelica Pajkovic

Forty-two years of working in the instrumentation industry has given Whitlock a wealth of knowledge and experience. He has spent time on projects in both upstream and downstream sectors; in pipeline systems and in chemical plants; and has worked with everything from control valves and temperature devices, to DCS systems and PLCs. While working in instrumentation and control system have been Whitlock's primary focus, he has always had a passion for power distribution. "I like dealing with high-voltage applications, while also working on the instrumentation side of it," he relayed. "I have pretty much worked with everything electrical-related. I specialize in all aspects of instrumentation and I know a lot about valves because I have done design engineering and management for all different types."

Some of his principal projects include:

- Crude oil rail unloading.
- Safety instrumented systems (SIS)
- Refinery expansions installation of vessel, heaters boilers pumps and valves.
- Firewater protection systems.
- Barge loading dock facility installation.
- Power distribution system upgrade.
- Flare gas recovery system.
- PSV 3% compliance and remediation.
- Steam system improvements
- Environmental compliance projects
- Solar power system
- Microwave communication systems
- Ups systems
- Diesel and natural power generations packages
- Navigational lighting systems
- Pipeline remote control automation and monitoring
- Compressor control systems
- Boiler management systems (BMS)



The multi-faceted nature of his role has simultaneously provided him with the opportunity to engage with a wide range of industry professionals. "One of the major issues I faced in the early days of my career was the inability to find good technicians coming out of the local colleges. So, I decided to train my own!" explained Whitlock. "I was a volunteer teacher for about 25 years. I basically took kids off the street and made instrumentation technicians out of them," he stated. This is what first brought Whitlock into professional teaching. As he took on more and more young technicians, he realized that he truly enjoyed the opportunity to share his experience with those just entering the industry. "I retired from the instrumentation industry in 2019, and my intention was to take a break from work, go fishing, and relax. Suddenly, I was offered a teaching position, and they wanted me to start immediately. So, I did."

Defining Instrumentation Engineering

The role of an instrumentation engineer varies greatly depending on which processes and equipment the engineer is engaged with. "My task as an instrumentation engineer was to arrive after the process equipment had been installed and install the instrumentation and controllers (distributed control system (DSCs), programmable logic controllers (PLCs), and standalone controllers) needed to get the process to worked as designed. If you simply install that equipment without anything else, they will not work," said Whitlock. Similar to the process of installing an engine into a car: if you do not connect the install instrumentation and a computer, the car will not go anywhere. The engine needs to be connected to the sensors, switches, the output control, and monitoring devices to get a fully functional piece of equipment. "The same goes for process equipment," continued Whitlock. "The equipment has to be tied to the computers, so we provide all the necessary instrumentation to make things work."

All instrumentation needs to be tied into a computer system, such as a DCS, a PLC, or any computer based monitoring and control systems. All process requirements, such as temperature and pressure, are plugged into the computer so that the system will send a signal and control those units. "We manage, install, and design," said Whitlock. "You can manually operate some of the systems, but even manual devices need some type of instrumentation support. A control valve will need the actuator, an air supply, and it needs to be calibrated properly. Ultimately, instrumentation engineers are necessary people. Without instrumentation, you will not be able to operate properly."

Process Equipment

Vessels, valves, pipe, pumps, compressors and hoses are crucial to a processes ability to function and produce saleable products. Maintaining the instrumentation that monitor and control the critical process equipment is essential to the role of an instrumentation engineer. "The biggest cause of failures I have seen with valves is actually inadequate documentation. Gathering the proper data, analyzing it, and documenting really helps," said Whitlock. "If you track how many miles you put on your car after each time you fill your gas tank from empty, and you see the number miles per tank getting lower and lower between each trip to the gas station, you know that your car is not performing at its best. By tracking and analyzing that data, you can tell your car is not performing well long before a mechanic will tell you the same thing. The same goes for valves," he continued. "We stress to students that they need to learn how to collect the right data, learn how to analyze it, and in the end, it will prevent a lot of avoidable equipment stress." This concept is commonly known as predictive maintenance.

As Whitlock has spent time working with industrial hoses throughout his career, he has learned that all hoses need to be sized properly for the application.

"There needs to be a QA/QC processes, with the sole focus of making sure the industrial hose products meet industry design standards. The standards should address the industrial application, operating temperature, operating pressure internal and external, operating environment, and any special or unique operating conditions.

Industrial hoses should also specify the type of protective instrumentation that should be used the field application to protect the hose from destruction or damage. At minimum, industrial hose manufacturers should specify the temperature and pressure instruments requirement and their settings. The setting should be used to shut down and upstream equipment feeding that hose.

The same could be said about instrumentation and pumps. "Pumps move everything through a facility, so there is a lot of instrumentation processes to make sure they are properly sized, installed, and hooked up to the rest of the plant," said Whitlock. "We get the students involved in pump sizing, mostly with centrifugal and PD pumps, but also with magnetic drive pumps, which are magnetically coupled so there is no risk of causing a seal leak to the environment."

The Joys of the Job

Whitlock considers programmable logic controllers (PLCs) to be the most exciting and the most challenging aspects of the instrumentation role. "The PLC is nothing more than a black box that you can start programming for your equipment. You program it with certain language, and it will take inputs and produce outputs. One of the most exciting things is being able to take the ideas from someone's head and program it into the PLC," he explained.

"There is no time for trial and error, and you have to do the job correctly with a lot of other dynamic factors in front of you. You have to be focused on maintaining project budget costs, you must work with the customer, and the other field support personnel, and you have to train a lot of people to use the instrumentation technologies properly."

Teaching the Next Engineers

Whitlock now teaches an Instrumentation Program. "I had not planned on taking another position so quickly, but when you are called, you go where you are needed," he said.

The Instrumentation Program has been designed for students coming straight from high school, as well as industry professionals who want to advance their skills. "Students need to have a basic level of understanding in math and science, specifically algebra and physics. We give them all the tools of the trade to maintain and calibrate equipment, but the first step is to understand each device. We teach them about temperature, pressure, and flow devices, among others," Whitlock relayed. "The second step is to interconnect these devices in the system and learn how to maintain them. We use special tools and computers, and teach the students how they would put them onto equipment and how they would calibrate them." Students learn what kind of signals will be put out of the devices, as well as maintenance and installation procedures. The next step for the students is learning how to troubleshoot problems. "Any technician in the field needs to know how to troubleshoot and keep things running. We take the students through a regimented, very strenuous, process of troubleshooting various devices that are found in the process industry. If they mess up, everything is okay—it is better to mess up in the class than out in the field. We give them scenarios, the teachers go to mess up the equipment, and we tell the students to figure it out and fix it."

To Whitlock, hands-on learning and training is an absolute must. He enjoys being able to get out of his chair and move his class to a lab to demonstrate what he is teaching. "There are so many engineers that have come into the industry not having touched the equipment during their years in school. I do not think that is a logical way to learn. You need to get your hands dirty when you still have your teachers as a resource, and then you can go out into the field and be ready for work."

"We want to make the students valuable assets for when they graduate," admitted Whitlock. "Typically, when engineers come out of school, there is up to two years of training on the job before they are comfortable in their roles. We want to prepare them properly, to cut down that extra training time." A lot of the teachers who work alongside Whitlock are engineers who are also retired or still working in the industry. "Our combined experiences can get the students to job-ready status by the time they are done here."

Looking to the Future

When Whitlock first entered the industry, he was thrown into the field without a lot of experience. "I gained the experience in the field, but I would recommend something a little different for new engineers," he said. "Gaining field experience while learning form lectures, textbooks, and the lab experiences in school, is a more all-encompassing way to become proficient at your job. Installing and maintaining instrumentation equipment should become second nature and a natural response. Even if an engineer dose not perform a specific task for years in the field, they should have it in the back of their minds should a problem arise. "I tell my students to practice what they learn every two weeks until it becomes part of who they are."

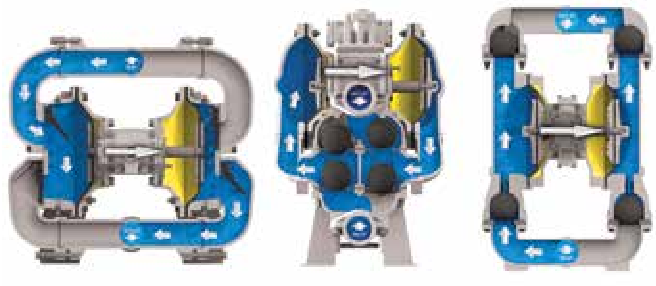
Whitlock knows that the instrumentation professions will be around forever. "Schools mainly focus on the process industries, such as oil and gas, and chemical, but instrumentation is instrumentation. The same practices we use in the process industries can be found on lab equipment in a hospital, auto computer diagnostic, traffic light control systems, HVAC system control, any system with end devices feeding a processor/computer generating outputs – it is all the same technology," he said. "As the oil and gas industry starts to diversify into renewable fuels, more solar and wind power, we have been taking the necessary steps to ensure that the instrumentation will be ready. It is just a matter of making the decision to change and being prepared for it."


SEAL
AWARD
Sustainability, Environmental Achievement & Leadership
awarded to
TEADIT®
TEADIT – LEADING & ACHIEVING ENVIRONMENTAL SUSTAINABILITY THROUGH SEALING
BRAZIL - ARGENTINA - USA - AUSTRIA - GERMANY - INDIA - CHINA
www.teadit.com

Versatility of Air Operated Diaphragm Pumps in the Chemical Industry

An Air Operated Double Diaphragm pump (AODD) may be one of the simplest pump designs found in an industrial plant. The simple design and ease of use makes an AODD one of the most versatile pumps, especially in a chemical plant.

By Ed Kupp, Business Development Manager, Warren Rupp, a unit of IDEX



Standard Ball Valve. *Flap Valve.* *Hybrid Down-Ported.*

Simple Design

The simple operation of an AODD utilizes compressed air to drive the diaphragms that pump the desired fluid. The AODD includes a series of ball or flap check valves that open and close to allow liquid in and out of the diaphragm chamber. The pump can produce liquid discharge pressures equal to that of the air pressure being used to power the pump. As the diaphragms are balanced with air pressure on one side and liquid process pressure on the other, they see very low stresses during operation and can operate for millions of cycles before fatigue failure. During the suction stroke of a diaphragm, the air behind the diaphragm is discharged to atmosphere.

There are a few basic designs for AODD pumps. AODD pumps that utilize check balls are configured with the suction on the bottom of the pump and the discharge at the top of the pump. This can cause problems when the pumpage has heavy solids present. The solids can be held down by gravity and accumulate in the diaphragm chamber. Flap valve pumps, on the other hand, typically have the suction on the top and the discharge on the bottom. This allow solids to follow gravity and flow down through the pump. Flap valve pumps are also ideal for large solids that would not normally pass through a ball check valve. There are also hybrid ball valve pumps that can be down ported to allow gravity to pull the solids out of the diaphragm chamber and resolve the solids build up problem.

Easy to Specify and Install

Because AODD pumps are simple by design, they are also easy to document in an engineering specification. Since there is no electric motor needed to operate the pump, there is no need to provide a motor specification or motor data sheet. To help understand the differences between pump types, Table 1 shows the typical requirements of an AODD and comparing them to needs of other pump types.

When looking for information regarding proper specification or installation of an AODD, please consult with your AODD supplier, see Figure 1 for depiction of AODD installation.

	Air Operated Double Diaphragm Pumps	Other rotating/motor driven pump types (centrifugal or positive displacement)
Specification/Selection	Flow, head, materials, temperature limits	Flow, head, materials, temperature, RPM, Voltage, Hertz
Power Source	Compressed air	Electricity
Installation	Foundation, flexible pipe connections, isolation valves	Foundation, grouted baseplate, shaft alignment, check valves, control valve, isolation valves
Operation	Pump reacts to the system. Will shut down by simply closing the discharge valve. Can run dry or self-prime on demand.	Pump needs to be controlled based on the system conditions. Must be turned off when demand stops. Not all pumps can self-prime, and most pumps are damaged when run dry.
Maintenance	Simply disconnect the air and the liquid piping connections. Maintenance personnel can do all required removal and repair.	Must disconnect the electric to the motor. This sometimes requires an electrician as well as maintenance personnel.

Table 1.

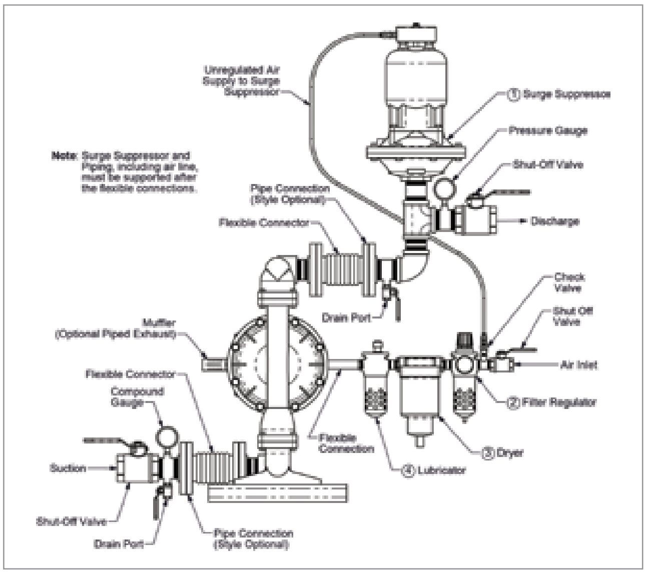


Figure 1: Example of a proper AODD installation.

Corrosion Resistant

In chemical plants, there are a variety of corrosive and non-corrosive applications. Having a pump that is available in multiple materials of construction and can be easily selected and sourced is very important. AODD pumps are manufactured in a variety of metal and plastic materials to better suit the needs of the application. Metal materials include aluminum, cast iron, stainless steel and higher alloys like Hastelloy-C for corrosive applications. Providing a pump in metal or plastic material with similar dimensions and interchangeable parts is important for a plant's asset and inventory management. AODD pumps in plastic materials such as Polypropylene, PVDF, PFA, and conductive versions of these materials, allows the pump user to leverage one pump style to support numerous applications.

All pump designs require static seals or other elastomeric wetted components in a variety of corrosive resistant materials. AODD pumps are easy to specify with corrosion resistant diaphragm, check valve/ball and gasket materials. Available materials range from EPDM, Neoprene, FKM, and Santoprene to PTFE and PFA. When specifying the materials for an AODD, it is typical to specify both the body material and the elastomeric material, making it easier to ensure all the right materials are being provided.

Safety

AODD pumps provide a unique combination of safety features for chemical process pumps. Most importantly, AODDs are air operated and require no electricity. By using air alone, if properly grounded, AODDs are intrinsically safe and can be used in environments with flammable liquids. Special care should be taken when using plastic pumps to ensure the plastic material provided is conductive. This can be done by the manufacturer of the pump by adding carbon to the plastic material. If the plastic material is not modified to ensure conductivity, it could develop a static charge that could be released as a spark.

In other applications there could be a risk of the pump running in a dead-head condition. This means that the discharge side of the pump could be closed off while the pump is still energized and operating. When an AODD pump is dead-headed, it simply stops. When the dead-head condition is relieved the pump will start pumping again. This restart does not require special monitoring or controls.

Another example of an upset condition a pump might experience is a lack of fluid being fed to the pump, or dry running. This could happen for a number of reasons. Most pump types will become damaged during dry run conditions, or can become vapor locked and cease to pump. An AODD pump can be run dry and when fluid is reintroduced to the pump, it will continue pumping. AODD pumps are resistant to vapor lock and can even re-prime themselves when drawing from sumps located below the pump. These two aspects make the AODD ideal for unloading, transfer, sump and tough process applications.

When most engineers in a chemical plant hear the term "seal-less" they think of magnetically driven centrifugal pumps or other rotating pump styles. The term "seal-less" specifically refers to the pump not having a mechanical or dynamic style of seal that will leak small amounts during operation and large amounts when the seal fails. AODD pumps do not have mechanical seals and are considered 'seal-less'. Under normal operation, the fluid being pumped will not leak out as liquid or vapor which is an advantage over mechanically sealed pumps that leak vapor under normal operation. For instances where leakage during failure must be avoided, the AODD pump can be fitted with a number of solutions to ensure that the fluid is contained. The simplest way to do this is to pipe the air exhaust back to the liquid source. This way, the leakage in a failed pump will simply go back to the source and will not leak to the environment. An additional way to provide secondary containment of the liquid being pumped is

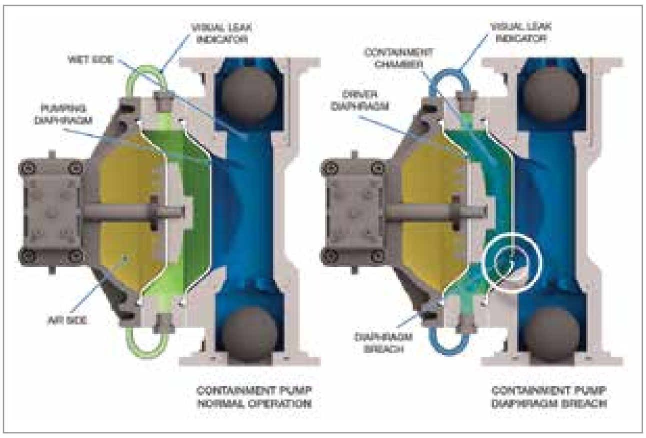


Figure 2.

to fit your AODD pump with a second set of diaphragms and a barrier fluid in-between the primary and the backup diaphragm. This barrier fluid can be monitored so when the primary diaphragm fails, that failure can be detected, contained and fixed without leaks to the environment. This is referred to as a containment duty pump, see Figure 2.

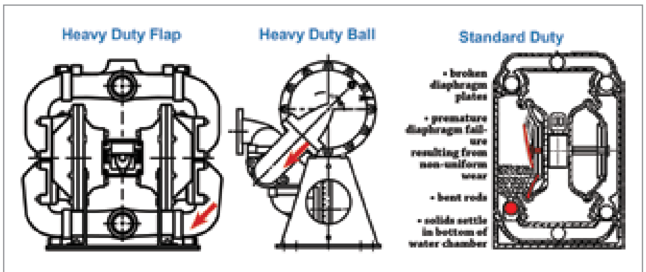
A third way to provide a secondary containment in the event of an AODD diaphragm failure is to provide an external containment vessel that will trap any leakage coming out the exhaust and can also be monitored to provide an alert if a failure occurs. These devices can be provided by the AODD supplier or a third-party provider.

Applications

When adding a new process to a chemical plant, multiple application aspects need to be considered. Often you may be pumping clean liquids at ambient temperatures. However, conditions can vary greatly throughout a chemical manufacturing process, requiring different pump styles for different applications. If you are looking for one versatile pump that can handle a wide variety of applications and conditions, first consider an AODD. Chemical reactions can increase solids content, viscosity, specific gravity and other fluid characteristics. While an AODD can handle all of these changes, they do have limitations. All application aspects should be checked against the AODD manufacturers' published limits. The most common reasons to not use an AODD pump in a specific application would be processes containing very high temperatures or very high pressure. Examples of these applications would be boiler feed pumps or hydrocarbon processing.

For specific applications with a high percentage of solids or large solids, there are flap valve or hybrid down ported ball valve AODD designs. The down ported design will allow for solids to leverage gravity to move out of the pump and into the discharge piping. Without this design, solids can build up in the diaphragm chamber and cause damage to the pump shaft or diaphragm plate.

When unloading tanks or totes in a chemical plant, an AODD can be used without complicated control systems. By simply opening a valve or a fill nozzle that is fed by the AODD, product can easily be transferred. When the transfer process is complete, the valve can be closed



AODD pump in sump application.

and the pump will automatically stop and be at the ready for the next time you need to transfer fluid.

There are many applications in a chemical plant where chemicals and other materials are collected in sumps and need to be pumped out. The AODD is ideal for these sump applications since it can handle solids that might get into the collection area, it can run dry and self-prime when needed again.

In the chemical processing industry, pumping needs can vary greatly. The fluid being pumped could be corrosive, hazardous, viscous, contain solids, or be as basic as clean water. The pump application itself can have demands that could require a wide range of pumps. Some applications require secondary containment. Others might have upset conditions like dry running or dead heading. Although the AODD pump may not be the first pump to come to mind, its versatility to handle all these applications might mean it is the perfect fit.

About the Author

Ed Kupp is a Business Development Manager at Warren Rupp, a unit of IDEX. He has 30 years of experience in the pump industry. Throughout his career he has held roles in Engineering, Sales, Marketing and Product Management. He holds a Bachelor's degree in Mechanical Engineering and a Master's degree in Business.

Q&A | Fluid Temperature in Seal Chambers

Pump Engineer is proud to present Q&A | Fluid Temperature in Seal Chambers. This article will address the primary ways that the temperature of a process fluid in a seal chamber can be reduced, to preserve the reliability of the seal. Readers are encouraged to ask questions for consideration in the future.

By Michael Huebner, Flowserve Corporation

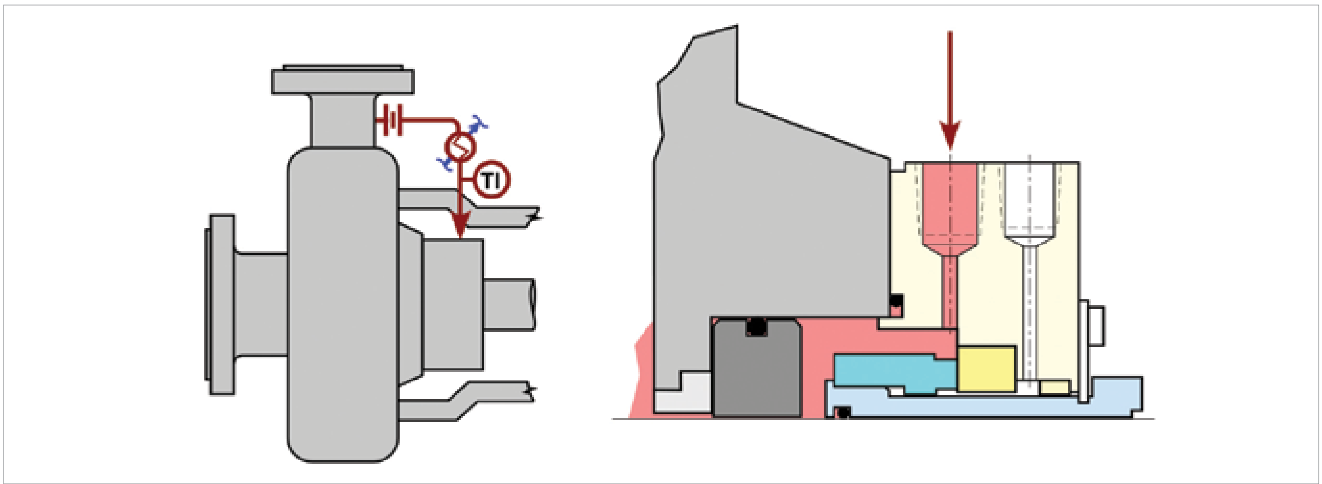


Figure 1: Piping Plan 21.

Q What options are available for reducing the process fluid temperature in the seal chamber?

A High temperature applications can be found in virtually every industry ranging from chemical and power generation to food processing and refining. Many processes in these industries are operated at high temperatures to support the process requirements and to control the physical properties of the fluids.

End users and process engineering always consider the impact of the high temperatures on pumping equipment, but they often pay less attention to sealing requirements. In some cases, a high temperature in the seal chamber can create fluid properties which make it difficult to achieve reliable seal operation. This can be due to high vapor pressures, low viscosities, or highly reactive environments.

Mechanical seal OEMs therefore have a variety of solutions for high temperature applications which include specialized seal designs, arrangements, and seal support systems. One of the strategies that can be employed is to reduce the local temperature in the seal chamber. Reducing the temperature in the seal chamber can improve the fluid properties, and seal reliability, while having a minimal impact on the process fluid in the pumps.

Piping Plans

There are two main options for decreasing the process fluid temperature in the seal chamber. While both can be effective, there are important differences which must be considered.

Piping Plan 21

Piping Plan 21 connects a high-pressure region of the pump (typically the pump discharge) to the lower pressure in the seal chamber. This creates a flow of process fluid that is controlled by a restriction, such as an orifice. The flow is then directed through a seal cooler, (e.g. heat exchanger) before entering the seal chamber, thereby flooding the seal with a lower temperature fluid. The advantage of this piping plan is that it reduces the temperature in the environment around the seals. It also creates a positive flow while the pump is in operation.

There are, however, some disadvantages to this plan. The primary disadvantage with this plan is that the cooler fluid is flushed back into the pump. The cooler fluid flows back into the process and, although the flow rates are generally low, the cooled fluid is lost into the process.

Another challenge with a Piping Plan 21 is that it is difficult to achieve a large reduction in temperature. Hot process fluid enters the seal cooler and must be continually cooled. This can result in larger seal coolers, higher cooling water requirements, and an increased tendency for fouling.

Piping Plan 23

Piping Plan 23 takes a different approach to cooling. This plan recirculates process fluid from the seal chamber through a seal cooler and back into the seal chamber. In this plan, the seal cooler only extracts heat from the fluid in the seal chamber which significantly lowers the impact on the thermal losses in the pump.

Due to its efficiency, a Piping Plan 23 can result in a smaller seal cooler, lower cooling water requirements, and lower operating temperatures. It is much easier to maintain low seal chamber temperatures with a Piping Plan 23.

One of the disadvantages of a Piping Plan 23 is that the circulation of the fluid through the system is achieved by a pumping device on the mechanical seal itself. These are common features, typically a small notched ring or screw-like grooves, on the outside of the rotating seal components. This system also requires specific locations for the porting on the seal gland, the location of the seal cooler relative to the pump, and the design of the interconnecting piping.

Seal Coolers

Seal coolers are devices which extract heat from fluids in a seal piping plan. While these can be considered heat exchangers, this term is used to identify their specific function, in support of the piping plan. The seal coolers are designed to provide proper cooling for the flow rates typically seen in piping plans; they are commonly designed with very low flow restrictions on the process side to improve seal performance.

Water-cooled

Water-cooled seal coolers are the most commonly used design in most industries. Cooling water is often available in plants and provides a reliable, stable environment in the cooler. This translates to a stable environment for the pump to operate in, and generally improves the pump and seal reliability. The drawback to water-cooled seal coolers is obviously that they require cooling water. Even in plants that have cooling water, there may be a limited capacity to support new equipment.

Air-cooled

Using air as a coolant is basically free and available everywhere. This can be critical for installations in remote locations, such as a tank farm, or remote facilities such as pipeline stations. Another advantage to an air-cooled unit is that it is immune to fouling due to poor water conditions in the cooling water system.

Air-coolers do, however, have some significant limitations in practice. As it is more difficult to dissipate large amounts of heat into the air, larger seal coolers are often required. In addition, air-coolers will be significantly impacted by ambient temperatures, and thus require additional considerations when contemplating locations with large swings in temperatures.

Additional Considerations

Piping plans with seal coolers have additional requirements in order to effectively create circulation and stable conditions in the system.

Cooler placement

Seal coolers must be mounted be in a location that promotes circulation. In many cases (e.g. Piping Plan 23), this requires that the cooler be placed close to the

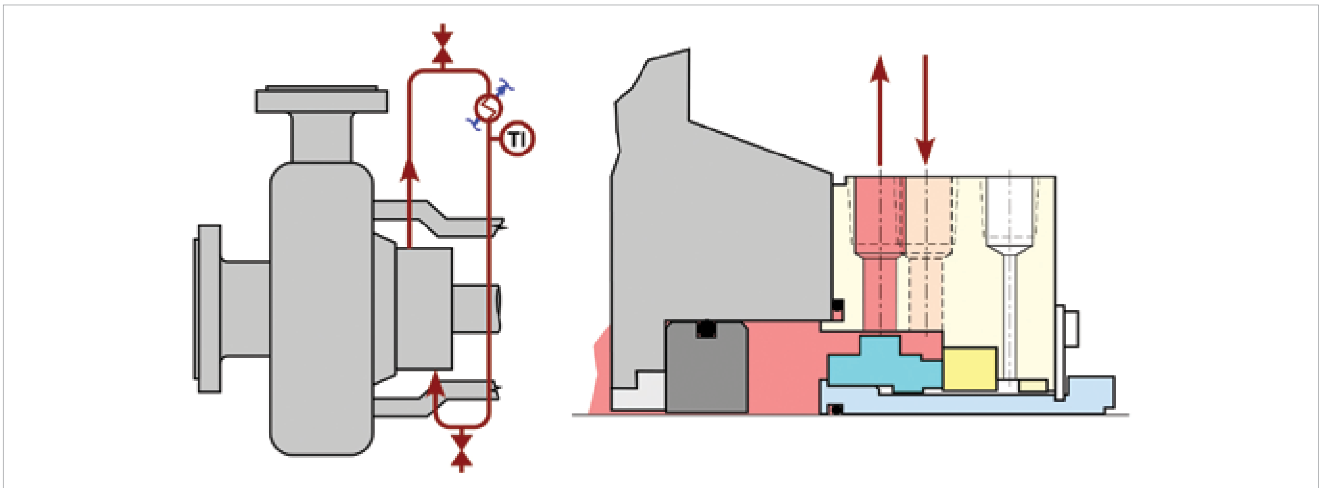


Figure 2: Piping Plan 23.

pump and at an elevation slightly higher the seal (approx. 1.5 to 2 feet or 45 to 60 cm). Placing the cooler close to the pump reduces friction losses in the piping plan which allows for higher flow rates and more consistent temperatures. Putting the cooler slightly higher than the seal creates a thermosyphoning flow which adds to the pumping ring output. In standby conditions, thermosyphoning continues to create a circulation and stabilize temperatures in the seal chamber.

Proper venting

Placing the seal cooler higher than the seal also makes it easier to vent air or vapors out of the piping plan. When a pump is initially flooded with process, it is critical to vent off gases and vapors out of a Piping Plan 23 system to avoid vapor locking the pumping ring. In all piping plans, the piping must be properly sloped to allow for self-venting at start-up, and during operation.

Standby considerations

Standby conditions can be easily overlooked on systems which provide cooling. During standby, there may be very low flow rates (or even no flow) of process fluid through the seal cooler. This can lower the process liquid temperature down to the coolant temperature. This can be the cooling water temperature for water-cooled units or ambient temperatures for air-cooled units.

Conclusions

There are several proven solutions to reducing seal chamber temperatures. These, however, require the application of all the best practices to achieve the most reliable solution for a specific application.

About the Author

Michael Huebner is a Principal Engineer at Flowserve Corporation in Pasadena, Texas. He has over 30 years of experience in the design, testing and application of mechanical seals both in the USA and Europe. He has authored numerous articles and lectured extensively around the world. He has a BS in Engineering Technology from Texas A&M University.

Thinking of Milorganite and Upgraded Pumps

In late 1989, the Milwaukee Metropolitan Sewage District (MMSD) asked for a three-day equipment maintenance course at one of its large effluent treatment facilities. Situated on Jones Island, the facility makes a product called Milorganite, which is sold by a number of companies for about USD $28 per 32lb bag. The product is in high demand, and deservedly so.

By Heinz P. Bloch, Contributing Editor

In case you are not familiar with the raw material that flows into a sewage treatment plant there is a lot of industrial waste. In the MMSD, this includes fluids from a nearby Miller-Coors Brewing facility, whose contaminated water by-product greatly exceeds the uncontaminated product that is imbibed. Milorganite is a high-value, nitrogen-rich, slow-release fertilizer. While the inflow captured by thousands of sewage treatment plants is basically the same wherever they are, there are still remarkable differences; each municipality and its local industries are unique.

With dry pellets as the end-product, MMSD sends the incoming material through four primary processing phases: screening, settling, secondary treatment (i.e. thickening), and disinfecting. These processes utilize tankage, agitators, mixers, pumps, filter presses, heated dryers, baggers, pallets, strap-wrap units, and many other machines. At MMSD, individuals are employed in all kinds of jobs that add value to processing whatever material flows in. By the time a clean stream of liquid is being discharged into Lake Michigan, heavy metals have been removed and reclaimed. Unlike elsewhere, MMSD's dried and deodorized sludge becomes a fertilizer.

Pumps are Involved

Machinery engineers at a plant will add maximum value if they view every maintenance intervention as an opportunity to upgrade. However, upgrading must be cost justified and value-adders must guard against 'reinventing the wheel'.

When asked if any of MMSD's employees were familiar with API (American Petroleum Institute) Standards that minimize failure risk and impart long uninterrupted operation to pumps in the Hydrocarbon Processing Industry, or HPI, few knew why the question would be asked. After all, flammability of product and explosion risks are not high on MMSD's list of priority concerns. However, it did not take long to showcase that reduced maintenance frequencies, and long uninterrupted operation, would be of interest to the plant. Especially if the incremental costs of upgrading were low.

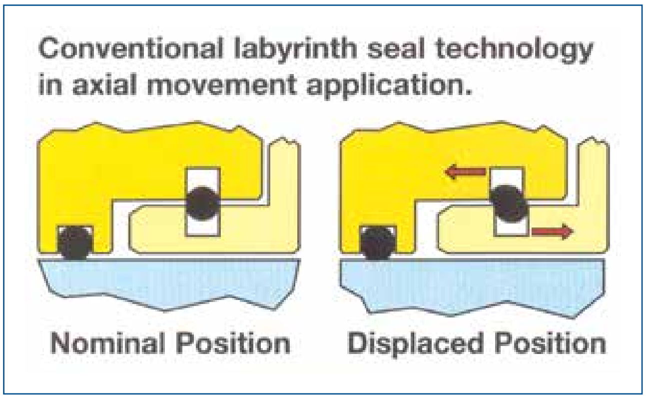


Figure 1: Radially moving O-rings easily damaged by sharp edges.

When the staff considered available upgrade components, the prospect of using state-of-art bearing protector seals, instead of lesser products, was discussed first[1]. An experience-based rule-of-thumb multiplier was explained. The rule simply states that a proven upgrade has traditionally extended uninterrupted run time by 20% or more. Replacing bearing protector seals of the type shown in Figure 1 with advanced ones, Figure 2, would likely extend operating life from X years to a readily achievable 1.2X years in the immediate future[2]. Oil rings, with their widely documented potential flaws, could also be replaced by engineered discs, Figure 3.

Engineered discs used in conjunction with the upgraded bearing protector seals in Figure 2, would allow one to confidently anticipate an operating increase of 1.2 times (1.2 X); a 1.44-fold increase in operating life before repairs are necessary. At the time of presenting these, and many other upgrade opportunities to MMSD, it was noted that many pumps still used braided packing in their stuffing boxes. The maintenance requirements of braided packing were discussed as part of a review of the practices implemented at oil refineries in the industrialized world. With few exceptions, oil refineries use mechanical seals, and the development of slip-on cartridge seals has eliminated many maintenance interventions at forward-looking plants and industries, Figure 4. Best-in-Class companies have standing protocols to routinely upgrade pumps that were taken to the repair shop. Upgraded parts were on hand to implement these upgrades without delay, which benefited the overall production process.

What Other Plants Do

When considering Milorganite and the unanswered question as to why the system at the MMSD is still unique, one can suggest that other plants have refrained from implementing new systems due to the associated costs. Elsewhere, the smelly semi-liquid by-product is loaded into railcars and sent to landfills. In Milwaukee, the semi-liquid provides jobs and a product that enjoys high demand.

Analyzing MMSD's innovative process can lead one to question; if an entrepreneur or philanthropist were to show an interest in doing something for the planet, would that something aim at duplicating the MMSD's success by implementing similar plants systems in other locations?

Potential Benefits of the MMSD Systems

It is entirely likely that many mechanical engineers would be delighted to be closely associated with the individuals that calculate how many jobs would be created at factories that make the machines that are needed to produce Milorganite, if the machines were in higher demand. It is also interesting to speculate how the implementation of these processes would promote the reclaiming of a dozen square miles of government-owned desert each year, and if manufacturers of drip feed irrigation (valves, actuators, pumps, plastic tubing, and pipe) would get financing.

Figure 4: Modern cartridge-style mechanical seal for easy retrofit to pumps in water and wastewater treatment plants.

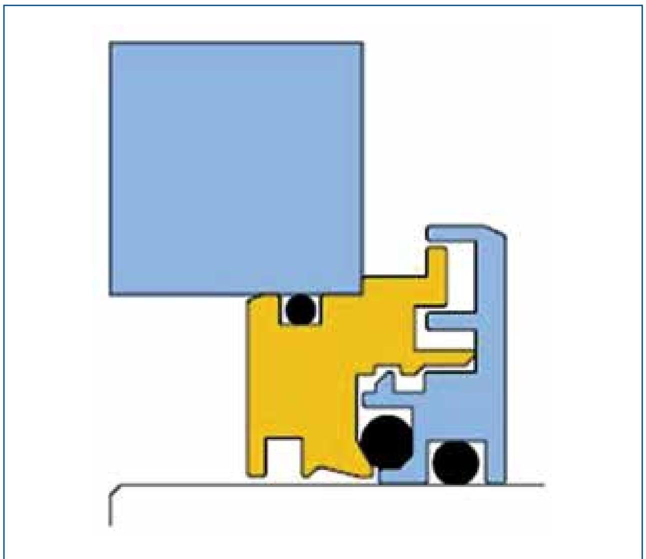


Fig. 2: Bearing protector seal with moving/sealing O-ring contacting smooth surfaces only.

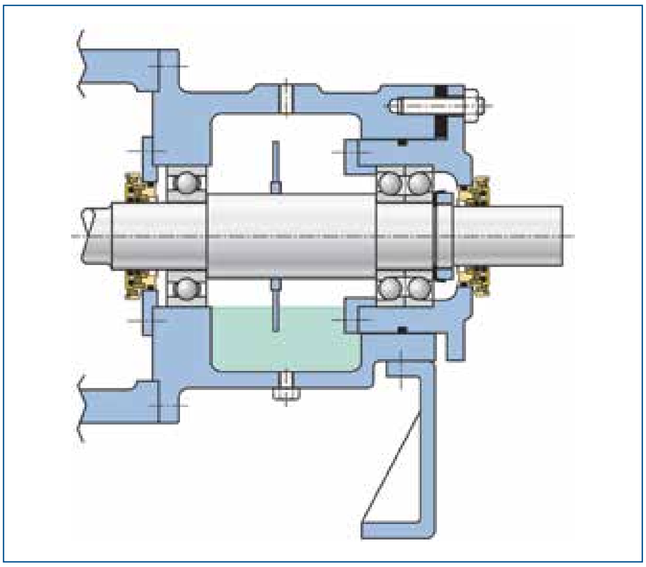


Figure 3: A pump bearing housing equipped with flinger disc and advanced bearing protector seals.

If additional plant systems were established, it would lead to large infrastructure projects. An individual would spend up to three months building modular housing (involving the North American timber industry and hordes of carpenters, cabinet makers, roofers) close to the desert reforestation and drip-feed irrigation site. Later, one would employ house builders to construct the pelletizing plants, or build modular schools. Other individuals would also be employed for constructing, assembling, and servicing the aeration blowers[3] and rotating rakes and fluid machines and processing equipment needed to efficiently produce pelletized fertilizer.

Consider the relatively straightforward ways of taking these conceptualized suggestions and improving on them. Implementation would be far less complicated and less expensive than putting man on the moon. The benefits to people would be long lasting. It would likely spiral into an ever-expanding work progress mentality that could lead to fundamental changes in how we think, and what benefits we reap.

Looking Forward

Thinking about Milorganite and the equipment and processes involved, can lead to the ultimate combination skills needed to train young engineers to move rapid-return tangible engineering in the right direction. In the combined process of learning and adding value, their contributions would create a heightened sense of self-worth while developing and producing lasting benefits for an environment that is visibly stressed.

References

1. *Bloch, Heinz P., "Pump Wisdom: Problem Solving for Operators and Specialists"; (2011); ISBN 9-781118-04123-9*
2. *Bloch/Ehlert/Geitner, "Optimized Equipment Lubrication, Oil Mist Technology andStorage Preservation," (2020); ISBN 978-1-941872-98-7*
3. *Bloch, Heinz P., "Fluid Machinery Improvement: Life Extension for Pumps, Compressors and Steam Turbines," (2020); ISBN 978-3-11-067413-2*

Images Source: *AESSEAL, Inc., Rotherham, UK, and Rockford, TN*

About the Author

Heinz P. Bloch resides in Montgomery, Texas. He received B.S. and M.S. degrees (cum laude) in Mechanical Engineering from NCE, Newark College of Engineering in 1962/64. He is an ASME Life Fellow and holds life-time registration as a Professional Engineer in New Jersey. He is one of 10 inaugural inductees into NCE's Hall of Fame, which honors its most distinguished alumni.


San Jacinto Petrochem
San Jacinto College offers a wide variety of programs to train the petrochemical industry's current and future workforce.
Electrical Technology
Process Technology
Instrumentation/ Analyzer Technology
Inspection Technologies
Environmental Health and Safety Technology
Welding, Pipefitting, and Millwrighting*
* Welding, pipefitting, and millwrighting offered as non-credit programs
We're into your success.
SAN JACINTO℠ COLLEGE
Your Goals. Your College.
sanjac.edu/CPET | 281-542-2092 or 281-476-1894 | Pasadena, Texas
An Equal Opportunity Institution

Cloud-Based Simulation in Pump Design

Computer-aided engineering (CAE), also known as engineering simulation, refers to the use of sophisticated graphical software to analyze designs and solve engineering problems. The main purpose of engineering simulation is to virtually test designs in order to predict and improve the performance, robustness, efficiency, and durability. These improvements can result in better products, reduce the amount and costs of physical prototypes, and shorten the time to market. This process can be therefore be employed in the industrial pump market to enhance efficiency.

By Arnaud Girin, Technical Marketing Specialist, SimScale

Initially used in the aerospace and automotive sectors as early as the 1950s, computer-aided engineering is now a standard part of the technology tool-belt used across almost all industries, including consumer goods and electronics, to industrial equipment and turbomachinery. CAE consists of finite element analysis (FEA), computational fluid dynamics (CFD), thermal analysis, multibody dynamics, and optimization.

In pump design, the simulation is employed to:

- Predict the 3D flow field distribution and determine the output velocities and flow rates for different operating conditions.
- Assess the static and total pressure rise.
- Calculate the aerodynamic forces and moments acting on the rotor to determine the torque for various flow rates and RPMs.

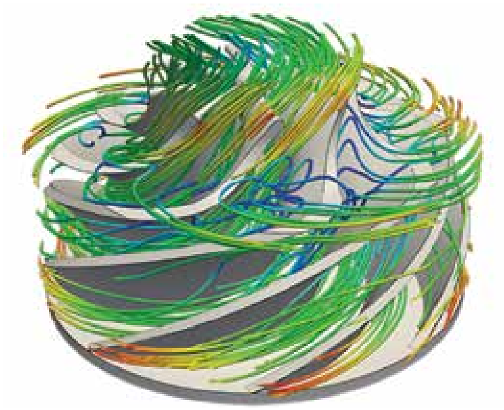


Figure 1: Post-processing results of the CFD simulation of an impeller, illustrating fluid velocity streamlines (Source: SimScale).

Simulation Process

Once a computer-aided design (CAD) model is created it is imported into a simulation software. A mesh is configured, the analysis type is selected (CFD/FEA/CHT), the settings with all conditions (forces, temperatures, etc.) is chosen, and then the first run is started.

After the simulation is complete the results, together with visualizations created through post-processing, are evaluated and used to improve the geometry. This process is repeated through an iterative design process, where the engineering team continues making changes until all the product's requirements are met. In case of any weak spots or issues with the design, engineers and designers make the necessary changes to the CAD model.

In this process, physical experiments are not eliminated, but significantly reduced, so that physical test becomes the final testing stage of an already advanced version of the design. While simulations generally only take a few hours (and with cloud-based solutions even minutes) building a physical prototype requires days or weeks. Due to high costs and resource utilization, the method does not support a highly iterative process. This is why most engineers use both testing methods together, saving costs and time.

What Is CFD?

For pumps and other turbomachinery applications, CFD simulation is the most commonly used part of CAE. CFD is the branch of fluid mechanics that makes use of computers to analyze the behavior of fluids and physical systems. The analysis became a necessary solution with the increased complexity in applying the laws of physics to real-life scenarios in order to make analytical predictions. A key factor to this process is knowing the boundary conditions for accurate results.

As mentioned above, in the simulation preparation stage, conditions are set: this includes outlets, pressure, flow velocity, temperature, and more. The precision

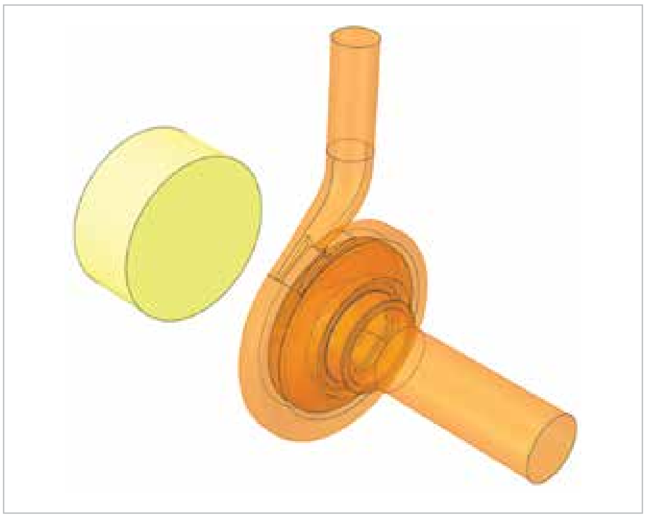


Figure 2: CAD model of the pump with flow volume (orange) and rotating zone (yellow).

of these conditions, which describe the environment and scenarios in which the product would operate in reality, is crucial, as they determine the accuracy of the simulation results.

Until recently, predicting the environmental factors and conditions was not the biggest challenge for engineers using simulation. The technology was actually the greatest barrier, as for several decades it could only be made available as a desktop application, which required installation, maintenance, upgrades, and would only run on powerful computers. Due to the high costs of the licenses as well as hardware, only a small percentage of engineers would benefit from CAE.

Once cloud computing emerged, so did SaaS applications for engineering simulation, which made the technology available in a standard web browser, without any installation or special computer. These solutions usually offer a subscription-based pricing plan, cutting costs and making onboarding fairly easy.

Cloud-Based Simulation Technology

A big differentiator of the cloud-based software and SaaS solutions is that they have the latest version accessible at all times. All software updates happen in the background and are immediately accessible to all users. This way, team members working together need not worry about having the same software version in order to see the same things; there only is one version making collaboration easy.

Case Study

The following case study describes how a pump design was simulated online within a cloud-based CAE platform. The project's goal was to assess the pump's performance under different operating conditions.

Pump Simulation Goals and Parameters

When designing a complex piping system for cooling, irrigation, wastewater treatment or process engineering applications, the design engineer must select a pump that is capable of delivering the desired flow output range while maintaining acceptable energy efficiency.

To facilitate this pump selection process, every OEM ensures reliable performance data on the product they offer.

The goal of this simulation is to assess a pump's performance under different operating conditions such as the rotating speed of the impeller and the flow rate. The information on the head produced, as well as the efficiency at each specific point, make the typical pump curves that are essential for the selection process.

Step 1: CAD Model and Import

The simulated pump was a centrifugal pump, typically used in engine cooling applications. It is made of a six-blade shrouded impeller with Ø170mm, an inlet of Ø50mm, and radial discharge outlet of Ø32mm. The CAD model is made of two volumes, one representing the flow domain, and the second one indicating the rotating zone, a useful feature for the computation of turbomachinery simulations.

Step 2: Simulation Setup

The simulation setup starts with the type of flow used; in this case, water. This can be selected from the predefined material library. The following step consists of setting up the operating conditions that will make one point on the pump curve to be built; the flow rate is entered as an inlet condition and the outlet is set to a reference pressure of 0 Pa (Pascal).

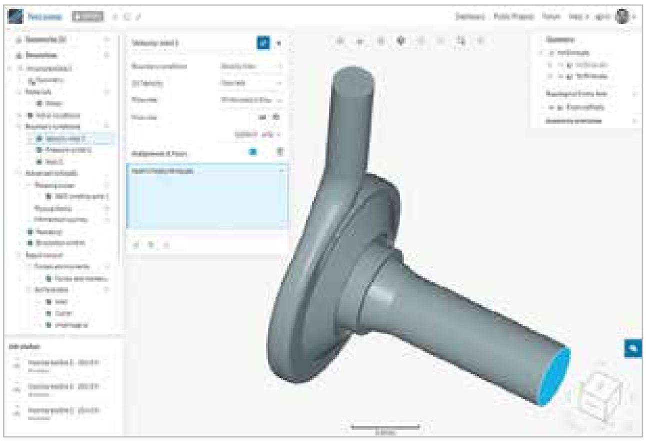


Figure 3: Simulation setup on the SimScale cloud-based platform.

Step 3: Definition of Reference Frame

The next step requires the definition of a multiple reference frame (MRF) zone which is a method that helps the computation, giving fast and accurate results. The rotating zone volume imported will make the zone where the rotation or swirl of the flow around the impeller is predominant. The last part consists of selecting the faces where results should be outputted:

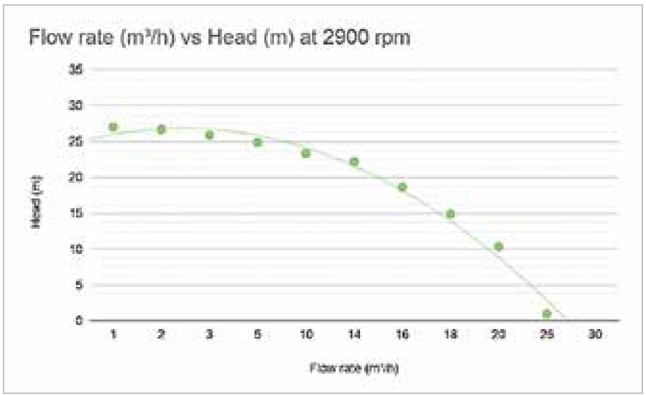


Figure 4: Pump performance curve showing the head (m) generated for different flow rates at 2900 rpm (Source: SimScale).

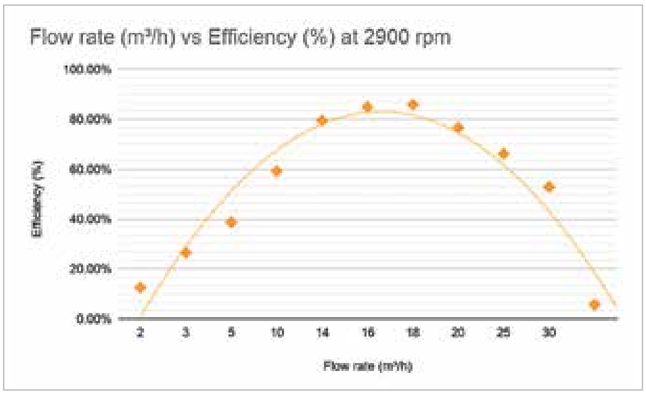


Figure 5: Pump efficiency curve showing the efficiency of the pump for different flow rates at 2900 rpm (Source: SimScale).

- Inlet and outlet faces, for the pressure head generated,
- Faces of the blades, for the torque values (necessary for the calculation of the pump's efficiency).

Step 4: Running Simulations in Parallel

As a cloud-based simulation solution is used for this project, the limitation for sequential runs is completely removed, and therefore many operating points for the pump (flow rate/pressure) can be simulated at the same time.

Step 5: Compiling Results to Assess Pump Performance Curves and BEP

For each run, the value for the pressure head as well as the torque can be evaluated after its numerical stability has been confirmed. The simulation runs take about 2.5 hours to reach this point. The final step consists of compiling all the values obtained for each operating point, calculating the power input (torque x rotating speed), and building up the pump curves with the input and output data. The first curve shows the flow rate against the head and the second curve the flow rate against the efficiency.

Results

Thanks to the efficiency curve, the operating point at which the efficiency is the highest can be identified at about 16m³/h, with an efficiency of about 86%. This is also called the best efficiency point, or BEP. There is a different BEP for each rotating speed of the impeller.

With this process in place, many curves can be obtained, for different rotating speeds and therefore confirm or validate the efficiency of a pump at a certain speed.

Assessing Ways of Improving a Pump's Efficiency

Quantitative and qualitative results can be obtained to help identify performance issues. These problems are typically represented by recirculation zones and a large pressure gradient. Furthermore, areas of low pressures at the blade angles can also be located and measured in order to evaluate cavitation risk, taking into account the vapor pressure and the velocity.

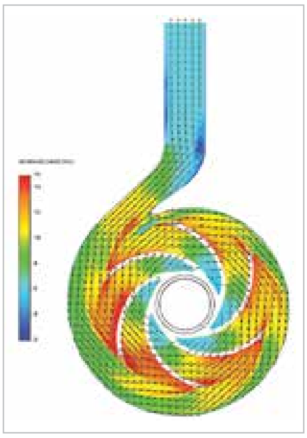


Figure 6: Velocity contours (m/s) at the median plane of the impeller (Source: SimScale).

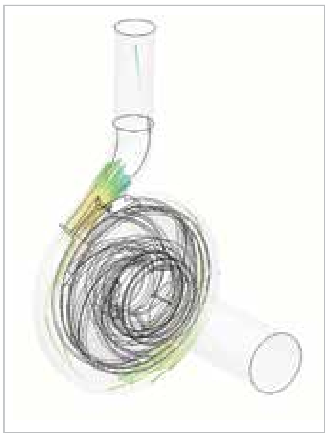


Figure 7: Velocity comets animation, colored by velocity (Source: SimScale).

Conclusion

Cloud-based simulation is increasingly being adopted by engineers across multiple industries. As a powerful online technology, in a world that becomes more digitized by the minute, it might become part of the software stack of every pump engineer in no time.

About the Author

With a mechanical design background, Arnaud Girin has worked for 6 years on industrial product performance optimization with CFD and FEA tools, of which three years in centrifugal pump design. He is currently part of the SimScale team and is involved in simulation projects for multiple industries.

TENDERS

Ethiopia – Addis Ababa: Procurement Of 7 Submersible Pumps

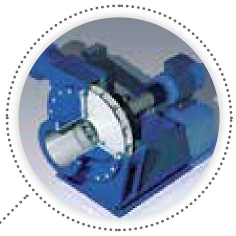
Description: *Procurement Of 7 Submersible Pumps With Fittings, Accessories And Surge Vessels*
Contact point: *+251-116676920*
Time limit for receipt of tenders or requests to participate: *October 26, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Amharic*

United States – California: Bid To Add Variable Frequency Drives To The Victor E. Benstead Plunge Circulating Pumps

Description: *Bid To Add Variable Frequency Drives To The Victor E. Benstead Plunge Circulating Pumps*
Contact point: *+1-310-781-7151*
Time limit for receipt of tenders or requests to participate: *October 21, 2020*
Language in which tenders or requests to participate may be drawn up: *English*

Japan: Turbo Molecular Pump

Description: *Turbo Molecular Pump E-i, E-s Type Set*
Contact point: *+81-0791-58-0063*
Time limit for receipt of tenders or requests to participate: *October 30, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Japanese*



India – Patna: Dvt Pump

Description: *Dvt Pump*
Contact point: *bme@igims.org*
Time limit for receipt of tenders or requests to participate: *October 19, 2020*
Language in which tenders or requests to participate may be drawn up: *English*

Romania –Trgu Jiu: Pumps And Spare Parts For Engine Room Pumps

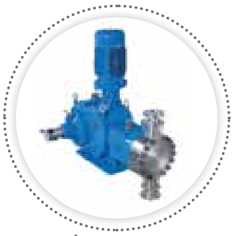
Description: *Pumps And Spare Parts For Engine Room Pumps*
Contact point: *daniel.burlan@ceoltenia.ro, +40372819765*
Time limit for receipt of tenders or requests to participate: *October 26, 2020*
Language in which tenders or requests to participate may be drawn up: *English,*

Australia: Beechworth Wastewater Treatment Plant Upgrade

Description: *Beechworth Wastewater Treatment Plant Upgrade - Design & Construct*
Contact point: *engineeringenquiries@newater.com.au*
Time limit for receipt of tenders or requests to participate: *October 26, 2020*
Language in which tenders or requests to participate may be drawn up: *English*

Malaysia: Promotional Pump System And Water Filter For Usm

Description: *Promotional Pump System And Water Filter For Usm - Construction Of Water Tank Tanks And Houses At Health Campus.*
Contact point: *komunikasi.jkr@1govuc.gov.my, +60-26108888/26189000*
Time limit for receipt of tenders or requests to participate: *October 20, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Malay*



South Africa: Supply & Delivery Of 9 Booster Pumps At Majuba Power Station

Description: *Supply & Delivery Of 9 Booster Pumps At Majuba Power Station*
Contact point: *ndabacz@eskom.co.za, +27-011-6294537*
Time limit for receipt of tenders or requests to participate: *October 22, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Afrikaans*

Brunei : Supply, Deliver, Install, Testing And Commissioning New Pumps And Electrical Works For Sewage Pumping Stations

Description: *Supply, Deliver, Install, Testing And Commissioning New Pumps And Electrical Works For Sewage Pumping Stations*
Contact point: *+673-2383911*
Time limit for receipt of tenders or requests to participate: *October 20, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Brunei Malay*

United States – Georgia: F. Wayne Hill Water Resources Center (wrc) Backwash Waste Pump Replacement

Description: *F. Wayne Hill Water Resources Center (wrc) Backwash Waste Pump Replacement*
Contact point: *dana.garland@gwinnettcounty.com, +1-770-822-8720*
Time limit for receipt of tenders or requests to participate: *November 6, 2020*
Language in which tenders or requests to participate may be drawn up: *English*

Japan: Infusion Pump And Syringe Pump Set

Description: *Infusion Pump And Syringe Pump (leased) Set (35 Infusion Pumps, 105 Syringe Pumps)*
Contact point: *+81-058-230-6035*
Time limit for receipt of tenders or requests to participate: *October 30, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Japanese*

Netherlands – Amsterdam: Delivery Of Submersible Pumps

Description: *Delivery Of Submersible Pumps*
Contact point: *wim.bokkers@waternet.nl*
Time limit for receipt of tenders or requests to participate: *October 31, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Dutch*

Poland: Supply Of Scientific And Research Equipment

Description: *Supply Of Scientific And Research Equipment (Dosing Pumps)*
Contact point: *jwosinski@chem.uw.edu.pl*
Time limit for receipt of tenders or requests to participate: *October 20, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Polish*

Japan: Ultra-high Vacuum Compatible Ion Pumps

Description: *Ultra-high Vacuum Compatible Ion Pumps*
Contact point: *+81-0791-58-0063*
Time limit for receipt of tenders or requests to participate: *October 28, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Japanese*

India – Maharashtra: Supply Of Spray Pump

Description: *Supply Of Spray Pump*
Contact point: *mittransk@gmail.com, +91-0253-2416057*
Time limit for receipt of tenders or requests to participate: *October 30, 2020*
Language in which tenders or requests to participate may be drawn up: *English, Hindi*

To subscribe to the Projects & Tenders newsletter, please contact Josh Gillen (**j.gillen@kci-world.com**). To submit a project or tender, please contact Angelica Pajkovic **(a.pajkovic@kci-world.com).**

PROJECTS & TENDERS
For flow control industries

Buyers Guide + ON·LINE

REACH OUT TO YOUR CLIENTS

Showcase your company's products and services in the Pump Engineer Buyer'sGuide +ONLINE

Combining the power of print with the reach of the Internet, the Buyer'sGuide+ ONLINE is an inexpensive yet persuasive way to brand your company's products and services to the global Pump Engineer community.

Your entries will be printed in each issue of Pump Engineer magazine (6 per year, on the yellow pages) and posted online. For more information, contact Vera Solis at v.solis@kci-world.com.

CASTINGS

Castech Foundries Pvt, Ltd.
1708 / 1709, GIDC 2
Dolatpara, Junagadh
362 037 Gujarat
India
tel: +91-285 2660113
fax:+91-285 2661314
info@castech.in
www.castechindia.com

INOXYDA
4-8, rue Etienne Dolet
76140 Petit Quevilly
France
tel: +33 (0) 235 63 78 50
fax:+33 (0) 235 72 99 99
contact@inoxyda.fr
http://www.inoxyda.co.uk
Aluminium bronze sand casting Sand Castings up to 30to Continuous casting up to diam 430 mm Centrifugal Casting up to diam 6m a member of LBI Foundries: http://www.lbi-foundries.com

MAGMA Foundry Technologies Inc
10 N.Martingale Road
Schaumburg, IL 60173
USA
tel: +1-847-969-1001
fax: +1-847-969-1003
info@magmasoft.com
www.magmasoft.com

Tycon Alloy Industries (Hongkong) Co.,Ltd.
Level 13, Tower 2,
Kowloon Commerce Centre,
51 Kwai Cheong Road
Kwai Chung, Hong Kong
China
tel:+852 2497 3300
fax:+852 2435 1162
enquiry@tyconalloy.com
http://www.tyconalloy.com

CASTINGS ALUMINUM BRONZE

INOXYDA
4-8, rue Etienne Dolet
76140 Petit Quevilly
France
tel: +33 (0) 235 63 78 50
fax:+33 (0) 235 72 99 99
contact@inoxyda.fr
http://www.inoxyda.co.uk
Aluminium bronze sand casting Sand Castings up to 30to Continuous casting up to diam 430 mm Centrifugal Casting up to diam 6m a member of LBI Foundries: http://www.lbi-foundries.com

CENTRIFUGAL PUMPS

Argal Pumps
Via Labirinto,
159 – 25125 Brescia
Italy
tel:+39 030 350 7015
info@argal.it
www.argalpumps.com
Pump manufacturer since 1975 Centrifugal and pneumatic pumps
Thermoplastic, metallic and FRP pumps

Debem Srl
Via del Bosco 41
21052
Italy
tel: +39 0331 074 034
fax: +39 0331 074 036
info@debem.it
www.debem.it/

DIAPHRAGM PUMPS

Argal Pumps
Via Labirinto,
159 – 25125 Brescia
Italy
tel:+39 030 350 7015
info@argal.it
www.argalpumps.com
Pump manufacturer since 1975. Centrifugal, pneumatic, thermoplastic, metallic and FRP pumps.

Debem Srl
Via del Bosco 41
21052
Italy
tel: +39 0331 074 034
fax: +39 0331 074 036
info@debem.it
www.debem.it/

Metso Sweden AB
Box 302
Norrängsgatan 2
SE-733 25 Sala
Sweden
tel: +46 (0)224-570 00
fax:+46 (0)224-169 50
pump-info@metso.com
www.metso.com/pumps

EVENTS

Fugitive Emissions Summit China
November 2-3, 2020
Shanghai, China
Exhibition information:
Ms. Rainie LIU
tel: +86 21 6351 9609
z.liu@kci-world.com
Conference Information:
Ms. Laura WANG
tel: +86 21 6351 9609
l.wang@kci-world.com
https://fugitive-emissions-summit.cn/

Managing Aging Plants Summit China
November 2-3, 2020
Shanghai, China
Exhibition information:
Ms. Rainie LIU
tel:+86 21 6351 9609
z.liu@kci-world.com
Conference Information:
Ms. Laura WANG
tel:+86 21 6351 9609
l.wang@kci-world.com
https://www.managingagingplants.com/

Stainless Steel World Japan 2021
Conference & Exhibition
The technical conference, held in both English and Japanese, will offer an excellent opportunity to share experiences and challenges related to the use of stainless steel. The exhibition will bring together manufacturers and stockiest to showcase their products and services to an international audience.
For information contact Ms. Kiyo Ichikawa **k.ichikawa@kci-world.com** tel: +31-575-789-260.

FROTH PUMPS

Metso Sweden AB
Box 302
Norrängsgatan 2
SE-733 25 Sala
Sweden
tel: +46 (0)224-570 00
fax:+46 (0)224-169 50
pump-info@metso.com
www.metso.com/pumps

GASKETS

Varisco & C. Srl
Piazza di Mauro 6A
I-96010
Priolo Gargallo (SR)
Italy
tel: +39 0931 760945
fax:+39 0931 760777
variscosrl@variscosrl.com
www.variscosrl.com

HORIZONTAL PUMPS

Vertiflo Pump Company
7807 Redsky Drive
Cincinnati, OH 45249
USA
tel: +1-513-530-0888
fax: +1-513-530-0893
sales@vertiflopump.com
www.vertiflopump.com
Vertiflo Pump Co.'s vertical, horizontal & self-priming pumps delivered in half the typical lead time!

HOSE PUMPS

Bredel Pumps –
http://www.bredel.com

MANUFACTURERS

Chesterton International GmbH
Am Lenzenfleck 23
D-85737 Ismaning
Germany
tel: +49-89-9965-46-0
fax: +49-89-9965-46-60
munich@chesterton.com
www.chesterton.com

Gebr. Steimel Gmbh & Co.
Maschinenfabrik
Johann-Steimel-Platz 1
D-53773 Hennef
Germany
tel: +49-2242-8809-0
fax: +49-2242-8809-160
info@steimel.com
www.steimel.com

Grundfos GmbH
Schlüterstraße 33
40699 Erkrath
Germany
tel: +49-2119-2969-0
info@grundfos.de
www.grundfos.de

Technosub
1156 Avenue Lariviere
Québec J9X 4K8
Canada
tel: +1-819-797-3300
fax: +1-819-797-3060
rheaultp@technosub.net
www.technosub.net

MARKET RESEARCH

Messe Düsseldorf GmbH
P.O. Box 10 10 06, 40001
Düsseldorf
Germany
tel: +49 211 4560 01
fax:+49 211 4560 668
info@messe-duesseldorf.de
(Continued ↗)

(Continued)
Messe Düsseldorf GmbH
http://www.messe-duesseldorf.de/
12th International Valve World Expo and Conference
01-03 December 2020
Düsseldorf, Germany

Resolute Research B.V.
Lovinklaan 1
NL-6821 HX Arnhem
The Netherlands
tel: +31-26-205-1515
info@resoluteresearch.com
www.resoluteresearch.com
Pump market Report
Pump Supplier Database
Pump Product Database
Custom-made Research

MATERIALS

INOXYDA
4-8, rue Etienne Dolet
76140 Petit Quevilly
France
tel: +33 (0) 235 63 78 50
fax:+33 (0) 235 72 99 99
contact@inoxyda.fr
http://www.inoxyda.co.uk
Aluminium bronze sand casting Sand Castings up to 30to Continuous casting up to diam 430 mm Centrifugal Casting up to diam 6m a member of LBI Foundries: http://www.lbi-foundries.com

Sandvik Materials Technology
SE-811 81 Sandviken
Sweden
tel: +46-26-263837
christer.thorsson@sandvik.com
www.smt.sandvik.com

MECHANICAL SEALS

A.W. Chesterton Company
860 Salem Street,
Groveland, MA 01834
USA
tel: +1 781 438 7000
fax:+1 978 469 6785
marketingdist@chesterton.com
www.Chesterton.com

ROTEN Srl
Via Ortica, 6
20134 Milano Italy
tel: +39 02 76110157
fax: +39 02 7385445
info@roten.it
www.roten-seals.com
Roten produces mechanical seals with passion for all pumps, food and chemical industry since 1945. We also manufacture cartridge for Atex application and products tailored to customer needs.

Tycon Alloy Industries (Hongkong) Co.,Ltd.
Level 13, Tower 2,
Kowloon Commerce Centre,
51 Kwai Cheong Road
Kwai Chung, Hong Kong
China
tel:+852 2497 3300
fax:+852 2435 1162
enquiry@tyconalloy.com
http://www.tyconalloy.com

PACKINGS

A.W. Chesterton Company
860 Salem Street,
Groveland, MA 01834
USA
tel: +1 781 438 7000
fax:+1 978 469 6785
marketingdist@chesterton.com
www.Chesterton.com

James Walker UK Ltd
Gawsworth House
Westmere Drive Crewe Cheshire
CW1 6XB
United Kingdom
tel: +44-1270-536-000
fax: +44-1270-536-100
sales.uk@jameswalker.biz
www.jameswalker.co.uk

PERISTALTIC PUMPS

Watson Marlow Pumps –
www.watson-marlow.com

POSITIVE DISPLACEMENT PUMPS

MasoSine Pumps -
www.masosine.com

Sulzer Pumps Ltd
Zurcherstrasse 12
P O Box 414
CH-8401 Winterthur
Switzerland
tel: +41-52-262-1155
fax: +41-52-262-0040
info.pumps@sulzer.com
www.sulzerpumps.com

PUMPS

ANDRITZ AG
Stattegger Strasse 18
A-8045 Graz
Austria
tel: +43-316-6902-2509
fax: +43-316-6902-406
pumps@andritz.com
www.andritz.com/pumps

JESSBERGER GmbH
Jaegerweg 5-7,
85521 Ottobrunn
Germany
tel: +49 89 66 66 33 400
fax:+49 89 66 66 33 411
info@jesspumpen.de www.jesspumpen.de
Drum pumps, hand pumps, air operated diaphragm pumps, eccentric screw pumps, dosing pumps, filling machines.

Torishima Pump Mfg. Co., Ltd.
1-1-8, Miyata-cho,
Takatsuki City, Osaka
Japan
tel: +81 (0)72 695 0551
(Continued ⤴)

(Continued)
Torishima Pump Mfg. Co., Ltd.
fax:+81 (0)72 693 1288
info@torishima.co.jp
https://www.torishima.co.jp/en/
Torishima: manufacturing and maintaining engineered (centrifugal) PUMPS for Water, Power, General Industries, etc, since 1919.

PUMP ACCESSORIES

Castflow Valves
Dalia 17, Humanes de Madrid
28970
Spain
tel:+34916043045
fax:+34916043045
export@castflow.com
http://www.castflow.com

PUMP COMPONENT CASTINGS

AMPO FOUNDRY
Barrio Katea S/N –
20213 Idiazabal (Gipuzkoa)
Spain
tel: +34 943 188 000
fax: +34 943 188 130
ampo@ampo.com
www.ampo.com

PUMP MANUFACTURERS

Argal Pumps
Via Labirinto,
159 – 25125 Brescia
Italy
tel:+39 030 350 7015
info@argal.it
www.argalpumps.com
Pump manufacturer since 1975
Centrifugal and pneumatic pumps
Thermoplastic, metallic and FRP pumps

DESMI Pumping Technology A/S
Tagholm 1
DK-9400 Noerresundby
Denmark
tel: +45 9632 8111
desmi@desmi.com
www.desmi.com/
Pumps Solutions
ROTAN internal gear pumps
Centrifugal pumps
High Efficiency
Low NPSH values

NETZSCH Pumpen & Systeme GmbH
Geretsrieder Straße 1
Deutschland / Germany
tel: +49 8638 63-0
fax +49 8638 67-981
info.nps@netzsch.com
https://pumps.netzsch.com/en/

T-T PUMPS
UK-Woore, Cheshire, CW3 9RU
United Kingdom
tel: +44-1630-647200
fax: +44-1630-642100
response@ttpumps.com
www.ttpumps.com

PUMP PACKING

Chesterton International GmbH
Am Lenzenfleck 23
D-85737 Ismaning
Germany
tel: +49-89-9965-46-0
fax: +49-89-9965-46-60
munich@chesterton.com
www.chesterton.com

PUMP SUPPLIERS

DESMI Pumping Technology A/S
Tagholm 1
DK-9400 Noerresundby
Denmark
tel: +45 9632 8111
desmi@desmi.com
www.desmi.com/
Pumps Solutions
ROTAN internal gear pumps
Centrifugal pumps
High Efficiency
Low NPSH values

INOXYDA
4-8, rue Etienne Dolet
76140 Petit Quevilly
France
tel: +33 (0) 235 63 78 50
fax:+33 (0) 235 72 99 99
contact@inoxyda.fr
http://www.inoxyda.co.uk
Aluminium bronze sand casting
Sand Castings up to 30to
Continuous casting up to diam 430 mm Centrifugal Casting up to diam 6m a member of LBI Foundries:
http://www.lbi-foundries.com

Maximator Ibérica S.L.
C/ Ripollès nº28
08820 El Prat de Llobregat
Spain
tel: +34 619389118
Mrs Ramona Vidal-Wagner
ramonavidal@maximatoriberica.com
http://www.maximatoriberica.com
For the Spanish and Portuguese market

SLUDGE PUMPS

Bredel Pumps –
www.bredel.com

SLURRY PUMPS

Metso Sweden AB
Box 302
Norrängsgatan 2
SE-733 25 Sala
Sweden
tel: +46 (0)224-570 00
fax:+46 (0)224-169 50
pump-info@metso.com
www.metso.com/pumps

STAINLESS STEEL PUMPS

Tycon Alloy Industries (Hongkong) Co.,Ltd.
Level 13, Tower 2,
Kowloon Commerce Centre,
51 Kwai Cheong Road
Kwai Chung, Hong Kong
China
tel:+852 2497 3300
fax:+852 2435 1162
enquiry@tyconalloy.com
http://www.tyconalloy.com

VERTICAL PUMPS

Argal Pumps
Via Labirinto,
159 – 25125 Brescia
Italy
tel:+39 030 350 7015
info@argal.it
www.argalpumps.com
Pump manufacturer since 1975
Centrifugal and pneumatic pumps
Thermoplastic, metallic and FRP pumps

Vertiflo Pump Company
7807 Redsky Drive
Cincinnati, OH 45249
(Continued ⤴)

(Continued)
Vertiflo Pump Company
USA
tel: +1-513-530-0888
fax: +1-513-530-0893
sales@vertiflopump.com
www.vertiflopump.com
Vertiflo Pump Co.'s vertical, horizontal & self-priming pumps delivered in half the typical lead time!

WATER PUMP CONTROL

Genebre sa
Avenida Joan Carles I , 46-48
E-08908 L'Hospitalet de LLobregat,
Barcelona
Spain
tel: +34-93-298-8000
fax: +34-93-298-8007
comunicacion@genebre.es
www.genebre.es

WATER & WASTEWATER

Graco Inc
88 11th Ave NE, 55413
USA
tel: +1-612-623-6000
fax: + 1-612-623-6777
info@graco.com
www.graco.com

Send us your news!

Keep up to date with the latest news in our special news section. Every day, our news department mobilizes its worldwide network and searches the web to find out the latest developments in the field of business, management, contracts, materials, pumps, etc. The Editor welcomes all news items, which are printed free-of-charge, space permitting. Read our guidelines for submitting news items in our website or send your press releases to **a.pajkovic@kci-world.com.**

PHONE DIRECTORY | OCTOBER 2020

A	
AMPO FOUNDRY, Spain	+34 943 188 000
Argal Pumps, Italy	+39 030 350 7015
A.W. Chesterton Company, USA	+1 781 438 7000
C	
Castflow Valves, Spain	+34916043045
D	
Debem Srl, Italy	+39 0331 074 034
DESMI Pumping Technology A/S, Denmark	+45 9632 8111
F	
Fugitive Emissions Summit, China	+86 21 6351 9609
G	
Gebr. Steimel Gmbh & Co. Maschinenfabrik, Germany	+49-2242-8809-0
Genebre sa, Spain	+34-93-298-8000
I	
INOXYDA, France	+33 (0) 235 63 78 50
J	
James Walker & Co. Ltd., UK	+44-1270-536-000
JESSBERGER GmbH, Germany	+49 89 66 66 33 400
M	
MAGMA Foundry Technologies Inc, USA	+1-847-969-1001
Managing Aging Plants Summit, China	+86 21 6351 9609
Maximator Ibérica S.L., Spain	+34 619389118
Messe Düsseldorf GmbH, Germany	+49 211 4560 01
Metso Sweden A, Sweden	+46 (0)224-570 00
N	
NETZSCH Pumpen & Systeme GmbH, Germany	+49 8638 63-0
R	
Resolute Research B.V., The Netherlands	+31-26-205-1515
ROTEN Srl, Italy	+39 02 76110157
S	
Saer Elettropompe, Italy	+39-0522-830-941
Sandvik Materials Technology, Sweden	+46-26-263837
Stainless Steel World Japan 2021, Japan	+31-575-789-260
T	
Torishima Pump Mfg. Co., Ltd., Japan	+81 (0)72 695 0551
Tycon Alloy Industries (Hongkong) Co.,Ltd., China	+852 2497 3300
V	
Varisco & C. Srl, Italy	+39 0931 760945
Vertiflo Pump Company, USA	+1-513-530-0888

Equipment Monitoring at Your Fingertips

Chesterton Connect™ is a simple-to-use data acquisition tool that enables you to monitor your process and equipment's operating conditions. Combined with the mobile app, easily monitor:

- Equipment vibration
- Surface temperature
- Process temperature
- Process pressure

CHESTERTON®
Global Solutions, Local Service.

connect.chesterton.com