The global magazine for pump users and suppliers

PUMP engineer

COVER STORY:

HABERMANN AURUM PUMPEN

The Heavy-Duty, Slurry Pump Specialists

Page 6

Special Topic: Pump Motors and Systems

In this issue of Pump Engineer magazine:

Volume 44, October 2023

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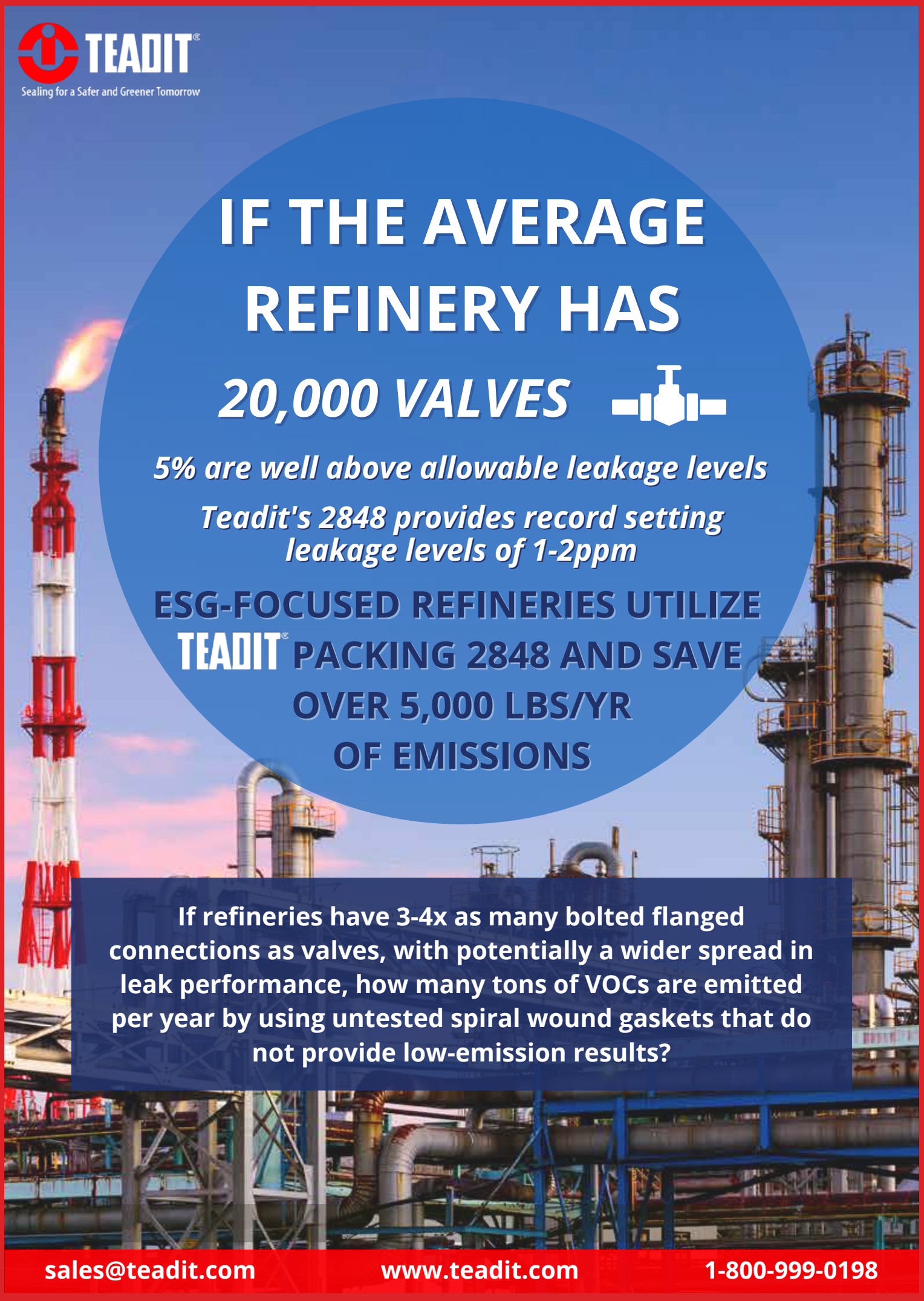
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Editor's Letter

Dear readers,

In a world where innovation and sustainability are paramount, the role of pumps in various industries has never been more crucial. Pumps are the unsung heroes, working tirelessly behind the scenes to facilitate the flow of liquids, gases, and even solids, enabling countless processes that drive our modern way of life. I am thrilled to present to you the second last issue of 2023, where we continue to explore the dynamic world of pump technology!

In this issue, we have curated a diverse range of articles that highlight the importance of pump technologies, solutions, and strategies. The focus on Pump Motors and Systems, which is our special topic of the month, unravels the intricacies of selecting the right pump motor and taking a system-centric approach to the ever-shifting pump industry. Be sure to read our Special Topic Features on pages 17 and 30.

This month, Pump Engineer speaks to Habermann Aurum, the heavy-duty, slurry pump specialists, who provides solutions for complex applications. With a focus on customized solutions to deliver the best possible resolution to its clients, Habermann discusses its extensive portfolio of engineered technologies that extend through all components of the pump. The company prides itself on its recent investments in research and development, focusing on innovation, and continuously adapting its product offering to current needs. The full story can be found on page 6.

Using his wealth of experience in rotating equipment, Bechtel's Naitik Mehta discusses the importance of mitigating practical issues in pumps, compressors, and turbines. From assessing the client's needs and creating design documents to initiating phases of procurement and construction, Mehta sheds some light on practical issues found in the plant. He speaks to working through the challenges of maintenance and provides us with solutions to mitigate these potential obstacles. This article can be found on page 10.

Additionally, this issue speaks to a wide range of technical areas that focus on topics such as selecting the right AODD pump for energy efficiency on page 14, to strategies that aid in knowing when to switchover from a duty pump to a standby pump on page 20, and understanding the relationship between net positive suction head in the plant and on a pump, which can be found on page 24 .

As the world grapples with ongoing challenges related to sustainability and environmental responsibility, we cannot ignore the role pumps play in these critical issues. We examine the growing importance of crucial infrastructure that creates accessibility to clean water and sanitation systems around the world. Explore clean water and sanitation projects in our global highlights map to discover the journey of unity between the industrial sector and the urgent call to eradicate global deprivation, on page 22. This edition of Pump Engineer dives into revolutionizing processes to achieve efficiency across the board.

Finally, I encourage you to stay engaged with us. Your feedback, questions, and suggestions are essential in shaping the future of the pump industry. If you would like to submit your technical articles, press releases, or would like to be featured in the Pump Engineer Magazine, please feel free to contact me at *s.ketheeswararajah@kci-world.com*. Together, we can continue to explore the fascinating world of pumps!

Shopia Ketheeswararajah

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COVER STORY

Habermann Aurum Pumpen
The Heavy-Duty, Slurry Pump Specialists

Boasting almost a century of expertise and experience, Habermann Aurum Pumpen built an excellent reputation throughout Germany and Central Europe for its heavy-duty slurry pumps and other highly specialized equipment. Now, following the implementation of new strategies and investments, the company is making its mark in important global markets as Pump Engineer discovered when visiting the company in Bochum, Germany.

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EPC INTERVIEW

Mitigating Practical Issues with Pumps, Compressors and Turbines

When completing designs for heavy equipment applications, engineers assess the client's various needs to ensure all the project requirements are met. Occasionally, some parameters must be modified based on the advice of suppliers and manufacturers. It is therefore important to have a thorough understanding of these assets to ensure that all necessary modifications have appropriate alternative solutions.

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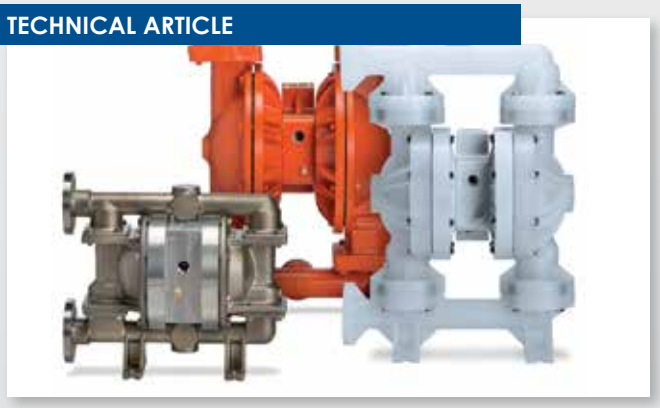
TECHNICAL ARTICLE



Choosing the Right AODD Pump Can Help Decrease Energy Consumption

AODD Pumps possess the operational capabilities to optimize air usage and satisfy the tenets of the sustainable manufacturing movement. There is no aspect of human existence that can function properly or reliably without energy produced from refined crude oil, natural gas, and coal. Therefore, it is imperative that companies who rely on energy to power industrial-manufacturing operations create and implement systems that are as energy-efficient as possible, especially as energy costs continue to rise.

Pages 14-16

SPECIAL TOPIC

Funding and Regulatory Changes Driving Shift In The Pump Industry

The pumping industry is on the verge of a technology transformation thanks to the significant impact of federal funding in the U.S. and the focus this funding has on innovation in the development of pumping systems. Although the funds benefit U.S. motor and pump manufacturers, end users everywhere will benefit from the increased energy efficiency and lower energy costs these investments are spurring.

Pages 18-19

TECHNICAL ARTICLES

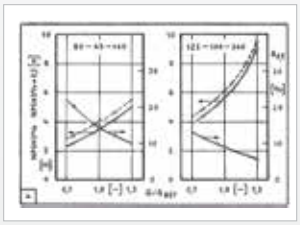
Duty to Standby Pump Switchover - Reaping the Benefits of Cost Efficiency and Reliability

From optimizing operations through making both duty and standby pumps available when required, to allowing functional operational checks and periodic predictive maintenance, as well as ensuring any upstream and downstream piping conditions are checked, switching over from duty to standby pumps not only optimizes reliability but also plays a role in cost efficiency as well.

Pages 20-21

Understanding the Relationship Between NPSHpump, Safety Margin and NPSHplant

For trouble-free operation of a centrifugal pump in the facility, the NPSHplant (Net Positive Suction Head available at the plant) must be equal to or greater than the NPSHPump (Net Positive Suction Head required by the pump). The values of NPSH3%=f(Q) are shown in the sales characteristic curves. This article will examine NPSH3%= f(Q) curves for selected manufacturers of standardized single-stage volute casing pumps with axial inlet.



Pages 24-26

SPECIAL TOPIC

Shifting the Pump Sector - A System Centric Approach

As players in the highly competitive global pump sector shift their focus from products to comprehensive systems, the endeavours that are set to thrive the most are those that directly influence user cost and their environmental, social and governance (ESG) priorities.

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HABERMANN AURUM PUMPEN:

The Heavy-Duty, Slurry Pump Specialists

Boasting almost a century of expertise and experience, Habermann Aurum Pumpen built an excellent reputation throughout Germany and Central Europe for its heavy-duty slurry pumps and other highly specialized equipment. Now, following the implementation of new strategies and investments, the company is making its mark in important global markets as Pump Engineer discovered when visiting the company in Bochum, Germany.

By David Sear

At first glance, the words of Markus Michael, the International Sales Director, may seem ordinary. When asked if Habermann Aurum maintains a database of pumps that have been previously installed, he responded that the company's records on pumps date back to the 1960s. However, he emphasized that pumps sold to plant builders are often delivered to locations that are not disclosed. “For example, I recently received a phone call from a South American company, requesting spare parts for one of our pumps that had been installed in the early 1980s. We were unaware that this company even had one of our pumps. Be that as it may, we were able to provide advice about maintaining the pump, suggest beneficial upgrades, and have the necessary parts dispatched quickly.”

This little story speaks volumes about Habermann Aurum’s customer-centric approach to business. Firstly, the company engineers and manufactures pumps with built-in product longevity – in this case, the pump had been operating for over 40 years without needing any intervention from the manufacturer. Secondly, the company's impeccable after-sales support promotes efficiency. Significant inventory is kept in the company warehouse, so clients can benefit from on-site consignment stocks whilst replacement parts for heritage equipment can be swiftly delivered thanks to the carefully preserved original technical drawings and casting patterns.

Tailored Solutions

Habermann Aurum further differentiates itself by selling pumps based on technical expertise, providing tailored solutions to meet customer-specific needs. “Once an inquiry is received, we do not default to off-the-shelf solutions. Instead, we carefully analyze all parameters of the facility and the fluid that needs to be pumped. By thoroughly examining all variables and utilizing our modular approach to pump design, we configure the best possible solution through a combination of different technologies. If we find that no suitable, standard solution exists, we collaborate with our technical design department to develop a tailor-made solution specifically for that facility. And who knows—what is considered a custom solution today, may well become the standard tomorrow," stated Marco Oude Lansink, the Head of Design and Development.

"In many cases, Habermann Aurum's in-house technicians install the pump, coupling, and motor on a sturdy baseplate, thereby delivering 'plug and play' functionality to customers," continued Mr. Oude Lansink.

Sales Director, Taner Sayar of Germany, Austria, and Switzerland, added that while centrifugal pumps are the core competency, Habermann Aurum also offers a range of complementary equipment. "We believe in offering all-in-one solutions, which can include water pumps, fittings, suction dredgers, and engineering services. We also provide a range of valves which are often required by customers during pump installation."

Habermann Aurum's clients can be found throughout the mining and chemical industries, as well as sand & gravel, the steel industry, energy management, sugar, water & wastewater, tunnel construction & civil engineering, and so on. "We are proud to serve a wide range of stakeholders, including plant owners, engineering companies, and fabricators," explained Mr. Sayar.

> ***"We believe in offering all-in-one solutions, which can include water pumps, fittings, suction dredgers, and engineering services."***
>
> ***Taner Sayar**, Sales Director (Germany, Austria, Switzerland)*

Extensive Portfolio

Habermann Aurum's portfolio encompasses a wide range of centrifugal pump types, ranging from horizontal and vertical designs to armoured pumps for medium or heavy-duty applications, submersible pumps, sump pumps, to dredging pumps and more. In terms of applications, robust pumps have been developed for slurries and solids, with other models perfectly aligned to industries such as water, chemicals, sewage, and other sectors across the board.

"We are not only focused on improving our pumps as a whole but are also intensively working on advancing the components. Many of our in-house developments have already made their way into the global market. We offer unique customer solutions and are constantly working on optimizing key components, such as mechanical seals. Our latest in-house development, the HGD-2, builds on the successes of its predecessor, the HGD-1, and sets new standards in the industry," said Sales Director, Markus Michael.

"Technological innovation is in our DNA. We continually invest in technological advancements, offering innovative solutions that push the boundaries of performance and efficiency. Wherever possible, we focus on modular construction utilizing standardized parts. This enables flexibility, ease of maintenance, and the ability to adapt to evolving needs. We also promote parts interchangeability, which helps to optimize cost, reduce turnaround times for new-builds, and facilitate maintenance and repair activities," added Mr. Oude Lansink.

HGD-2 - The Compact Mechanical Seal

Mechanical seals are one of many critical elements of a pump. This component is designed to prevent the pumped fluid from leaking out of the shaft, in addition to stopping contaminants from entering. Habermann Aurum's HGD-1 and HGD-2 mechanical seals both offer top reliability, but the HGD-2 benefits from a more compact design. Featuring a single seal ring, the HGD-2 no longer requires the pins, O-ring, and mating ring found on the HGD-1. These innovations resulted in the reduced size and complexity of the overall assembly.

Habermann Aurum's new range of chemical pumps has been one of the newest and highly sought-after additions to its portfolio. "This has been quite a novel experience for us, given that many of our pumps – built for heavy-duty applications – have never really been covered by industry regulations or standards. However, when clients in the chemical industry asked us to develop a lower-duty model for chemical applications, we decided to engineer a pump which would meet ISO2858 standards and would incorporate the beneficial features, as well as the performance of our heavy-duty models," Mr. Sayer mentioned.

Engineered from the ground up, Habermann Aurum's new chemical pump benefits from a modular design. With the official launch expected later in 2023, the pump is currently undergoing extensive testing. Feedback so far has been very positive. "As always, we are not looking to perform rocket science but simply apply our deep knowledge of components such as the wear parts," stated Mr. Oude Lansink. "In everything we do, we stay in our areas of proven expertise. We want to be the front runners, seamlessly serving industries where other pumps fail."

Engineered from the ground up, Habermann Aurum's new standardized chemical pump benefits from a modular design.

Habermann's Team by the Steinexpo 2023 - leading exhibition for the mining industry in Germany

Ahead of the Curve

The market for pumps has undergone notable changes in recent years, driven by customer demands for performance and sustainability, as well as the emergence of online platforms. Nevertheless, Habermann Aurum's directors are confident the company remains ahead of the curve. "In order to meet evolving market demands, we anticipate investing in research and development, focusing on innovation and continuously adapting our product offerings. By staying at the forefront of technological advancements and addressing customer needs, we will maintain a strong position in the dynamic pump market and continue to deliver value to customers," added Mr. Michael. Habermann Aurum now provides pump rental services, allowing customers to experience the superior performance of the products firsthand. In efforts to meet the growing demands of its customer base and ensure faster deliveries, the company has significantly expanded its storage capacities. This is yet another step in Habermann Aurum's commitment to providing its customers with the best possible service.

"A recent and significant investment that was made is the expansion of our machinery park, boosting operational flexibility. We have also taken on extra personnel to support our growing business," said Mr. Oude Lansink. In terms of quality control, the company regularly invests in equipment to ensure that their products meet the highest standards.

"Technological innovation is in our DNA."

Marco Oude Lansink,
Head of Design and Development

Global Presence

In 2018, Habermann Aurum combined all manufacturing operations and Headquarters at the current site in Bochum, Germany. In this well-appointed facility, about 60 employees design, build, service, repair and even recycle pumps for a growing clientele in an increasing number of countries.

"Following a reorganization in 2015, we responded to positive developments in our overseas markets. Our strategy for overseas growth is simple – to be close to clients and potential customers," stated Mr. Michael, when speaking on the company's global ambitions. This can be done in-office or by working through key alliances with equally skilled and dedicated partners.

Mr. Michael states that direct communication with the company's demographic is important. "Customers looking for premium products require far more information and guidance than those seeking a commodity item from a catalogue. Acting as technical consultants, Habermann Aurum therefore begins by fully understanding the application in order to develop the ideal solution. Our pumps are built around the customer's technical parameters." Attention to detail is critical and enables the company to deliver pumps that offer the best all-round proposition in terms of cost and performance.

MADE IN BOCHUM.
MADE FOR THE WORLD.

Habermann Aurum has been making its mark in South America's mining industry, as there is a growing need for bigger pumps. "We have begun expanding our recently developed KBKM series offering larger dimensions and higher capacities. It is important users understand that we are not simply scaling up an existing model. We are working from the ground up to deliver a pump with all the performance and reliability the customer requires," mentioned Mr. Oude Lansink.

Looking Ahead

At all stages of pump design, Habermann Aurum keeps a close eye on sustainability. This is maximized by primarily focusing on modular designs, using alternative materials that will last longer, and the use of the company's take-back program. "We prioritize developing pumps with robust designs to enhance durability, reliability and maintainability, minimizing the risk of breakdowns, and extending operating durations between scheduled shutdowns. Finally, we maximize the pump's efficiency, thereby reducing electricity consumption," said Mr. Michael.

> ***"We prioritize developing pumps with robust designs to enhance durability, reliability and maintainability, minimizing the risk of breakdowns, and extending operating durations between scheduled shutdowns."***
>
> ***Markus Michael,***
> *Sales Director (International)*

Mr. Sayar neatly encapsulates all the advantages that Habermann Aurum can deliver to clients by recalling a particularly challenging pump application. "We were contacted by a new customer who indicated that pumps sourced elsewhere typically only lasted for three months. After a thorough evaluation of all relevant data, we built and delivered a test pump. Well, that pump of ours ran for three years without fail! The customer subsequently asked us to service the pump which is still in use today. It is the lifespan of our products that makes us highly competitive in the market. And as our customers often tell us, the return on investment counts!"

Habermann Aurum, a pioneer in the world of pump solutions, has made their commitment to quality, advanced solutions, and customer satisfaction evident through its position in the market. Whether users are looking for reliable pumps or comprehensive services, Habermann Aurum maintains its promise to deliver excellence.

The views and opinions expressed in this article are those of the profiled company and may not reflect the position of Pump Engineer .

Materials Expertise

Materials are a core competence at Habermann Aurum. Due to their highly abrasive properties, solid-laden liquids - including acids and alkalis - place enormous demands on pump components that come into contact with the media. For more than 60 years, Habermann Aurum has relied on specially developed alloys and various types of lining for reliable protection of the components, such as:

- HBN
- Special Metallic Alloys
- Non-Metallic Composite CeramCarbide®
- Iron Carbide
- Special Polyurethane APFlex®
- Rubber APG
- FKM

The Challenges of Foam

When it comes to pumping foam, many suppliers remain unaware of the necessity of dedicated technology. Instead, customers often receive a standard pump which is only suitable for transporting media with a maximum 1.05 foam factor.

The proven pumping solution from Habermann Aurum is based on a special technology that enables the bubbles to escape from the foam, causing it to collapse and disperse. Thanks to this special feature, Habermann Aurum pumps can handle mixtures with a foaming factor of up to 2 with the V330 model or even 3, with the N-series pumps.

Mitigating Practical Issues with Pumps, Compressors, and Turbines

When completing designs for heavy equipment applications, engineers assess the client's various needs to ensure all the project requirements are met. Occasionally, some parameters must be modified based on the advice of suppliers and manufacturers. It is therefore important to have a thorough understanding of these assets to ensure that all necessary modifications have appropriate alternative solutions. Naitik Mehta, a Rotating Equipment Engineer at Bechtel, spoke to Pump Engineer regarding his experiences working with design plans for pumps, compressors, and turbines, and the solutions he requires to ensure the plant runs efficiently.

By Shopia Ketheeswararajah

A Day in the Life

In his current role, Naitik Mehta creates and executes design plans for heavy machinery. "When I was pursuing my Masters' Degree at Texas A&M University, my research was geared towards rotating equipment and rotordynamics. After graduating in 2012, I began working at Bechtel and a lot of my experience aligns with working closely on the pumps, turbines, and compressors designs," he said.

Depending on the phase of the project, Mehta reviews design documents from equipment manufacturers to ensure the project requirements are being followed. "We must always make sure that the equipment fits properly within the process parameters and ensure that the safety and integrity of the equipment are met. By coordinating between various engineering disciplines, we can tie together any loose ends seamlessly."

When a project is in its initial phase, FEED (Front End Engineering Design) operations begin. This is a basic procedure for understanding the premise of the project. "Once I know what process parameters that the machine has to operate within, my team and I begin creating the design plan."

Once the design phase commences, suppliers are brought in to ensure that the equipment is sized correctly. A bid form, which is a document that details

all the requirements that must be met for a successful operation, is then used.

"Once the supplier provides us with quotes, it is reviewed to finalize all the technical details of the proposal," Mehta added. Various engineering disciplines are required to coordinate with one another to clarify the bid evaluation. After this step is completed, Mehta proposes the evaluation to a procurement team. "The bid form would then be approved and an order for the equipment is placed."

This is when the EPC phase begins. "We ensure all the fluid compositions are correct, if there are any changes, we go back to the supplier and fine-tune the equipment," he said. The engineering phase involves several critical meetings, from HAZOP reviews and 3D models to alarms and trip reviews.

In the engineering phase, the vendor starts designing the application and submits the system review documentation. "This includes a systematic review of piping and instrumentation diagrams, general arrangement drawings, control system narratives, cause and effect diagrams, equipment data sheets, and performance maps", he mentioned. Upon review, comments are made and recorded to make sure the equipment is in line with the rest of the project, its product specifications, industry standards and safety regulations. "We make sure everything looks good and works great," he stated.

The Big Three: Pumps, Compressors, and Turbines

When working with any complex equipment, Mehta's role remains the same. "The sizing, selection, design review, test witnessing, construction, and start-up support are similar. There are challenges that show up on a day-to-day basis, this is because the system is often complex." When determining the best turbine or compressor for an application, it is important to remember that when purchasing a compressor the end user is investing in an entire package. "The compressor package includes the compressor, the driver, auxiliary and piping systems."

When speaking of the relationship between the big three, Mehta shared that the major difference is the fluid that is used when these components are in operation. With pumps, the fluids that are most often used are non-compressible. Turbines and compressors on the other hand, almost always use compressible fluids or gases.

"There are a lot of aerodynamic properties that are associated with compressible fluids, the gas dynamic and rotordynamic issues are present because of the rotating speeds in the turbines and compressors that are in operation," he added.

The parameters that need to be considered, align with the flow, the inlet and outlet pressures, temperatures, the gas molecular weight of the media that will be run through the application, and the material used for the component. "Hydrogen sulfide has different material requirements. The same thing could be said for hydrogen or carbon dioxide. The gas that is being run through the special component can demand different metallurgical suggestions," Mehta stated. There are application-specific details that must be reviewed.

"In the case of pumps, they are often times operating at driver speed. For example, when coupled with motor operating at a line frequency of 60 Hz, the speed is either 1,800 or 3,600 rpm. It is rare to see a pump working at higher speed." In terms of designing pumps, factors such as differential head, system curves, NPSH, and the margins between the shutoff and operating head must be considered. This, however, is not the case with compressors or turbines. Often, these are operated at high speeds. "For this reason, it is common to see a lot of rotordynamic analysis when it comes to turbine and compressors." Compressors and turbines generally have more complexities than pumps.

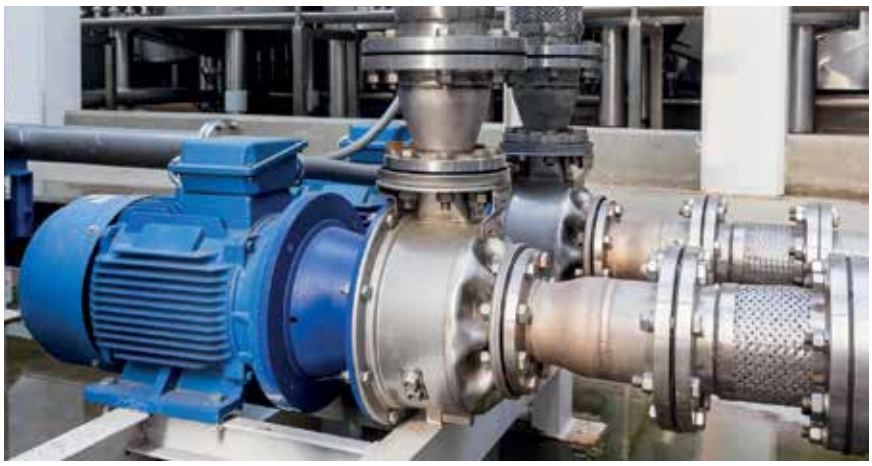
Working Through Maintenance Challenges

One of the most challenging parts of Mehta's line of work is to make the correct decision when it is time to evaluate deviations. "The deviations and clarifications that the vendors send back usually do not align with the industry standards and project specifications; the supplier might not be in compliance with every requirement and the deviation requests often acknowledge what was asked of the manufacturers. Since they cannot accommodate the requirement for a specific reason, the suppliers ensure the engineers have alternate solutions," he said.

Once these alternative solutions and deviations are communicated, it is up to Mehta and his team to determine whether the suggestions would be feasible by understanding the impact the deviation would create if it were to be accepted.

"Another thing about my work that I find a little challenging would be reviewing the maintenance requirements for the equipment," added Mehta. The maintenance requirements are reviewed during the equipment's manufacturing phase when there is no operating information available. "We ask for the maintenance schedule and then compare that to previous designs to ensure accuracy. Whenever possible, we seek input from the client's maintenance and operations team. Typically, the maintenance schedule comes from the manufacturers, who determine how often maintenance should occur," he said. Most of the maintenance that occurs is preventative; this includes oil changes, filter cleaning, and making sure the equipment is operating within the design limits.

"When looking at the maintenance needed for a compressor, for example, the most common practices



include checking oil filters and strainers. Upstream equipment also need to be cleaned. The compressors are shut off from production periodically, so operators can open them up and check on components such as bearings. This is to ensure there is no corrosion or erosion. A lot of this information is available through machine monitoring systems which often predict failures early enough for the operators to take preventive actions."

"Turbines are a little similar in this case, these components also have quite a bit of ongoing maintenance, especially when steam or water is involved; the blades in the turbine need to be well tended to for optimal performance."

Practical Issues and Test Witnessing

Usually with EPC companies, the operation experience is imminent. "Our operating experience is limited and mostly is in start-up or commissioning phases. We have a list of lessons learned that we apply across the board. Whenever there are issues at the job site, we do everything in our power to make sure it is not repeated." It is therefore important to have the client's input when it comes to the operating experience and the use of his expertise when product specifications are being drafted. "We include any requirements that we may feel is important, this way the clients do not have to run the repeating previous mistakes."

For Mehta, the best part of his role is being able to witness test runs of the designs that he has created. "When reviewing the design documents, I have to make sure the operability and maintainability are fully functional," he said. When the equipment manufacturing begins, the job site visits to complete testing are performed. Engineers often ask for permission to observe. "The testing typically determines whether or not the component is functional and if it follows project specifications and industry standards. One of the most exciting parts about test witnessing is to see if the design you have been working on is the perfect fit, it is most exciting when it actually works," he said.

Looking Ahead

When looking ahead, Mehta believes that the global push toward reducing the carbon footprint within the industry will become more prevalent. "The resources are available, we have solar energy, wind energy, hydropower, and so on. Of course, we can use these alternative resources, but it would be difficult to completely rely on only wind or solar power," he said. He argues that with the constant fluctuation in weather, it becomes increasingly difficult to provide energy, irrespective of what the weather condition is outside. Alternative fuel sources solutions such as hydrogen are still not mature enough to replace hydrocarbons completely. "I think we will still continue with the hydrocarbon industry, but we will also take more part in carbon reduction activities, such as carbon capture and sequestration and an increase in the use of hydrogen," he said.

In addition to this, Mehta provides some insight into the new generation of engineers in the industry. "There is a lot of fear around new engineers entering the oil & gas industry. The cyclic nature of the business has brought on a little bit of misinformation on the industry; that we are dying out and becoming more reliant on renewable resources, which we are beginning to incorporate, but the renewable resources will not entirely eradicate the oil & gas industry." Mehta advises new engineers that are grappling with this idea that "the energy industry is not dying; it is not going anywhere."

Final Thoughts

The process of creating designs for heavy equipment applications entails multiple stages of planning, evaluation, and approval. Several requirements need to be fulfilled and carefully considered when preparing for the beginning stages of the project's development. It is essential engineers have a clear understanding of the complex machinery to successfully provide alternative solutions for clients, while keeping the integrity and safety of the equipment.

About the Expert

Naitik J. Mehta, a Senior Rotating Equipment Engineer at Bechtel Energy in Houston, TX, has over 11 years of experience working with various Rotating Machinery and Packed Equipment. Naitik holds a Master of Science in Mechanical Engineering from the Texas A&M University and is a Registered P.E. in the states of Texas and Louisiana.

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Choosing the **Right AODD Pump Can Help Decrease Energy Consumption**

AODD pumps possess the operational capabilities to optimize air usage and satisfy the tenets of the sustainable manufacturing movement.

There is no aspect of human existence that can function properly or reliably without energy produced from refined crude oil, natural gas, and coal. Therefore, it is imperative that companies that rely on energy to power industrial-manufacturing operations create and implement systems that are as energy-efficient as possible, especially as energy costs continue to rise.

By Tom Zuckett, AODD Business Development Manager PSG & Wilden.

To aid these companies in creating both sustainable manufacturing regimes and battling increasing energy costs, several companies that supply energy through the electrical power grid have created rebate programs. Industrial companies that can demonstrate methods of operation that require less energy and more sustainability can be eligible to receive monetary refunds.

Knowing this, many industries are commendably attempting to develop new manufacturing and production methods – known as 'sustainable manufacturing' – that are more environmentally and socially friendly. The caveat, however, is that while these methods can have long-term benefits for the future, they can also have higher upfront implementation costs.

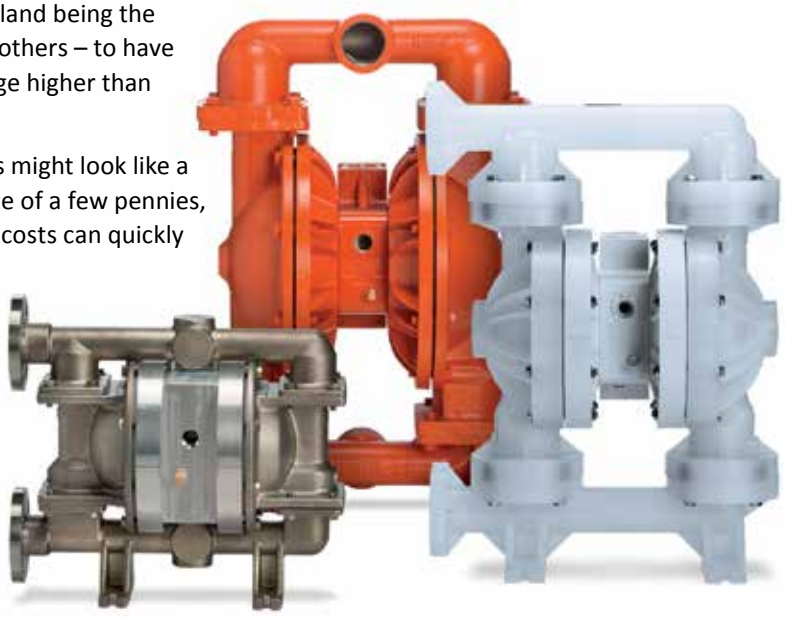
The Challenge

Air-operated double-diaphragm (AODD) pumps are powered by air, and air compressors are ultimately run by electricity. Prices for a kilowatt/hour (kWh) of electricity have been significantly influenced in recent years. In 2017, the average national price for a kWh was USD $0.07. In March 2022, that price had more than doubled to an average of USD $14.47 per kWh, which was up from USD $13.33 per kWh a year earlier.

The lucky residents of Montana, Oregon and North Dakota saw a decline in electricity prices from 2021 to 2022, but average costs (USD $10.03 to USD $11.01 per kWh) were still higher than 2017's national average. On the other hand, the state of Maine had seen its average kWh price jump more than 40% to USD $23.03 per kWh in 2022, making it one of eight states – with Alaska, California, Connecticut, Hawaii, Massachusetts, New Hampshire, and Rhode Island being the unfortunate others – to have a kWh average higher than 20 cents.

Although this might look like a slight increase of a few pennies, these higher costs can quickly add up, not just for homes and businesses trying to stay warm in the winter, but for industrial operators that are the backbone of the global manufacturing chain. The Hydraulic Institute revealed the importance of electricity in industrial manufacturing in a study that showed industrial pumping systems can account for nearly 20% of the world's electricity demand and that energy consumption can be up to 90% of the total cost of owning and operating a pump.

At the same time, it has been estimated that 30% to 50% of the energy that is consumed by pumps can be saved through the implementation of equipment or control-system upgrades. This makes pump systems an easy target for developing operational improvements that can lower energy consumption which will help optimize operating costs and create a more environmentally friendly mode of operation.



According to the World Commission on Environment and Development, sustainable manufacturing is designed to "meet the needs of the present without compromising the capability of future generations to meet theirs." This can be accomplished by manufacturing products via economical means and utilizing components that reduce waste and negative environmental impacts. The claim that this altruistic mindset is being adopted by many of the world's largest companies is backed by KPMG's 2020 Survey of Sustainability Reporting which showed that 80% of the world's leading companies are now reporting on sustainability efforts and are incorporating sustainability programs into day-to-day operational goals.

There are six elements that must be optimized to create a reliable, sustainable-manufacturing process, and pumps that are capable of operating effectively, while contributing to at least four of the six elements: manufacturing cost, power consumption, operational safety, and environmental friendliness. In order to overcome the challenges of energy acquisition and consumption while still being able to live up to the tenets of the growing sustainable-manufacturing movement, operators of industrial-manufacturing facilities must find ways to improve their pumping systems and processes.

The Solution

Pumps are required pieces of equipment in many applications within a manufacturing facility, from loading and unloading raw materials and finished products to the transfer of critical fluids and waste products. While the pumping landscape is rife with different technologies, all of which must be powered through some type of energy source, AODD pumps have proven over the decades to be one of the top choices for pumping applications.

AODD pumps are reciprocating, positive-displacement pumps that are driven by electricity-generated compressed air. AODD pumps are an ideal solution for many industrial liquid-handling applications because of their simple design, which simply features two diaphragms that are connected by a common shaft, two inlet ball valves and two outlet ball valves. The diaphragms are driven by compressed air, which removes mechanical stress from the pump's operation, leading to a longer and more reliable service life.

While the AODD pump's features and benefits were an undoubted revelation when introduced to the market nearly 70 years ago, the pumps required large amounts of compressed air to operate properly. This compressed air is delivered to the pump via electricity, which, as noted earlier, has been increasing in price in recent years.

For example. Jim Wilden, the creator of AODD pumps, was an innovator and this mindset has been ingrained in his company's DNA from the start. This has led to a pursuit of excellence that has resulted in a number of innovative improvements to the design and operation of AODD pumps over the years.

The engineers at Wilden invented the Pro-Flo® SHIFT Air Distribution System (ADS) to help reduce the overall amount of compressed air needed to operate the pump while simultaneously optimizing the air that is used. These types of air distribution systems were not just an incremental improvement in ADS technology, it was a true game-changer, one that represented an entirely new way of looking at how pneumatic pumps operate.

The inefficiency in the operation of traditional ADSs is the time delay that AODD pumps experience when pressurized air is switched from one air chamber to the other. This results in overfilling of the air chamber, with the

excess air vented into the atmosphere without having any beneficial effect on the pumping process.

To combat overfilling, the design and operation of certain ADS equipment restrict the airflow into the air chamber near the end of each pump stroke so that only enough air is introduced to keep the pumping process functioning. The key here is the incorporation of a specialized air control spool that automatically meters the air to prevent overfilling with no reduction of product yield. The result is reduced air consumption while still maintaining maximum operational efficiency and flow rates.

In fact, this air distribution system can operate reliably and efficiently with up to 60% less compressed air when compared to other AODD pump technologies while still being able to achieve flow rates that are up to 34% higher.

Whether it is for an existing installation using older ADS technology or the upgrade of a pump, manufacturers and its distribution partners have developed tools and usage calculators that can provide proof that AODD pumps are more energy efficient and can be used in a sustainable-manufacturing system.

Conclusion

With energy costs continuing to increase and companies encouraged to make manufacturing operations more sustainable, finding the right pumping technology has never been more important. AODD pump technology has been proven to ease energy consumption and contribute to more sustainable manufacturing processes. With documented reductions in air consumption and simultaneous improvements in flow rates, implementing AODD pumps is a reliable strategy for pumping solutions many of the world's most significant manufacturing operations can utilize.

About the Author

Tom Zuckett is the AODD Business Development Manager, Americas for PSG® and Wilden® and can be reached at tom.zuckett@psgdover.com. Wilden is a brand of PSG®, Oakbrook Terrace, IL, USA, a Dover company. PSG is comprised of several leading pump companies, including Abaque®, All-Flo™, Almatec®, Blackmer®, Ebsray®, em-tec, Griswold®, Hydro™, Malema, Mouvex®, Neptune®, PSG® Biotech, Quantex™, Quattroflow®, RedScrew™, and Wilden. You can find more information on Wilden at psgdover.com/wilden and on PSG at psgdover.com.

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Valmet FORWARD

Funding and Regulatory Changes Driving Shift In The Pump Industry

The pumping industry is on the verge of a technology transformation thanks to the significant impact of federal funding in the U.S. and the focus this funding has on innovation in the development of pumping systems. Although the funds benefit U.S. motor and pump manufacturers, end users everywhere will benefit from the increased energy efficiency and lower energy costs these investments are spurring.

By Patrick Hogg, Director of Marketing, Nidec

Figure 1: Nidec's SynRA® motor is an example of an integrated motor and drive solution with IE5 level efficiency and "Smart" pump system capability.

Two major federal legislative acts in the past two years are driving the change: the 2021 Bipartisan Infrastructure Deal, also known as the Infrastructure Investment and Jobs Act (IIJA), and the 2022 Inflation Reduction Act or IRA. The latter approved approximately USD $400 billion in federal funding to overhaul regulation for energy security and climate change as well as investing in future development of sustainable energy reduction and production.

Combined, these two legislative actions are going to allow the pumping industry to take advantage of new innovative technology that is the focus of this government spending. Pumps are a large source of energy consumption and therefore a huge target for improvement. The pump industry sits on the edge of a huge opportunity: the chance to change how the industry thinks about energy consumption within pumping systems.

Smart Pumping Systems

The development of higher efficiency, 'smart' pumping systems is a key element that is revolutionizing the future of pumping. These systems incorporate state-of-the-art technology, including electric motors that surpass NEMA Premium efficiency levels, variable speed operation, closed-loop control systems, and overall ability for variable demand response.

An example of this new technology is the increased adoption and installation of Electronically Commutated Motors (ECMs), synchronous motors, and motors integrated with Variable Frequency Drives (VFDs) which are the heart of these 'smart' pumping systems. The implementation of intelligent pump systems can minimize energy consumption and simplify installation and maintenance procedures. By harnessing cutting-edge technologies such as ECM, advanced sensors, real-time data analysis, and automation, these 'smart' pumping systems can optimize water usage, detect anomalies, and adapt to changing conditions. They provide a dynamic approach to pumping, enhancing operational efficiency and reducing environmental impact.

Connectivity to an Internet of Things (IoT) system with the integration of artificial intelligence and machine learning algorithms further empowers these systems to optimize pumping schedules by considering factors that affect the demand of pumping systems, like soil moisture for irrigation, solids content for wastewater, or overall demand required for clean water. These new connected systems offer opportunities for more than preventive maintenance but can provide predictive maintenance to limit downtime of pumps, limit the cost for maintenance, and increase the overall production and profit.

Less Apprehension to Invest

Prior to the U.S. legislation, there was apprehension about increasing initial capital for a new technology or more intelligent drive system. Now, with funding support, manufacturers and end users can focus on lifetime costs and overall energy savings. With the U.S. government's focus on energy infrastructure and energy use reduction, the pursuit of higher energy efficiencies within the pump industry now has an effective pull-through method.

However, this new push is not solely driven by economic benefits. As higher efficiency standards are being formulated, the availability of new technologies enables a more sustainable future. By adopting these innovative systems, pump users can benefit from incentives and rebates offered by utilities and substantially reduce their carbon footprint which can support company Environmental, Social and Governance (ESG) goals.

Stimulating Innovation

As the U.S. government injects USD $250 billion of spending directly into the vein of high efficiency pump

products, this stimulates and funds innovation, purchase, and supply chain of U.S sourced products that result in less energy consumption. This injection is aimed at key industries for which pumps are the main life blood, such as commercial building, agricultural irrigation, and HVAC. Specific targets for the federal funding include:

- Approximately USD $10 billion focused on water conservation, water use efficiency, drought resilience, and stormwater infrastructure to mitigate flood damage.
- USD $4.5 billion for state-level rebate programs incentivizing adoption of new energy efficient products.
- Almost USD $10 billion for rural electrification and to move away from fossil fuels. This will increase the need for high-efficiency electrified pumps.

The IRA also provides USD $47 billion to support the manufacturing of the products and the components of the products that are the drivers of this innovation revolution such as pumps, motors, and VFDs. This provision helps support the localization of the supply chain for these products. The earlier passed IIJA legislation had provisions for energy efficiency and infrastructure revitalization as well, but like the IRA has Build America Buy America requirements. This means that components for federally funded projects must be domestically sourced.

To help the development and acceleration of the goals in both acts, focused manufacturing funds, along with a few other pieces of legislation, aim to increase U.S.-based manufacturing on components that make up energy-efficient products, such as semiconductors, lamination steel, and wire.

New Pump Rules Pushing Efficiency

Regulations from the U.S. Department of Energy (DOE) are also continuing to push the minimum efficiency levels for many parts of the pumping system. Pump efficiency rules are being expanded to include circulator pumps, and the industrial and commercial pump rule continues to evolve.

New induction motor standards are expected to increase the minimum level of efficiency to 'Super Premium' levels on 100-250 Horsepower (hp) industrial motors. In the near future, DOE is expected to expand both the fractional horsepower motor rule, as well as the integral horsepower motor rule to increase minimum efficiency to NEMA Premium levels up to 750hp and on additional motor enclosures.

To standardize overall pump system efficiency, new testing methods are expected to be published for motors that can only be operated on VFDs. These methods are a way to start viewing the motor and VFD as a single system to drive equipment. This is otherwise known as the Power Drive System (PDS). The publication of these test methods will allow the DOE to include the efficiency requirements of combined motor and VFD power drive systems. This will also include regulations on many of the new technologies mentioned previously, such as synchronous motors and electronically commutated motors. Also, the development of a test method for submersible motors will eventually bring submersibles into a standardized efficiency-testing method to allow for industry-wide system comparisons no matter the type of pump.

The water treatment facility for the city of Venice, FL, features pump motors from Nidec/U.S. MOTORS. Project details at https://watercollaborativedelivery.org/project/venice-water-treatment-plant/ Photo courtesy of Haskell https://www.haskell.com/

Final Words

The pumping industry is entering a new era of sustainable resource management. With substantial funding and generous incentives, the industry is poised to invest in advanced technologies, particularly 'smart' pumping systems, to achieve higher efficiency and conserve water and energy.

By leveraging funding and innovation, stakeholders can lead and shape the future of the pumping industry, ultimately ensuring a more sustainable and resilient water supply for generations to come. These opportunities have their hurdles, but the pumping industry is poised to achieve sustainable systems that use a fraction of the energy.

About the Author

Patrick Hogg is Director of Marketing for Industrial Pumping & Distribution at Nidec Motor Corporation/U.S. MOTORS and an active member in Hydraulic Institute with over 15 years of experience in the pumping industry.

PART ONE

Duty to Standby Pump Switchover - Reaping the Benefits of Cost Efficiency and Reliability

Typically, standby pumps are installed with various configurations and capacity to provide operational flexibility and increase system availability. The switchover of duty to standby pumps is required for numerous reasons. From optimizing operations through making both duty and standby pumps available when required, to allowing functional operational checks and periodic predictive maintenance, as well as ensuring any upstream and downstream piping conditions are checked, switching over from duty to standby pumps not only optimizes reliability but also plays a role in cost efficiency as well.

By Mohammad Rahman, Mechanical Integrity & Reliability Engineer, Zeon Chemicals L.P.

It is important for operators to understand that both duty and standby pumps are available when needed, meaning that if a duty pump fails, the standby pump can take over. This minimizes any downtime in the pumping system. Additionally, it is essential for both variations of equipment to refrain from accumulating the same number of running hours, allowing for replacement equipment to be scheduled for installation at a suitable interval. This approach allows for various tasks, such as function checks, periodic and preventative maintenance tasks, like bearing lubrication, collection of vibrational data, and oil sampling to be performed by the standby pump. The replacement pump will readily take on the system load when required. Lastly, regular checks are conducted on the upstream and downstream piping and valve conditions.

This is to prevent the accumulation of process fluid, which can lead to line plugging, corrosion, or valve seizure over time. If the standby pump remains inactive for an extended period, the idle bearing may experience false brinelling, which is caused by low-amplitude vibrations from surrounding machinery. This can result in damage to the bearing and potentially lead to premature failure when the pump is put into operation, ultimately resulting in multiple failures where both pumps become unavailable simultaneously.

Following the Start-Stop Cycle

Typical duty-standby pump switchover follows a 90% – 10 % start-stop cycle. Several studies have been carried out to demonstrate good practice. Usually, a duty pump is run for 9 weeks, and then a standby pump is in operation for one week afterwards. This is to maintain the 90% – 10% cycle with this arrangement, the number of start-stop cycles can be kept minimum in a year. For example, a duty pump can start 6 times, and have 5 stops. A standby pump can can perform 5 starts and 5 stops.

When starting a pump, most of the strain on the pump comes from its seal. Whether it is a packing or mechanical type seal, the pump's primary and secondary seal faces may start to rub against each other prior to being lubricated by the process fluid and form an effective sealing. That is why the start-stop cycle needs to be minimized to keep the wear level minimum on the pump seal. However, there are some challenges that come with the 90–10% start-stop switchover approach.

This approach solely emphasizes reducing the frequency of start-stop cycles to minimize wear-and-tear within a specific timeframe. However, it neglects the economic aspects associated with pump operation and maintenance. The start-stop cycle approach does not provide a specific switchover time; instead, it suggests keeping the start-stop cycle to a minimum percentage of the total time without specifying the actual duration.

Lastly, this approach fails to consider the impact of other failure modes and its consequences. For example, certain processes may involve corrosive elements, some require extensive cleaning to prevent line plugging, and certain seals may be more expensive to replace. Additionally, health and safety challenges may arise that are not accounted for in this approach.

The Economical Aspect- Using an Analytical Approach

An analytical approach is developed to find an economical duty to standby pump switchover frequency that considers reliability and cost optimization in the operation and maintenance processes.

For example, if the duty pump fails, the standby pump starts and meets operational demands. If each pump fails randomly and the failure data follows the Weibull Distributions, this approach may be beneficial to operators. Multiple failures only occur when the standby pump fails, while the duty pump is simultaneously in a failed state.

The probability of multiple failure can be calculated as per SAE JA1012:

If the failure rate of the standby pump is represented by λ, the reliability of standby pump that it will operate at time t > 0 is calculated by:

$$R(t) = e^{-\lambda t}$$

Probability of multiple failure = Probability of failure of duty pump X Avg. unavailability of the standby pump

Rate of multiple failure = Rate of failure of duty pump X Avg. unavailability of the standby pump

Expanding this as:

$$R(t) = 1 - \lambda t + \frac{(\lambda t)^2}{2!} - \frac{(\lambda t)^3}{3!} + \ldots$$

By ignoring higher order terms:

$$R(t) = 1 - \lambda t$$

Instantaneous unavailability of standby pump can be expressed through:

$$u(t) = 1 - e^{-\lambda t} = \lambda t$$

Average unavailability of the standby pump is expressed as:

$$\bar{u}(t) = \frac{\int_0^T (1 - e^{-\lambda t})}{T} = \frac{\lambda T}{2}$$

Where T is the standby pump switchover frequency to ensure the pump is periodically restored in working condition.

The average multiple failure rate is shown here:

$$M(T) = \mu \frac{\lambda T}{2}$$

μ – demonstrates the failure rate of the duty pump.

Optimizing Duty Pump to Standby Pump-Part Two

In order to achieve the most efficient duty pump to standby pump switchover interval, a balance is needed between switching too frequently. By evaluating total cost per switchover cycle, cost of multiple failure and cost of the pump switchover, users can seamlessly determine switchover frequency.

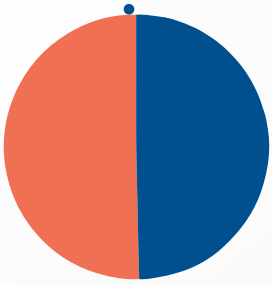
Be sure to find the second part of this article in Pump Engineer's December 2023 issue.

About the Author

Mohammad Rahman is a maintenance, reliability, and physical asset management expert with more than a decade experience in the chemical, power, and nuclear sectors. He has extensive experience leading reliability improvement initiatives for both rotating and stationary equipment.

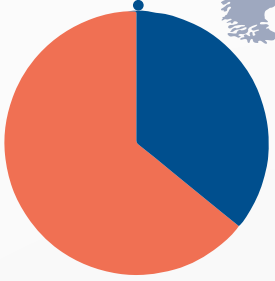
SANITATION AND SAFE WATER

Access to clean water and proper sanitation facilities play a pivotal role in influencing a nation's progress. The United Nations' (UN) Sustainable Development Goals (SDGs) are a set of 17 objectives designed to address urgent global issues pertaining to society and the environment. These goals are interconnected to cover a wide range of targets that ensure prosperous unity across all industrial sectors, governments, and most importantly, people. SDG 6 and SDG 9 draw the spotlight on clean water and sanitation access, as well as industrial innovation and infrastructure. These goals go hand in hand; SDG 9 addresses the industrial sector with an emphasis on the need for sustainable and resilient infrastructure, while SDG 6 discusses the demand for clean water and sanitation access through the implementation of water and wastewater facilities to enhance the health of communities in underdeveloped areas.[1] The global demand for water is steadily increasing after decades of resource misuse and inadequate structural integrity for clean water systems, or the complete lack thereof. Working alongside non-government organizations (NGOs) and authorities across the globe, leading manufacturers in the pump industry have implemented engineered solutions through upcoming and sustainable technologies. These collaborative efforts are redesigning agendas and frameworks to progressively improve access to clean water and sanitation by enhancing existing infrastructure, creating new projects, and collaborating with organizations that prioritize innovation, social equity, and global access. Follow Pump Engineer to explore these efforts.



HONDURAS' SHARE OF SAFE SANITATION ACCESSIBILITY (2020)[9]

- **Population with Safe Sanitation Access** 49.68%
- **Population with Unsafe Sanitation Access** 50.32%



PAKISTAN'S SHARE OF CLEAN WATER ACCESSIBILITY (2020)[9]

- **Population with Safe Water Access** 35.84%
- **Population with Unsafe Water Access** 64.16%

1 Tegucigalpa, **Honduras**

The Inter-American Development Bank and the government of Honduras have launched a drinking water and sanitation program that will provide support to 31,000 households, aiding up to 30,000 people access to safe water. The Potable Water and Sanitation Program is executed by the Department of Community Development, Water, and Sanitation (SEDECOAS), which will ensure sustainable infrastructure and expose communities who have historically struggled with water scarcity, to strengthened sanitation solutions and water security.[8]

2 Punjab, **Pakistan**

Punjab's monsoon floods have become an incredible challenge for the country's water supply and sewage systems. This WaterAid project promotes access to purified water and the elimination of diseases caused by unsafe water through water trucking resources. The project's sanitation services include building toilets in displacement camps and within communities that lack this basic human right.[4] With the help of The World Bank, The Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) intends to upgrade infrastructure to enable equitable access to safe water management.[5]

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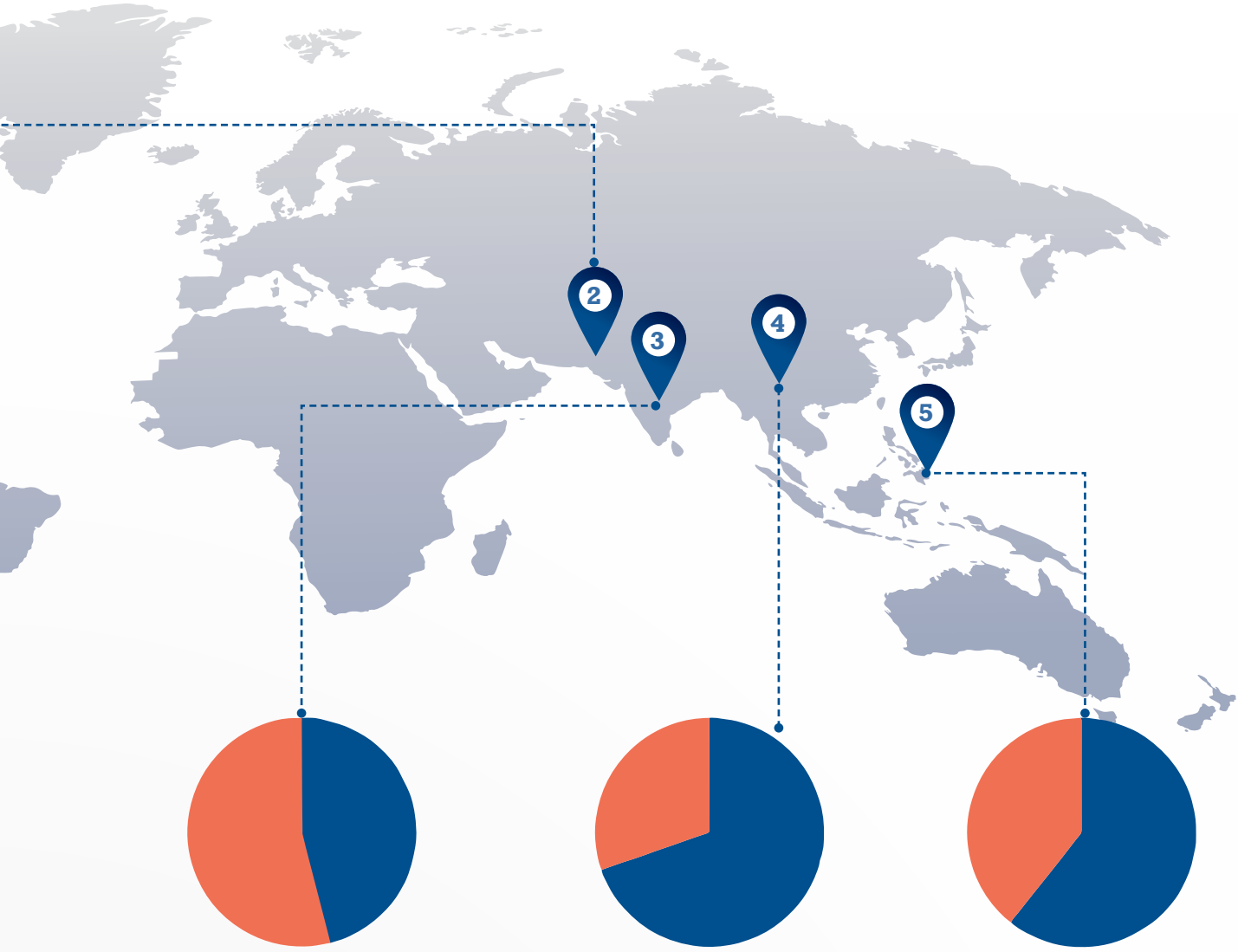
INCENTIVES ACROSS THE GLOBE



INDIA'S SHARE OF SAFE SANITATION ACCESSIBILITY (2020)[9]

- **Population with Safe Sanitation Access** 45.91%
- **Population with Unsafe Sanitation Access** 54.09%

3 Digambarpur, **India**

Many safe water and sanitation projects are implemented in India with the help of non-government organizations (NGOs), such as Water for People. These projects aim to provide resources pertaining to Water Access and Water, Sanitation, and Hygiene (WASH). UNICEF India and Water for People have created programs that enforce monitoring, evaluation, and knowledge management frameworks to be taught in rural areas and schools where sanitation is often left out.[2] Water for People installed new hand pumps and rehabilitated existing water systems[3] providing 34,000 people in eight villages within Digambarpur, with water security.

CHINA'S SHARE OF SAFE SANITATION ACCESSIBILITY (2020)[9]

- **Population with Safe Sanitation Access** 69.66%
- **Population with Unsafe Sanitation Access** 30.34%

4 Dongchen Village, **China**

The World Bank and the city of Zhejiang had collaborated to execute the Zhejiang Water Supply and Sanitation Project in a few counties across China. One of the projects installed sewer pipes that connect homes in Dongchen to a wastewater treatment network. The Zhejiang Sanitation Project also built community toilets and cleaned ditches and ponds to improve the environment quality in rural areas. This infrastructure is projected to improve 110,000 households, estimated to total a million people with accessible sanitation facilities.[7]

PHILIPPINES' SHARE OF SAFE SANITATION ACCESSIBILITY (2020)[9]

- **Population with Safe Water Access** 60.64%
- **Population with Unsafe Water Access** 39.36%

5 Quezon, **Philippines**

Planet Water Foundation has been working in the Philippines to provide elementary schools with clean drinking water. Currently, there have been over 370 water projects deployed across the country and several water filtration systems have been implemented in schools and disadvantaged communities. In addition to this, the NGO executes WASH resources, handwashing facilities, and hygiene education across many Indigenous and rural towns.[6]

PART ONE

Understanding the Relationship Between NPSHpump, Safety Margin and NPSHplant

For trouble-free operation of a centrifugal pump in the facility, the NPSHplant (Net Positive Suction Head available at the plant) must be equal to or greater than the NPSHPump (Net Positive Suction Head required by the pump). The values of NPSH3%=f(Q) are shown in the sales characteristic curves (referred to as 'characteristic curves', going forward). This article will examine NPSH3%= f(Q) curves for selected manufacturers of standardized single-stage volute casing pumps with axial inlet. This pump type is significant for this study because of its widespread use in both industrial plants and ships. The presented investigation aims to determine whether the specialized literature and technical documentation provided by manufacturers deliver information about the necessary safety margin on NPSH3% or not.

By Dipl.-Ing. Jürgen H. Timcke, Mechanical Engineer.

Regarding the NPSH3% of the pump, it is important to note that the most commonly used cavitation criterion is NPSH3(=NPSH3%), not because it holds exceptional technical relevance, but because it is straightforward to measure. As a result of this, the term NPSH appears in pump specifications of numerous manufacturers without explicitly indicating that it specifically refers to NPSH3.[1]

When looking at NPSH3%, NPSH safety margin, NPSHPump, and NPSHPlant, the relevant specialized literature either lacks accurate information or presents inconsistent information on these matters. Consequently, it becomes interesting to determine whether the manufacturers' technical documentation provides answers to the following questions:

a. What information is provided in the specialized technical documentation?
b. Do the details in the manufacturers' technical documentation consistently align, or is it conflicting?
c. Do varying conditions exist for the required minimum NPSHPlant that must to be met?
d. Are the differences between the calculated NPSHPlant values using distinct calculation methods substantial or negligible?

Understanding the Difference Between Safety Margin S0.5 and Safety Summand S0.5

The term 'safety margin S0.5' is not accurately used on a consistent basis; a distinction must be made between the 'safety summand S0.5' and the 'safety margin S0.5'. The following are two examples of manufacturers A and B, which illustrate this obstacle.

Example 1

Manufacturer A

Minimum NPSHPlant=NPSHPump + 0.5 meters (Equation 1)

In this case, the example explicitly states that the safety margin between NPSHPlant and NPSHPump is 0.5 meters.

Example 2

Manufacturer B

NPSHPump=NPSH3% + 0.5 meters (Equation 2)

In this situation, it would be more appropriate to refer to this '0.5 meters' as a safety summand rather than a safety margin. This value needs to be added to the NPSH3%. By doing this, it essentially enlarges the entire NPSH3%=f(Q) curve, which can also be used for future tenders or bid sheets.

These examples can be a bit complex when it comes to understanding the significance of the numerical value of '0.5 meters.' However, one of the manufacturer's technical documentations include the following statement: "This safety summand of 0.5 meters, added to the values of the NPSH3%= f(Q) curves, is necessary to account for the measurement inaccuracies. Inaccuracies arise from determining the 3% head drop of the HS-H curves at various but consistently constant flow rates Q."

Breaking it Down

When looking at example 1, the term 'NPSH3% + 0.5 meters' from equation 2 into equation 1 results in equation 3:

NPSHPlant = NPSHPump + safety margin = NPSH3% + safety summand + safety margin =

NPSH3% + 0.5 meters + 0.5 meters = NPSH3% + 1 meter (Equation 3)

NPSH3% = f(Q), NPSH3% + 0.5 [m] = f(Q), and R0.5 = f(Q)

To further understand this, the characteristic curves from two different standardized sizes of randomly chosen manufacturers were utilized. These sizes are compliant with the criterion of having nearly the same specific speed nq at n=2900[1/min]. The selected size for this example is >80-65-160 (ISO 2858) and >125-100-260 (EN 733)

The curves of NPSH3%= f(Q) were extracted from their characteristic curves and presented in Figures 1 and 2. Additionally, the curves of NPSH3% + 0.5[m] = f(Q) and R0.5 = f(Q) are depicted. While NPSH3% =f(Q) curves are familiar, the term R0.5 refers to the safety summand

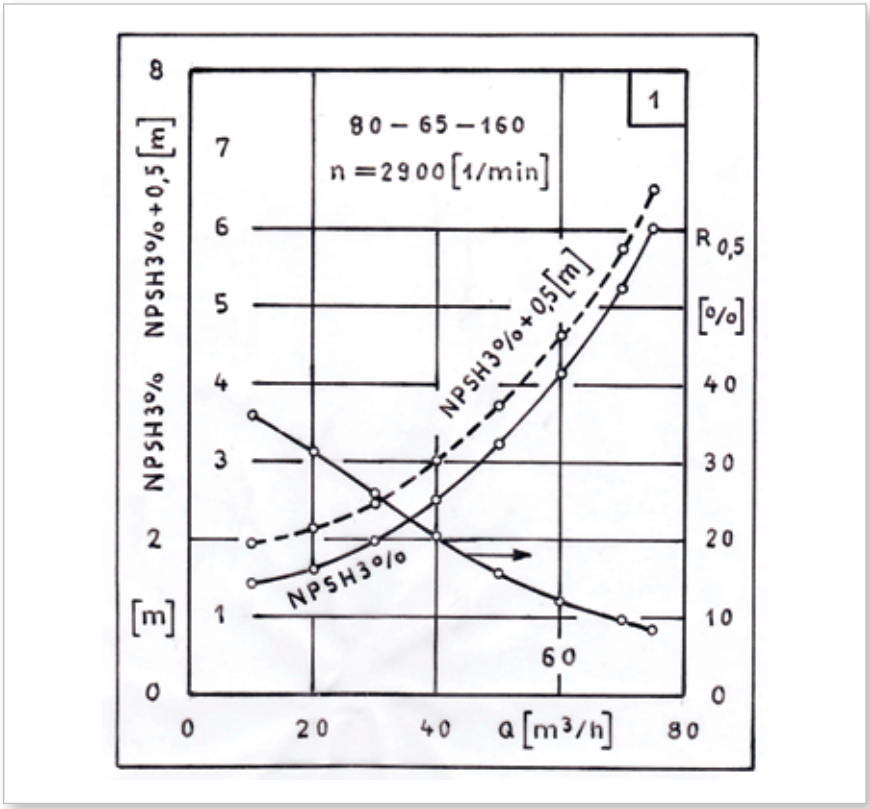


Figure 1: Size 80-65-160 NPSH3%, NPSH3%+0.5[m] and R0.5 all presented as function of Q.

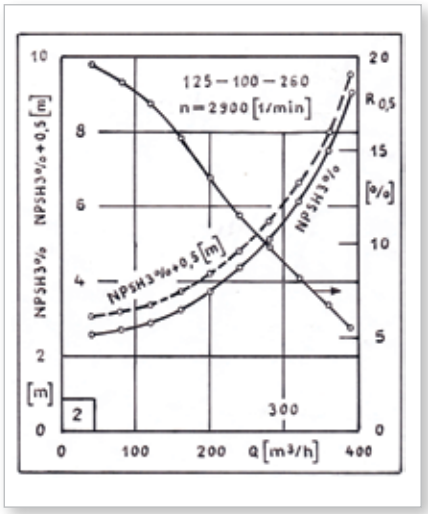


Figure 2: Size 125-100-260 NPSH3%, NPSH3% + 0.5 [m] and R0.5 all presented as function of Q.

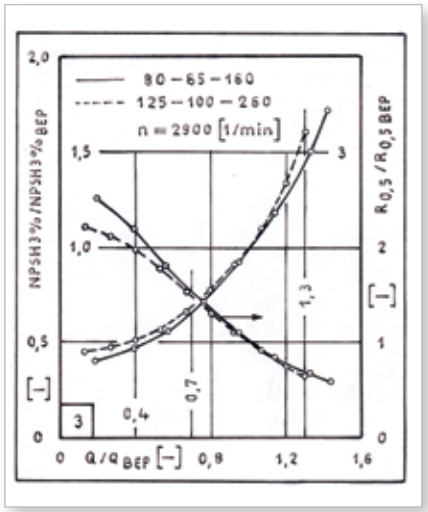


Figure 3: Dimensionless presentations. Full lines: size 80-65-160. Broken lines size 125-100-260.

of "S0.5 = 0.5 [m] expressed as a percentage of NPSH3% [m]". It is calculated as follows:

R0.5 = S0.5 [m] / (NPSH3% [m] / 100 [%]) = S0.5 [m] • 100 [%] / NPSH3% [m] (Equation 4). The dimension of R0.5 is [m • % / m] = [%]. As NPSH3%=f(Q) increases, the value of R0.5 consistently decreases.

Given this information, why does the smallest NPSH3% value correspond to the highest R0.5 value, and conversely, why does the largest NPSH3% value correspond to the lowest R0.5 value? This can seem counterintuitive. Perhaps attempting to reverse this might seem more logical.

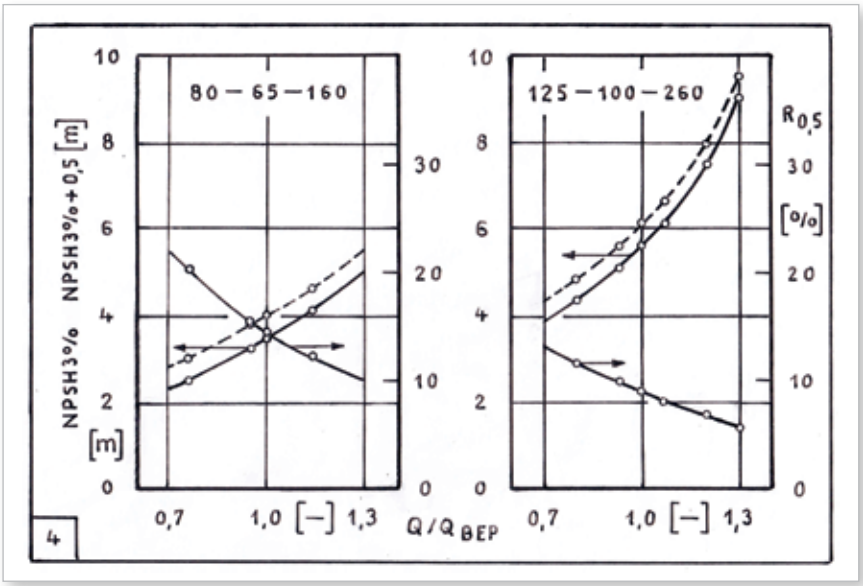


Figure 4: Comparison of Figure 1 and Figure 2.

Figure 3 presents NPSH3% =f (Q) and R0.5=f(Q) from Figures 1 and 2. The curves of NPSH3% =f(Q/QBEP) as well as R0.5=f (Q/QBEP) present good correspondence, particularly within the range of Q/QBEP [-] = 0.7 to 1.3. These requirements represent the part-load and overload ranges for efficient operation of the discussed standard pump models.

The diagrams in Figure 4 offer a comparison of the tendencies of the curves for the two sizes relative to Q/QBEP, within the part load and overload ranges.

*** Read **Part Two of this article in the December 2023 issue of Pump Engineer.** ***

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Dipl.-Ing. Jürgen H. Timcke studied mechanical engineering at the University of Applied Sciences in Karlsruhe. He has 40 years' experience in the field of centrifugal pumps and has gained a thorough understanding of the pump industry. In the last 30 years, he has been a Manager of the Development, Design and Testing at a number of international and well-known pump companies. In addition to his professional activities he was also a regular lecturer at the University of Applied Sciences in Konstanz. As an expert in his field he was elected a member of the AMERICAN SOCIETY OF NAVAL ENGINEERS. Other articles by Timcke can be found at: www.juergen-h-timcke.ch

Global Highlights

COMPANY NEWS

Blackmer Opens Expanded Headquarters to Support Growth

Blackmer, a brand of PSG, a Dover company, and a global leader in rotating pumps and reciprocating compressor technologies announces the opening of its expanded headquarters at the PSG Grand Rapids Rotating Center of Excellence in Grand Rapids, MI. The grand opening caps off a nearly two-year-long construction and renovation project that added 56,000 square feet of new manufacturing, office, and R&D space. The new building and renovated facility also feature energy-efficient lighting, heating, air conditioning and manufacturing systems.

COMPANY NEWS

ITT Names President of Industrial Process Business

ITT Inc. announced the appointment of Fernando Roland as president of its Industrial Process (IP) business, reporting to Chief Executive Officer Luca Savi. Roland succeeds David Steblein, who retired earlier this year after more than 30 years with the company. IP, one of ITT's three segments, is a global leader in centrifugal and twin-screw pumps for chemical, energy, mining, and industrial markets.

Roland joins ITT after two decades in various senior leadership roles at multinational manufacturing conglomerates, including Continental AG, Hyosung Corporation and DuPont.

PROJECT NEWS

Pumping Station Upgrade for Inner Newcastle

Works to upgrade Hunter Water's Newcastle West 1 Wastewater Pump Station in Marketown Shopping Centre have commenced, following preparatory work completed in 2022. The upgrade will reduce future maintenance, improve the existing pump station fixtures, improve amenities and support population growth in the area. The site was set up over several weeks and construction is scheduled to conclude in early 2024. Hunter Water is installing a permanent odour control unit (OCU), having had an interim unit in place since last year, as well as remediating existing concrete, and some pipework, covers and hatches at the pump station.

COMPANY NEWS

Sundyne Appoints Vice President of Global Aftermarket Services

Sundyne, a global leader in designing and manufacturing mission-critical pumps and compressors, announced that Adolfo Gomez has joined the company as Vice President of Global Aftermarket Services.

Adolfo will lead Sundyne's commercial aftermarket business and team, working closely with Channel Partners and Authorized Service Centers to proactively support Sundyne's customers and grow the aftermarket business.

Product Developments

Vogelsang Creates New Pump Seal Supply Unit to Lower Operating Costs

The Automatic Supply Unit (ASU) has been specially developed by Vogelsang's engineering team in Germany to keep mechanical seals in rotary lobe pumps running for longer and increasing the service life by 1.5 times, reducing the frequency of changing the seals by as much as 33%. While conventional supply systems are essential to keep the lubricant in a mechanical seal at a constant level and maintain the pressure in its buffer chamber, they can consist of a large number of parts which require additional installation space. Vogelsang's new ASU is much smaller than previous designs, requiring much less installation space.

GEA's New Twin Screw Pump for Conveying And Cleaning

The revamped GEA Hilge NOVATWIN+ is more powerful than its predecessor series and, with its higher flow rate, covers a wider range of applications with a smaller pump. The new design reduces the material footprint by 23%, while the improved efficiency saves 10% energy. With variable speeds of up to 3000 rpm, the self-priming positive displacement pump conveys lumpy, shear-sensitive and abrasive media particularly gently.

Watson-Marlow Cased Pumps for Biotechnology

Watson-Marlow's range of peristaltic pumps is developed for biotechnology applications and offers an industry-leading solution to fluid handling challenges.

Backed by a global network of technical and support teams, WMFTS is an established fluid processing and handling partner. Its portfolio of peristaltic-cased pumps is scalable and developed to optimize the performance of your processing for a wide variety of biopharmaceutical applications that demand sterility, repeatability, flexibility, and precision.

Edwards Extends Its Range of Dry Scroll Pumps

The new mXDS3 with a pumping speed 3m3h-1 builds on the established Edwards nXDS scroll pump experience and extends the current small dry pump range from 3 up to 120m3h-1. The mXDS3 offers a dry alternative to traditional oil-sealed rotary vane pumps. With no oil to check, replace or dispose of these scroll pumps offer an environmentally friendly option; typically, with lower power requirements compared to similar capacity pumps.

KSB's New High-Pressure Pump Variant

The new HGM-S variant was designed to be reliable, service-friendly and economical. The pump's internal, product-lubricated plain bearings, for example, do not require any external supply systems while the small spacing of bearings lowers the vibration level of the pump. This markedly reduces wear. The combination of suction stage impeller and axial inlet results in a very low NPSH and good suction characteristics. With its axial inlet, the new pumpset is compact and space-saving.

Danfoss Burner Components Is Launching a New Service Pump

The new TIER 2 Service Pump is a reliable and efficient standard service pump that offers high performance while reducing overall costs of installers and end customers.

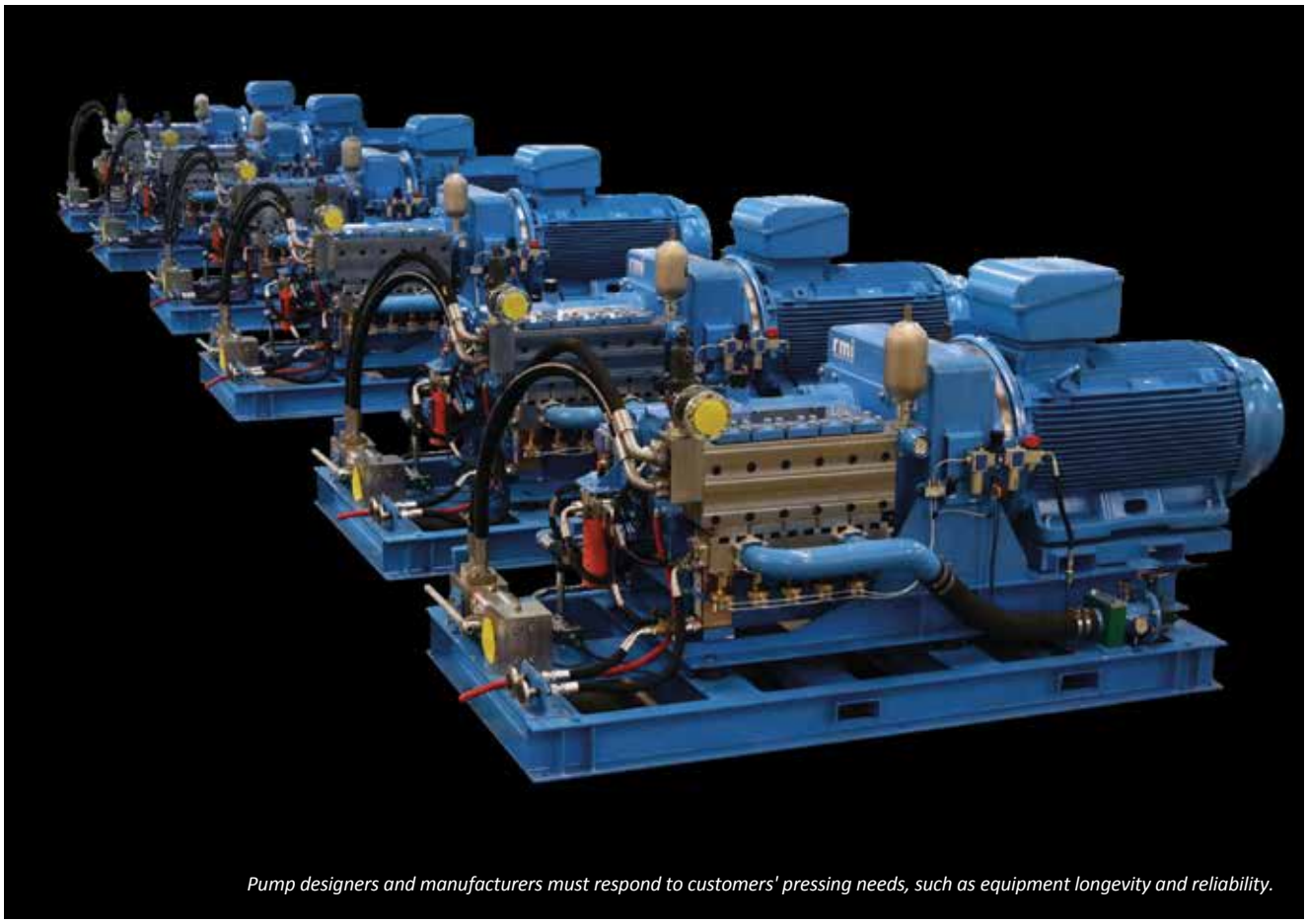
Danfoss Burner Components has released the new TIER 2 service pump as part of the new modified service pump portfolio, including, Service Standard – TIER 2 pump (cost-effective standard fuel pump), Service Standard Plus - TIER 2 Bio30 pump (cost-effective and compatible with up to 30% biofuel blend pump) and Service Premium – Diamond Bio100 pump (high quality, reliability, and 100% biofuel ready pump)

Danfoss now offers a full range of fuel pumps for the service market. With only a few variants up to 95% of all installed boilers fuel pumps can be replaced!

Shifting the Pump Sector- A System Centric Approach

As players in the highly competitive global pump sector shift their focus from products to comprehensive systems, the endeavours that are set to thrive the most are those that directly influence user cost and their environmental, social and governance (ESG) priorities.

By Joe Keenan, Global Managing Director, Industrial Fluid Flow Solutions at RMI Pressure Systems



Pump designers and manufacturers must respond to customers' pressing needs, such as equipment longevity and reliability.

The global industrial pump market – which some estimate to be worth around USD $70 billion a year – continues to grow rapidly, at an annual compound rate of 4-6%. In an average industrial facility, it is likely that pumps can account for 30% of the total energy consumption. At the same time, it is acknowledged that the vast majority of pumps operate at low efficiencies – which runs the risk of wasting money and generating unnecessary volumes of carbon dioxide.

Addressing these energy inefficiencies should therefore be a priority for the growing pump sector, as such initiatives feed strategically into customers' commercial and ESG imperatives. An important way of doing this can be seen in the shift away from a mere product offering – and towards broader system-based solutions for customers. This shift also presents opportunities for brand differentiation in a market that has become increasingly commoditized.

In pursuing this differentiation, designers and manufacturers of pumps need to respond to the users' pressing needs in their specific applications. A key differentiator, for instance, is equipment longevity and reliable operation, which for many customers is a vital bottom-line requirement.

Climate Change and Global Conflicts

Currently, climate change and the geopolitical position brought forth

several important prerogatives that define value for customers – especially for those in energy-intensive sectors such as mining and steelmaking. For industries like these, ESG is now becoming a central element in strategy and branding, demanding more efficient use of energy in production – especially as gas and power costs surge in the wake of the Ukraine conflict.

Many large customers are therefore looking to reduce their carbon footprint and operating costs by using less energy, while at the same time also conserving water as an increasingly precious natural resource. Responding to these needs should therefore be a priority for pump specialists to embrace a system-centric approach to enhance their offerings.

Focusing on Pump Systems

While pump OEMs must continuously improve the technical aspects of their equipment, there are invariably diminishing returns on these gradual enhancements on these components. The more comprehensive and significant trend is beyond the realm of the product, and into the systems space. The pump is one component among others within an application or system that aims to solve multiple customer requirements, as opposed to just one.

By way of illustration, a pump user would traditionally procure a pump

for a certain purpose and would need the in-house expertise and infrastructure to install, monitor, maintain, and service that equipment. This requires specialized knowledge about how that pump is applied in that specific application or system to ensure that it delivers the value required to warrant its purchase price.

A market shift occurs when a pump supplier begins to augment its offering with the other components or accessories that the customer has previously had to procure themselves. It could even occur through corporate acquisitions of upstream or downstream 'phases' of production, allowing the customer to source more of their operational equipment from a single supplier.

Lessons from Electric Vehicles (EVs)

The significance of system offerings as a disruptive strategy was recently highlighted in the process of developing and marketing electric vehicles (EVs). With innovative battery technology as the enabling innovation behind the EV revolution, what is essentially occurring is a vehicle being constructed as a 'system' around a battery. This process has provided customers with a differentiated product and created a new trajectory for the motor industry.

The well-established pump industry can gain valuable insights from the recent growth of the electric vehicle (EV) sector. Two insights stand out for those companies wanting to grow their offerings from stand-alone products to systems.

For one, businesses can seldom be good at everything, so they need to decide where exactly their energies and resources are best directed. Secondly, developing a knowledge base is crucial. Creating a system solution often entails venturing further downstream into aspects of the user experience and operations, that were once the responsibility of themselves or another supplier.

This means learning more about what the user already knows to essentially assume more responsibility for their process. The next important strategy is to harness the power of technology for this new system, to improve monitoring, leverage operational data, predict maintenance requirements, and reduce downtime. In the pump sector, there has been a significant increase in focusing on systems and the potential to enhance these applications, including the incline use of variable speed drives to conserve both energy and water.

There are considerable benefits for companies with the insights and resources to successfully move forward with system-centric approach. These companies would transition into a less saturated market, as the barriers to entering this trade space may not be as prominent in comparison to former competitors. Most importantly, it situates the firm in a different position to its clientele – where the conversation moves away from products and their features to outcomes and their value.

Final Words

For the customer, the conversation is now elevated to a level where their key performance indicators (KPIs) – including compliance with ESG standards – can be discussed. The supplier becomes the service provider and takes an active role in helping the user achieve these KPIs through systems that include pumping equipment. The difference now is that they are tested and sold using a different framework. In this sense, the strategic shift into the realm of systems and solutions must keep pace with the changing imperatives that drive customer decision-making, turning the supplier relationship into a stronger collaboration.

CASE STUDY- Plunger Pump System for Italian Steel Mill.

When a steel rolling mill in Italy was looking to enhance the quality of its product while improving overall efficiency, it turned to a partnership of metallurgical plant solutions and high-pressure pump specialist RMI Pressure Systems.

The mill decided to invest in new descaling equipment – with a view to raising quality standards while lowering overall energy and water costs. According to Kathryn Poke, RMI's general manager (EMEA), the company designed a bespoke solution based on its established series of reciprocating plunger pumps.

"The specialized system for the mill included controls, nozzles and headers to ensure reliable and efficient operation and a pump at the heart of it." RMI was required to provide a pump which could deliver hydraulic power at multiple pressures, using a variable speed drive and engineered nozzles. The result was a system capable of producing flow rates from 50 up to 670 litres per minute, at pressures up to 1,000 bar.

The variable speed drive and engineered nozzles ensured that the system delivered controlled hydraulic pressure and precision impact while consuming less energy and water. The system was performance-tested, confirming its robust design and manufacture – which would underpin its reliability and uptime. The lower installation and maintenance costs resulted in a payback period of less than two years.

RMI managing director Joe Keenan highlighted the value for customers of pump manufacturers moving beyond a focus on discreet products and into the systems space. "Customers are increasingly looking for solutions and not just products," said Keenan. "This contract illustrates how RMI's custom-design capability allows us to build fit-for-purpose solutions with our pumps as a central component."

About the Author

Joe Keenan, Global Managing Director: Industrial Fluid Flow Solutions at RMI Pressure Systems. RMI Pressure Systems designs manufactures and supports world-class reciprocal pumps that last. Through stringent quality processes and extensive testing protocols, the company produces pumps that give customers optimal uptime and life-long productivity.

Taking a Niche-by-Niche Route

Why is cost data used as a guide and a reference, whereas market data is used only as a reference? The answer is the difference in detail and reliability. One can imagine the implications of a pump company cutting back on detailed cost analysis and relying just on total costs for guidance. This article will discuss the process of using a niche-by-niche route to achieve 30% earnings before interest, taxes, depreciation, and appreciation (EBITDA).

By Bob McIlvaine, President & Founder – The McIlvaine Company

TRUISM: Cost data is used as a reference and a guide; market data is used as a reference and an expert is used as a guide.

To qualify this truism, one may argue that it is possible to obtain precise cost data, while the same is not true for markets. The counterargument is then, however, why do individuals use practices such as last-in, first-out (LIFO) and how are good estimates of future costs derived by analyzing trends for materials used? The labor for every product is carefully tabulated. But how detailed are the sales cost tabulations applied to each product in each industry, in each location?

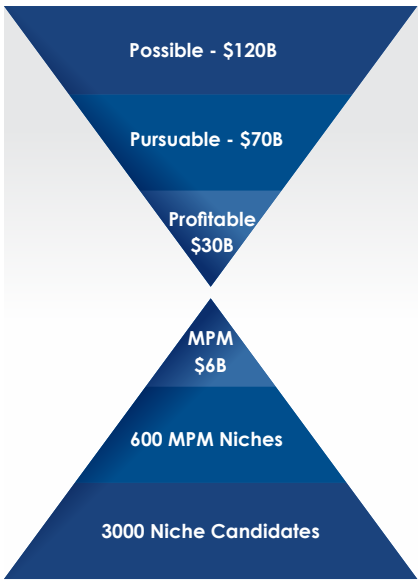
Focus on Niches

A few pump companies are achieving 30% EBITDA but the average for the industry is closer to 15%. The reason for the lower margin is that most companies are not pursuing the best customers with the best products in the best manner. The most profitable niches for FGD slurry pumps are now in Southeast Asia. A decade ago, the big market was China and before that it was Europe. It all started in the U.S. 50 years ago.

The road to success is to identify the best niches and focus on them. It is nice to be a general technology leader, but it is much better to be a technology leader in the most profitable niches.

Pump Niches

The USD $120 billion pump market[1] consists of 12,000 niches and 120,000



sub niches which, like LEGO blocks, can be combined into millions of shapes by their creators. The shapes consist of various combinations of products, applications, and geographies.

There are pumps used for severe, critical, unique, and general service. There are a dozen types of pumps with endless variations. There are some 20 main application segments with hundreds of important sub-classes. The world can be divided into 72 countries and 8 small country aggregates. In most cases, a niche involves just one State or region.

To adequately select the best products for the best applications to pursue them in the best manner, large amounts of market data are needed.

Simultaneous Top-Down and Bottom-Up Market Analyses

There should be simultaneous top-down and bottom-up market analysis efforts.

The top-down approach is critical to assess long-term major trends and opportunities. It is also a way to assess the strengths of competitors. The bottom-up approach should be continuous and include each sub-niche of importance. The goal is to focus on niches where a 20% market share and 30% EBITDA can be achieved. The Most Profitable Market (MPM) is an aggregation of these niches.

For example, if one considers an industrial pump company with revenues of USD $500 million that focuses on industrial markets. A top-down approach indicates a potentially profitable market of USD $30 billion/yr. The bottom-up approach concludes that the company could capture 20% of a USD $6 billion market and raise revenues to USD $ 1.2 billion. If it wants to grow at 10% per year it will need to identify and pursue 25 new niches per year.

The McIlvaine pump report details a USD $70 billion market. However, it does not include most of the pumps used in discrete applications such as lubrication of a machine tool and does not include commercial applications. When these applications are included, the market is USD $120 billion/yr. This is also known as the Total Available Market (TAM).

Further analysis shows that only USD $70 billion is pursuable given the structure and assets of the corporation. This is the Serviceable Available Market (SAM).

Further Analysis

A more detailed study shows that a market of USD $30 billion could be potentially profitable. This is the Serviceable Obtainable Market (SOM).

This top-down study is necessary to define the boundaries for the bottom-up forecast. However, it would be a mistake to use this data directly for decision-making. The reason is that the market is an aggregation of niches. Decisions should be made on aggregation which only comes with a bottoms-up study.

Time	Revenues $ millons	Market $ millons	Niches
2023	500	2500	250
Per Year Increase	50	250	25

The Bottom-up initiative quantifies each USD $1 million sub-niche and aggregates them in the most profitable niches of USD $10 million. In this case, it is determined that sales can reach USD $1.2 billion by capturing 20% of a USD $6 billion/yr. market.

If the company wants to grow at 10% per year it will have to add 25 new niches per year. Considerable effort is needed to select just a small percentage of the niches. It is made more complex by the need to consider new niches as well as existing ones.

The sales and management structure should be based on a niche analysis of USD $10 million/yr. markets. The facts and factors to be assessed include the technology and ratings for competitor products. These findings are then incorporated into a value proposition. So, for a $500 million company, there needs to be at least 250 value propositions.

The bottom-up analysis uses the existing niche forecasts and value propositions as the starting point. To grow at 10% per year it will need 25 new value propositions per year.

Final Thoughts

The bottom-up focus should be on the existing operations whereas the top-down focus should be on new opportunities where there are promising most profitable market opportunities.

Reference

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About the Author

Bob McIlvaine founded the McIlvaine Company in 1974 and oversees the work of 30 analysts and researchers. He has a BA degree from Princeton University.

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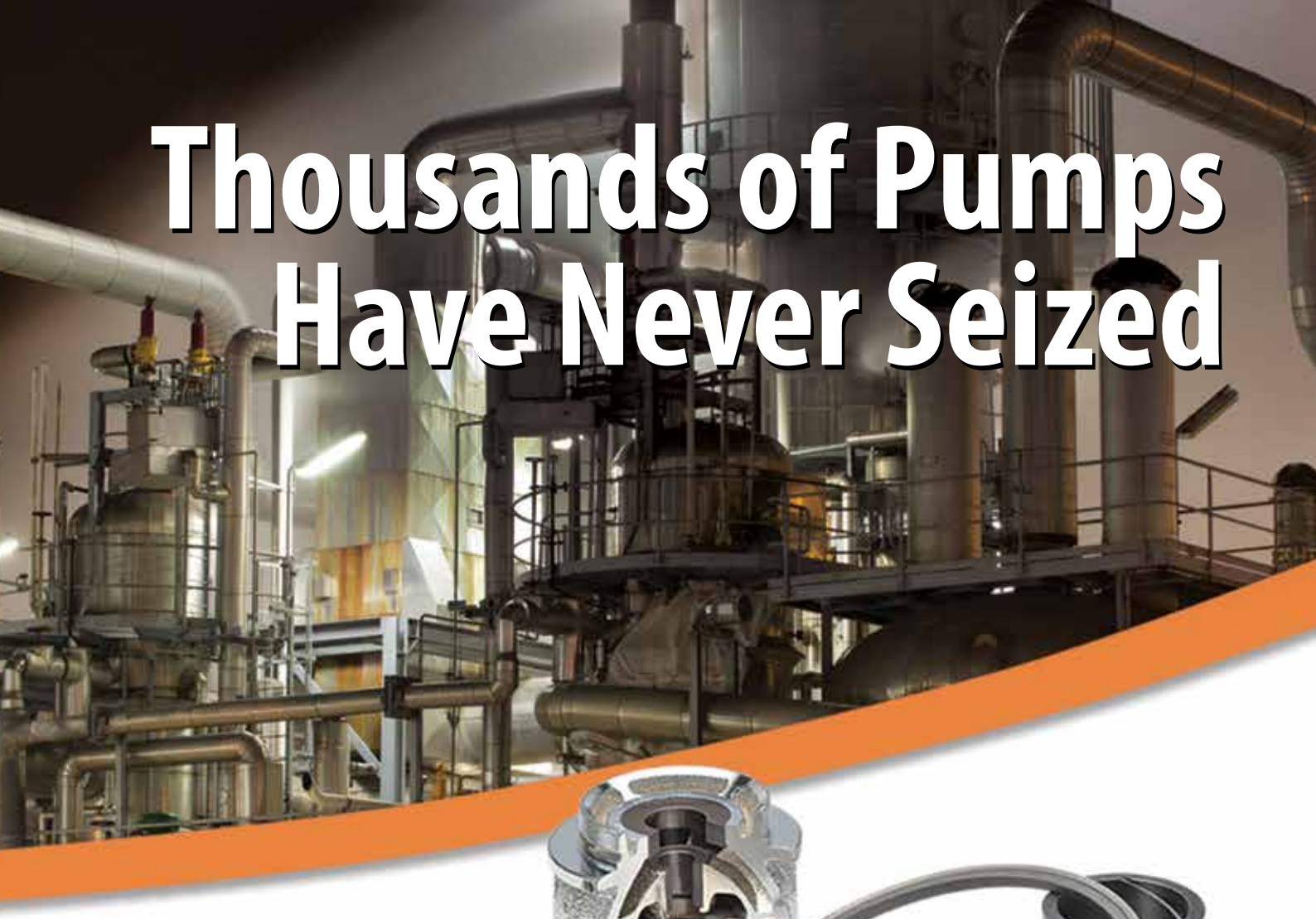

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HABERMANN AURUM PUMPEN

We Pump Reliability into Your Project.

Pumps with protective lining

Linings from elastic materials PU APFlex®, FPM and rubber for superior wear behavior compared to metals, thanks to their "trampoline effect." CeramCarbide®, a non-metallic composite coating, enhances pump performance in applications with hypochlorite, concentrated acids, alkalis, sliding wear and high temperatures.

CHEMICAL INDUSTRY, FILTER PRESS, SALT PRODUCTION, DESALINATION, CYCLONE SEPARATION, SINTER & SCALE, FE, ZN, CU, TI, AL, ETC.

Standardized chemical pumps

According to EN ISO 2858 with APFlex® polyurethane lining for wear protection, easy part replacement and additional component options . The choice of material depends on the chemical, thermal, mechanical or abrasive load. This pump offers the same advantages in terms of wear protection as our heavy-duty HPK pumps.

CHEMICAL INDUSTRY, ABRASIVE CHEMICALS, PRECIPITATES, SODIUM, SO4, CHLORIDE, FERTILIZERS, PO4, SOLVENTS, PIGMENTS

Metallic pumps

Heavy, robust versions of one stage centrifugal slurry pumps. The pump housing is made of high chrome HBN casting, achieving a Brinell hardness of 650 HB. The pump has wear plates on suction and drive sides for more protection of the surface against wear and tear exposed to intense rolling abrasion and impact by solid particles.

TUNNEL CONSTRUCTION, AGGREGATES, MINING, PIPE JACKING, IRONWORK, STEEL PRODUCTION, TRENCHING, HEAVY MINING SLURRY

Vertical pumps

All pump series are available in vertical construction for wet well and dry well installation, max. immersion depth up to 1800 mm. V330 series are vertical pumps with an open system designed for froth pumping applications. Spacial type V1 & V2 enables the pump reach the immersion depth up to 5000 mm.

FLOTATION, FROTHY SLURRY, MILL SCALE AND SEPARATION, COAL & COKE PROCESSING, BLAST FURNACES, AERATED SLURRIES

Submersible slurry pumps

Challenger® pumps come with or without an agitator and in metallic or polyurethane coated versions, which is ideal for low pH or alkali mud. Heracles® pumps are designed for heavy-duty applications with a special shaft seal for smooth, reliable operations. They can be equipped with electric or hydraulic drive.

MINING, EXTRACTION OF FINE SAND, SLUDGE DUMPS, DRAINAGE OF DAMS, CLEANING LAKES, PONDS AND RIVERS

Floating units

Vertical pump on a pontoon is a floating pump station with significant advantages. It is flood-proof, easily installed anywhere on bodies of water, and serves as an active backwash station for sand conveyance. Floating pump stations are designed to set the pump on the floating, apply to lakes reservoirs, ponds, rivers etc.

QUARRY DEWATERING, WATER TABLE DRAWDOWN, SETTLING BASIN, EXTRACTION DREDGER SOLIDS PUMPING, DEWATERING

Water pumps

Our water pumps are specially developed to ensure optimum pumping performance. Numerous factors must be considered when selecting a water pump, such as the size of the system, the volume of water to be processed and the intended use. We offer a comprehensive portfolio of water pumps for every application

WATER & WASTEWATER TREATMENT, DRAINAGE, DESALINATION, IRRIGATION, ENERGY INDUSTRY, HYDROPOWER PLANTS

Sewage pumps Apollon®

Submersible motor pumps Apollon®: drainage, wastewater, sludge and drainage pumps. The use of wear-resistant components, such as the high-chrome impeller treated with the proven ACrS technology, enables the Apollon® series to achieve optimal service life even when working with highly abrasive media.

SEWAGE TREATMENT PLANT, CONSTRUCTION, SLUDGE TRANSPORT, DEWATERING, WATER SUPPLY & MANAGEMENT

Industrial Valves

We offer industrial valves and fittings for all equipment and applications. To find the right solution for you we take into account all key parameters, ranging from internal to external conditions. We offer also valves for highly abrasive media, which are specially developed for the harsh operating conditions

WATER SUPPLY, SEWERAGE, METALLURGY, MINING AND PROCESSING PLANTS, CONSTRUCTION, SPECIAL CIVIL ENGINEERING

Suction dredgers

The dredger consists of a central pontoon, two side pontoons, a diesel-generating set on the common frame with the dredger master's cabin and the gantry for dredge pump movement. With a hydro-dredging system, modular design, robust construction, and advanced hydraulics, they efficiently handle sand, silt and gravel.

SLURRY PROCESSING, EXCAVATION OF SOILS, SAND AND OTHER NON-METALLIC MATERIALS, BOTTOM DREDGING OPERATIONS

In every field of application we support you in selecting the most efficient and durable pump solution for your project and provide you with the highest quality – made in Germany.

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• Water & Wastewater • Building Technology • Cleaning, Washing & Environment • Food & Drugs •

STROBL PUMPEN

STANDARD WITH EXTRAS

TRY OUR CHEMICAL STANDARD PUMPS

- ***Standardised*** – dimensions and performance according to ISO 2858
- ***Versatile*** – large selection of materials, seals and seal-less options
- ***Low-maintenance*** – few spare parts, quick and easy maintenance, long service life
- ***Efficient*** – optimised flows, highly efficient
- ***Special*** – taylor-made solutions for you

follow us

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