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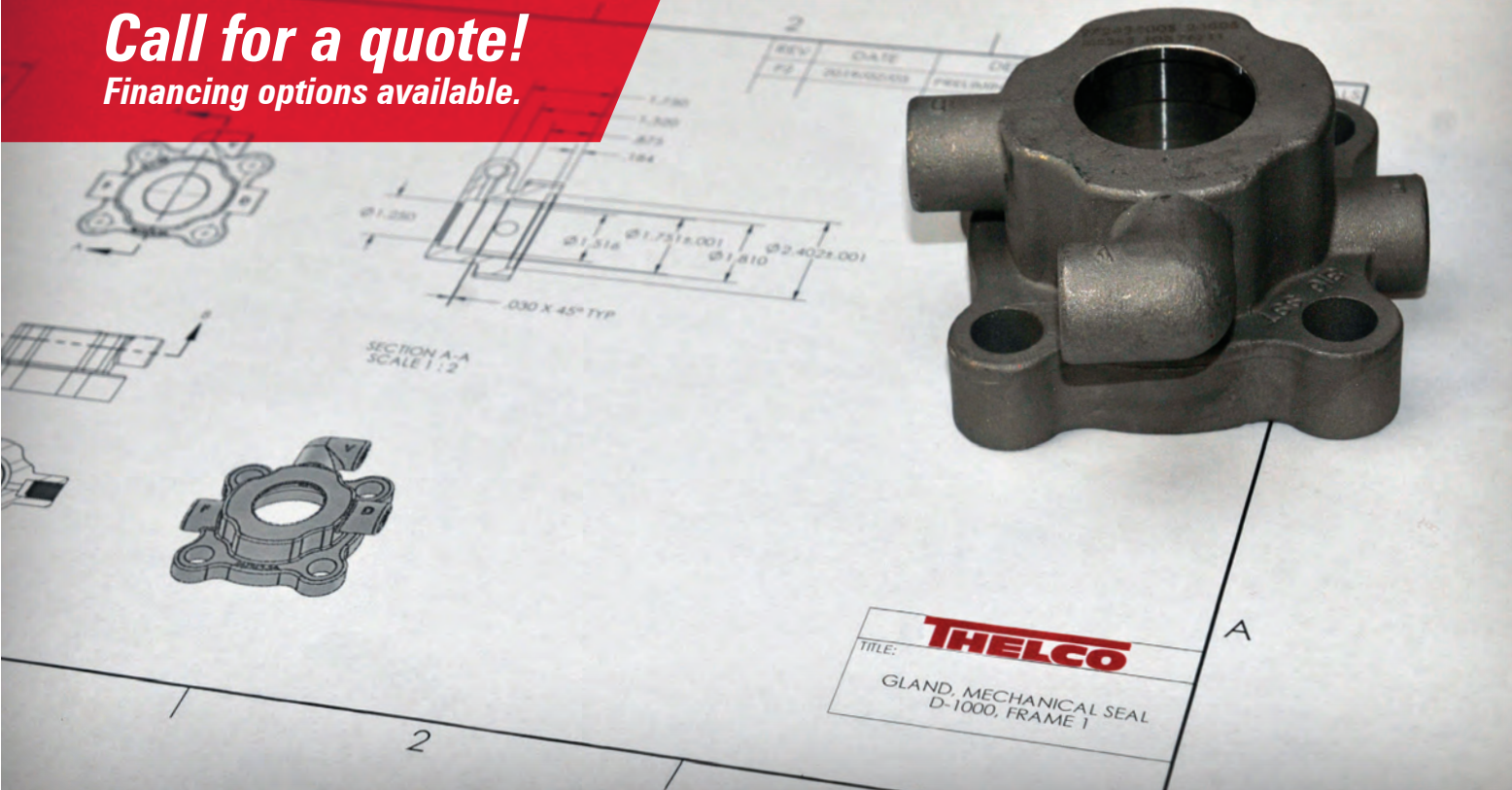
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A NOTE ON THIS ISSUE:

Welcome to the August issue of MPT. If you're reading this, there's a good chance you're on your way to New Orleans for WEFTEC 2022—and so are we! So take a sneak peek at MPT's section of Featured Exhibitors (pg.13) that you'll definitely want to see at this year's event. These profiles present a cross-section of the industry's leading companies you'll want to take note of.

In this month's Case Studies section, Xylem shares how their smart sewer technology reduced CSO volume by 80 percent for the municipality of South Bend, Indiana (pg. 18). During heavy rains, the city faced sewer overflows into the landmark St. Joseph River because an aging sewer system. See how Xylem's technology handled this problem.

Also, the needs of fluid-handling operations are as varied as the kinds of liquids they handle, and do you know how to select the right mixer for your operation? In our Pump Solutions section, Neptune's Eulis Ester lays out the critical considerations for selecting a portable mixer and gaining the advantage toward optimizing any fluid mixing application (pg. 38). Enjoy!



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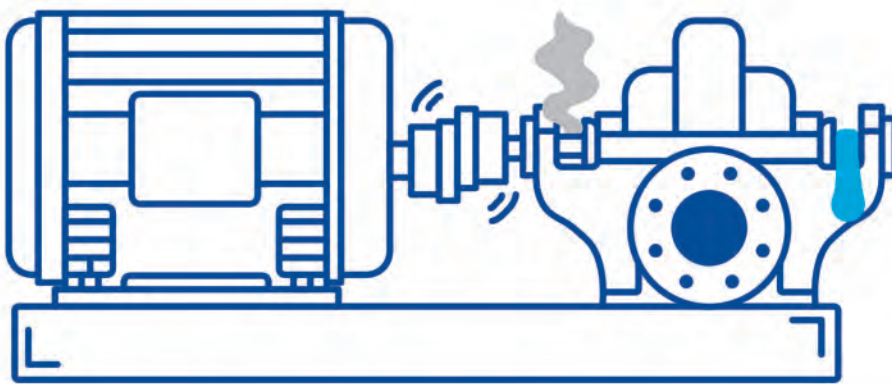
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NCMS MEMBER ATMOSPHERIC PLASMA SOLUTIONS RECEIVES DOD'S APFIT AWARD

National Center for Manufacturing Sciences (NCMS) member Atmospheric Plasma Solutions (APS) has been awarded funding for their PlasmaBlast precision surface preparation system from the Office of the Under Secretary of Defense for Research and Engineering via a pilot program to Accelerate the Procurement and Fielding of Innovative Technologies (APFIT).

APFIT aims to expeditiously transition technologies—with priority given to those developed by small businesses and/or nontraditional defense contractors—from pilot programs, prototype projects, and research projects into production. The PlasmaBlast system, winner of NCMS's 2019 CTMA Technology Competition, is a precision surface preparation system that can remove coatings, clean surfaces, and promote adhesion.

"We are thrilled that APS received funding for the PlasmaBlast system," says NCMS's Debbie Lilu. "Every year, nearly 100 NCMS industry partners submit innovative technologies to our technology competition. The fact that the PlasmaBlast system won the 2019 competition speaks to the great value of this technology." The PlasmaBlast system improves small-scale coating removal operations required for shipbuilding and naval maintenance. The PlasmaBlast 7000-M system accelerates

small-scale coating removal operations without these negative effects.

ULTRASONIC FLOWMETERS PROJECTED TO BECOME BILLION-DOLLAR MARKET

The global ultrasonic flowmeter market size was worth \$690 million in 2021 and is projected to reach \$1.08 billion by 2030, growing at a CAGR of 5.1 percent during the forecast period, according to Straits Research.

To measure the flow rate of fluids, including liquids and gases, ultrasonic flowmeters use ultrasonic technology. They mostly use Doppler and transit-time technology to detect the velocity of a fluid flowing through a pipe, which transmits and receives sound waves. The flow rate of a liquid is determined by interpreting its momentum. Ultrasonic flowmeters have several benefits over conventional forms of flowmeters. This sort of flow measurement system primarily uses non-invasive; transducers do not directly contact the process fluid and do not block the fluid's flow, making them perfect for detecting corrosive and abrasive chemicals.

The primary factor propelling the worldwide ultrasonic flowmeter market is the need for ultrasonic flowmeters in the oil and gas sector for custody transfer applications. Extreme accuracy is required to determine how much of a product has been carried. For receivers, even the tiniest measurement inaccuracy might be expensive.



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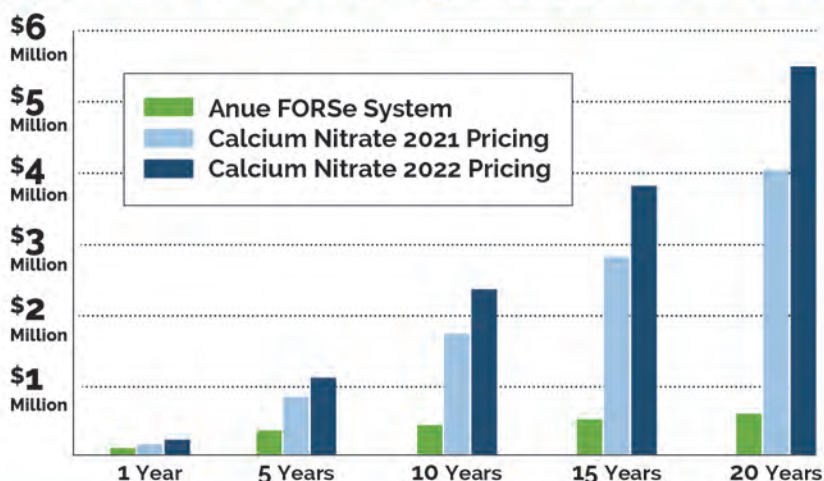
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CORERX APPOINTS NEW CHIEF STRATEGY OFFICER

CoreRx, Inc. announces the appointment of Dan Dobry as chief strategy officer and a member of CoreRx's executive leadership Team. Dobry will report to CoreRx's chief executive officer, Ajay Damani.

Dobry brings to CoreRx twenty-five years of experience as a global CDMO business leader and drug delivery innovator. Early in his career, he contributed to process and formulation development, particle engineering, and materials science innovations, resulting in more than fifteen patents. His experience in the pharma services industry, manufacturing science and technology, product development, alliance management, and in corporate development will be a valued addition to the CoreRx team. Previously, Dobry held leadership roles in commercial development at Lonza, strategic alliance management at Capsugel, and as the vice president of engineering for Bend Research, Inc.

In his role as chief strategy officer, Dobry will oversee CoreRx's strategy and corporate development functions. He will work closely with CoreRx's executive leadership team and board of directors in evaluating, developing, and executing CoreRx's strategic growth initiatives.

"I'm thrilled to join CoreRx at this stage in its journey," said Dobry.

MULTIVAC SPAIN WELCOMES NEW MEMBER TO THE BOARD OF DIRECTORS

On July 1, Diogo Abreu was admitted to the Multivac Spain's board of directors. The role of this experienced manager is to further strengthen the company's position in the flourishing Iberian market. At the same time Managing Director Francisco Monente has stepped down and taken retirement.

Multivac is on a growth course at the moment. Despite the pandemic, the company was successful in 2021 in increasing the turnover 15.7 percent more than in the previous year. A continuously upward trend in spite of numerous economic and political challenges. The growth markets include the Iberian Peninsula covering Spain, Portugal, and Andorra.

Here in his new role as a member of the board of directors, Diogo Abreu, who was managing director of the Multivac subsidiary in Portugal from 2005 onwards, has been supporting the management team in Spain in its daily operational work with his profound knowledge of the Iberian market.

"This measure is intended to further strengthen Multivac's position in the Iberian market, and to continue using the synergies within our subsidiaries," says Christian Traumann, group president at Multivac. ■



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SUBMERSIBLE PUMPS TAKE IT EASY ON THEIR OWNERS

From ease of use to minimal repairs, submersibles earn their reputation

BY SWPA EXECUTIVE DIRECTOR ADAM STOLBERG AND TIMOTHY MERKEL, METROPOLITAN INDUSTRIES

Even as Industry 4.0 and AI are adopted across the board, part of the popularity of submersible pumps remains their relative ease of use and reliability. Also, most submersible repair work can be done without disturbing the overall pump system, eliminating higher end costs normally associated with industrial pump repair. Below, Timothy Merkel, the business development manager for Metropolitan Industries, and SWPA Executive Director Adam Stolberg discuss how submersible pumps make life easier on operators and end users.

Submersible wastewater pumps have a reputation for ease of use and simpler field service than competing products. How have they earned that reputation?

Submersible pumps embrace an inclusive design of motor and pump wet end as a single installable component to the overall pump station. They are compact in design, and by being in the wet well itself, take advantage of motor cooling by the liquid surrounding them, reduce or eliminate suction head and pipe clogging issues with conventional dry pump installations. They are also designed to be easily removed for service. Submersible pumps have become a reliable mainstay of the pump industry over the last seventy years based on all of these factors.

How does the design of a submersible wastewater pump add to their ease of use? Why do repair teams have a reduced need for special tools?

This is one of the great advantages of the submersible pump. Most submersible pumps are combined with a guide rail disconnect system which allows for removal of the pump from the wet well without disturbing the piping and valves of the overall system. By removing the pump from the wet well, it can then be serviced outside of the pump station environment, eliminating the need for confined space entry requirements into the wet well itself. This also allows for a common strategy of having a backup pump available that can easily and immediately replace the submersible pump in need of service so that the overall pump station operation interruption is greatly minimized.

How have IIoT and remote technology been incorporated into field service for today's pump technicians?

Across the pump industry, remote monitoring has become more prevalent in application and capability. From large to small installations, the continuous overall operation of a pump station is the most critical measure of its reliability. Every pump station has a physical location, often with many pump stations spread over a larger geographical area working in concert to service a municipality or other operation. By establishing remote monitoring, and often remote operation into the design of a pump station, the overall communication with multiple stations can be centralized to a secondary more convenient location—whether that be a physical computer, server, or a cloud-based technology that allows for even greater access to the system. In all of these cases, remote access to the pump station frees up personnel from physically monitoring stations, identifies pump inefficiencies more easily and quickly, and can alert pump technicians to the most needed service issues.

Many submersible pumps are being used as replacements in older, non-



submersible centrifugal pumps. What advantages do submersibles offer to these users?

Submersible pumps are a more compact design than most conventional dry mounted pumps allowing for more installation designs when working with replacement of aging systems. Either the station can be completely converted to a wet well station with a standard submersible pump, or a dry

well submersible can be installed in place of the older pump. The dry well submersible pump is also a single unit rather than a coupled arrangement of separate pump and motor of many older installations. Additionally, many dry well submersibles are designed to be mounted either vertically or

horizontally to the existing pump station piping, which allows for options in retro fitting existing pump stations. Finally, dry well submersibles will continue to function in the event of a flooded pump station making it a desired replacement alternative in critical operations or flood prone areas. ■

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SMART SEWER TECHNOLOGY REDUCES CSO VOLUME BY 80 PERCENT

Xylem saves utility \$400 million

BY XYLEM

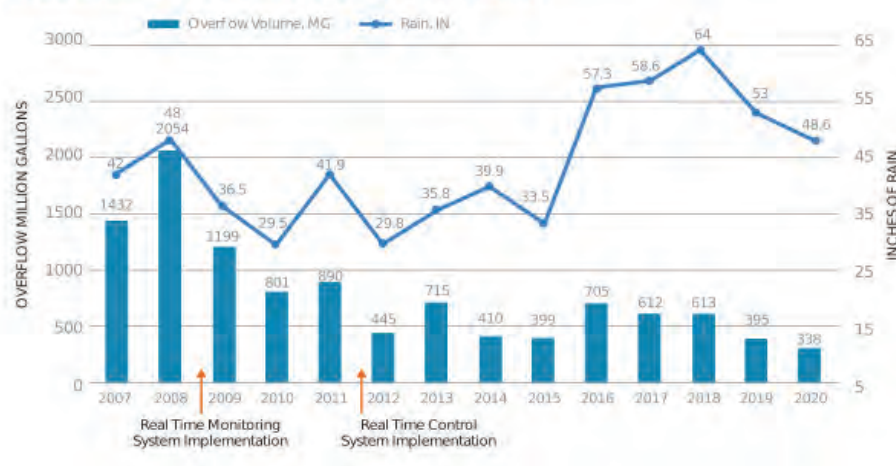
The St. Joseph River has long shaped South Bend's economy, especially during the mid-twentieth century, when the river was the conduit to heavy industrial development such as Studebaker and the Singer Sewing Company. Despite the demise of heavy industry in the 1960s, the city is still the economic and cultural hub of Northern Indiana,

and the St. Joseph River is still the central downtown attraction. Over the past decade, the city's population has started to grow for the first time in fifty years, and the old Studebaker plant and surrounding area is being re-ignited as a technology center to attract new business.

To reduce the one to two billion gallons of polluted water dumped

in the St. Joseph River annually, and the huge environmental, social, and economic costs associated with the ongoing issue, the city embraced a way to harness intelligent watershed technology to optimize its existing sewer system, without the need to build costly new gray infrastructure.

Results: 80% Reduction in CSO



CHALLENGE

Prior to 2008, virtually every time it rained heavily, the city of South Bend faced sewer overflows into the landmark St. Joseph River because the city's aging sewer system could not handle the excess discharge, an average of some one to two billion gallons annually.

In 2012, the city entered into a consent decree, agreeing to a long-term control plan (LTCP) of their sewer overflow estimated at \$713 million in capital improvements plus financing costs. For South Bend, with a population of just over 100,000, this equated to a significant burden per citizen, which is economically unfeasible



given that the average annual household income is around \$32,000.

SOLUTION

South Bend turned to Xylem for help to solve the overflow problem. In 2008, the city installed and commissioned a real-time monitoring system of more than 120 sensors located throughout the city's urban watershed. After a thorough data review in 2012 the system was expanded with Xylem Wastewater Network Optimization, a real-time decision support system consisting of smart sensors and actuators. Xylem's system enables the network to react to sudden wet weather events to avoid sewer overflows and prevent water pollution by trading available sewer capacity in real time and moving flows to under-utilized parts of the network.

Xylem's Wastewater Network Optimization serves overflow information via SCADA screens to operators, via smartphones and tablets to field staff, and through web portals jointly developed with the city's engineering staff. A key benefit is that operators have the ability to override the system at any time and take control.

Since 2012, the monitoring sites (currently 165) and thirteen automated gates and valves have eliminated dry weather overflows and reduced combined sewer overflow (CSO) into the St. Joseph River by more than 70 percent.

Eric Horvath believes in the benefits of the real-time decision support system approach. In 2021, the Department of Justice and

the U.S. Environmental Protection Agency endorsed the city of South Bend's updated long-term control plan requiring 60 percent less infrastructure investment than originally estimated, saving the city

infrastructure, while improving system performance and capacity utilization, lowering operating costs, and delivering environmental gains ten to fifteen years ahead of schedule. ■

“We spent \$400 million less than originally estimated, achieving the greater environmental benefit and level of service, just by optimizing the existing system in the ground.”

—ERIC HORVATH | SOUTH BEND DIRECTOR OF PUBLIC WORKS

approximately \$400 million in capital expenditure spending.

OUTCOME

Since implementing its smart sewer program, dry weather overflows have been eliminated and combined sewer overflow volumes have been reduced by 80 percent, or roughly one billion gallons per year. South Bend has also enjoyed approximately \$1.5 million in annual operating and maintenance cost savings. In addition, E. coli concentrations in the St. Joseph River have dropped by more than 50 percent on average, improving the water quality.

Overall, this real-time decision support system allowed South Bend to reduce costly traditional gray

Xylem Vue, Xylem's digital solutions platform, combines smart and connected technologies, intelligent systems and services, and over 100 years of problem-solving expertise. Xylem's Asset Performance Optimization solution helps identify, prioritize, and quantify potential challenges in water pipeline networks before they negatively impact the community. For more information, visit www.xylem.com.



BIG BLOWER SAVINGS FOR THE UNITED KINGDOM'S LARGEST WATER AND WASTEWATER COMPANY

*New monitoring study shows benefits
of efficient aeration*

BY STEVE BARRETT, RIVENTA

Following a highly detailed study with its proven FreeFlowi4.0 (FFi4) pump monitoring equipment, optimization experts Riventa have identified annual savings of \$303,000 for nine blowers that serve aeration lanes for Thames Water in England.

During a week-long exercise, the performance of each of the blowers was monitored using the thermodynamic technique, with measurements taken every five minutes for:

- Inlet and outlet pressures
- Inlet and outlet temperatures
- Electrical input power (taken before any inverter, if one present)
- Frequency downstream of any inverter, where applicable

From this, the following were calculated:

- Isentropic efficiency of the blower
- Total differential pressure rise across the blower
- Mass flow rate and volumetric flow rate
- Specific power requirements per unit of air volume

INSIDE THE THAMES WWTW

The Thames Wastewater Treatment Works operates in tandem with another site, as it takes the residual load within the catchment. As a result, there is a broad operating range, for which the aeration requirements need significant flexibility in blower output.

There are twenty aeration lanes (numbered Blowers 3 through 23) in use and seven operational blowers that serve a common header that supply them with air. The blowers are of centrifugal type, split into two different sizes: four at 355 kilowatts, 415-volt supply (Blower 4, on the 3.3-kilovolt system, is not used anymore and is out of service). There is a ninth blower, Blower 6, on the low voltage system, which is a high-speed turbo-type unit (285

kilowatts, 400-volt supply). This unit, however, has been recently installed and is still awaiting completion of final commissioning works. As such, it was not run at any time during the logging period and is not included in any of the following analysis.

All seven operational units have the ability of delivering variable flow rates individually through the use of their individual inlet guide vanes.

- Blowers 1, 2, and 3 (3,300 volts; 210 kilowatts), and Blowers 5, 7, 8, and 9 (415 volts, 355 kilowatts) all supply a common header that provides air at 450 to 500 millibar to twenty plug-flow type aeration lanes.
- Air flows to the lanes vary widely between 20,000 and 95,000 actual cubic meters per hour, a turn-down of almost 5:1.



FREEFLOWi4.0

RESULTS

All available blowers ran during the course of the logging period, with a wide range of operating flow rates required (20,000 to 90,000 actual cubic meters per hour), producing the need for solo operation to all seven blowers in parallel.

For 59 percent of the time, the blowers operate at more than 73 percent efficiency. The rest of the time is spent at efficiencies below 72 percent. This time includes operation during disruptive periods when there are planned change-overs from grid power supply to onsite generation. This shows that the site's control of the process is relatively robust, with limited impact on overall average aeration performance.

Interestingly, it is noticeable that when there is a reduction in efficiency, it coincides with the removal of one of the HV blowers from operation.

The blowers have to overcome the differential pressure in order to deliver the desired flow of air to the aeration lanes. There is a combination of frictional losses in the delivery pipework and diffuser head arrangement (as well as static pressure), due to the height of fluid above the diffuser heads.

In this case, the full range of operation of all the blowers was needed, providing a good relationship for the system pressure requirements for any flow. A static pressure of 445 millibar translates to an effective level in the lanes of 4.5 meters above the diffuser heads, and approximately 512 millibar required at the maximum flow rate (90,000 actual cubic meters per hour).

It is important to note that this system characteristic also encompasses all leakages and blockages—and any partially closed valves. It is known that a proportion of the diffuser heads have been identified for replacement in the coming months. Greater OTE (oxygen transfer efficiency) should occur with larger area of interface between air and liquor, reducing air demand per unit of BOD. The control valves will operate more within their optimum operating ranges (usually 30 to 70 percent open).

During the logging period there were 8 prevailing operating combinations (i.e., greater than 10 percent utilization) that constituted



77 percent of the total time run, all of which had average efficiencies of between 73.3 and 74.1 percent.

The most efficient blowers are Blowers 1 and 2 (at 80 percent each) and the least efficient is Blower 5 (at 67.5 percent). It should be borne in mind that as inlet guide vanes are closed, there is some sacrifice to efficiency. However, Blowers 1 and 2 can both achieve 80 percent efficiency—and so it is fair to expect that the other blowers, of the same manufacturer and type, should be able to achieve the same performance, through remedial works.

The electrical power for each unit of air or oxygen supplied to the aeration lanes has an average requirement of 0.018 kilowatt-hours per actual cubic. As air demand increases, so does the cost of oxygen supplied. Moving from the average flow to the most common operating conditions between six and seven blowers operating, there is an increase in specific power of 3.2 percent.

With clean lanes and new diffuser heads it would be expected that the mass of oxygen should reduce (for the same average biological load) as the oxygen transfer rate (OTR) increases through better bubble formation and distribution. It should be noted that OTR is related to the

area of the interface between the liquid and the air. Smaller bubbles in greater density will address this.

Downstream, in each of the twenty aeration lanes, the dissolved oxygen (DO) is measured in two locations at progressively different parts of the aeration process. One important observation is that the DO readings appear high, given a set point expectation of approximately 2 milligrams per liter as a final output. High DO will mean considerable additional energy usage, because more air is supplied than needed. It can also have a negative impact on settlement of the sludge downstream, as natural flocculation is less effective.

There are no flowmeters on Blowers 1 through 3 but they are operating close to 13,000 cubic meters per hour each. It would be recommended that a flowmeter is added to the combined output of these three blowers (there is insufficient room to install a flowmeter on the discharge of each blower). This would allow the construction of KPIs (e.g., kilowatt-hours per cubic meters) for benchmarking purposes.

When the diffuser heads have been replaced in each specific lane, the control valves need to be addressed. Twenty-nine of the forty control valves are currently operating outside the

recommended operational range of 30 to 70 percent, which means they will not be working effectively. This will be because of greater than expected flows downstream, possibly due to burst diffusers or leaks. Replacement of the diffuser heads will remedy this—and greatly improve the control of lane specific DO.

It is also noticeable that the guide-vanes are used where VFD's could provide a similar effect (with some attention to the FDS and PLC logic used). This would have the advantage in that there would be only marginal change in isentropic efficiency, with a change in speed, yet the blower shaft power would be substantially less.

For the full range of flows measured over the logging period, and using a variable speed drive throughout—instead of inlet guide vane control—would give Thames Water a potential saving of \$27,500, or 1.8 percent, per year.

Given the additional costs surrounding 3.3-kilovolt inverters, and the associated equipment, the costs to achieve this for Blowers 1 through 3 could be prohibitive. However, Blowers have a 250-kilowatt rating, and generally demand an electrical load of no more than 230 kilowatts. There could therefore be a comparison of 3,300-volt inverter retrofit to 415-volt

electrical infrastructure replacement, making all equipment low voltage. This has advantages of its own: safer to operate, ease of spares, less costly to maintain—and lower initial capital cost.

REFURBISHMENT SAVINGS ANALYSIS

The original equipment manufacturer's (OEM) performance curves were not available. However, it is fair to assume that the same efficiency should be expected of all of the Blowers. Blowers 1 and 2 both achieved an average 80 to 81 percent over the logging period—and both operated more than 95 percent of that time. If all the other blowers were able to achieve the same efficiency of 80 percent, this would give Thames Water a total saving of \$120,000 per year.

With Blower 6 part-way through commissioning, it is evident that there is a perceived advantage in choosing a turbo-type blower over the existing centrifugal types. It is recommended that before further replacement occurs, the post-refurbishment performance is verified; thus, providing an alternative to the introduction of further new technology.

Hybrid-type blowers will provide larger turn-down ratios of 3:1 relative to the much narrower performance of the centrifugal types. However, there is a trade-off with a lower efficiency of maximum 75 to 77 percent. Turbo-type units have a narrower turn-down (max 2:1) but a higher peak efficiency (82 percent)—although efficiency falls

away either side of its best efficiency point. Purchase and maintenance costs also tend to be higher than hybrid or the status quo.

With all seven of the current blowers running, the total load was at most 1,710 kilowatts (at isentropic efficiency 74.2 percent, drive efficiency 91.5 percent). Blower 6 is rated as 18,000 cubic meters per hour for 285 kilowatts (Pshaft). The maximum flow of 92,000 cubic meters per hour seen over the logging period would thus need five units like Blower 6—and would demand 1,546 kilowatts for a similar air flow, constituting a potential 10 percent saving to existing; 10 percent of the current energy bill is \$153,000. ■

STEVE BARRETT is managing director for Riventa.

Riventa has a long track record delivering highly innovative technology and is committed to working with the best project delivery partners across the globe and focused on achieving great results for its customers. The Riventa team of pump energy experts includes highly skilled hydraulic engineers, software developers, engineering consultants, business managers, contract specialists, and project managers. For more information, visit www.riventa.com.

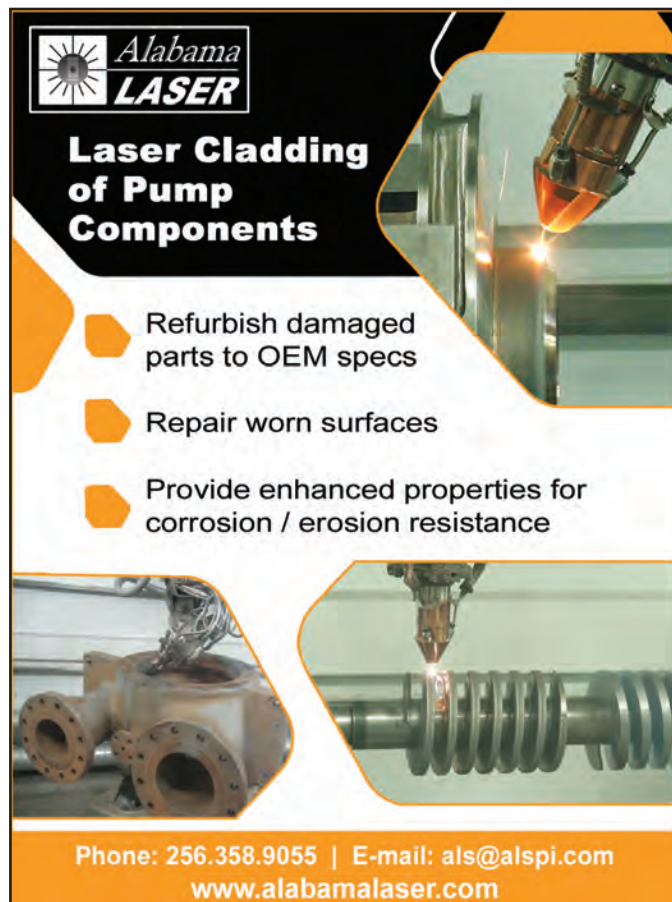


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WHAT REALLY GOES INTO A FULL-SERVICE ENGINEERING PROJECT?

Engineering expert shares top tips to find the right solution

BY IAN HART, ADI GROUP

Perhaps unsurprisingly, engineering solutions are not simply about supplying equipment or carrying out the required work. When it comes to delivering effective services, a stable process tailored to a client's needs as well as a strong supply chain should be at the very core of the operation.

Many others in the business focus on providing the solution itself, but without working out the logistics of the

project first and making sure they work for the client, what could be effective solutions on paper, can easily become ineffective once they are executed.

Not having a complete picture of the process and its requirements from the start can also lead to time delays, inconsistencies and other issues that only present themselves down the line. Below, we discuss the importance of project management within the engineering industry.

ONE SOLUTION

With the above in mind, adi Group is dedicated to providing bespoke, complete turnkey solutions for clients that effectively target their needs. With any new project, adi's solution-focused approach involves working with clients to develop an understanding of their requirements and then devising a complete plan that incorporates all the right elements.

Our partnerships are based on a need for bespoke solutions, with every new project having different criteria and therefore requiring the creation of a new plan each time. When it comes to devising and executing a plan for a new client, we begin by looking at what the client needs. Clients often know they have a problem but are not always aware of where it lies or what is needed to solve it.

We start by providing a user requirement specification, that is a complete plan that effectively targets the client's requirements. We then present it, ensure the client is satisfied with the proposition, and provide the services in the shortest amount of time possible.

At adi, we fully focus our efforts on the problem at hand by providing a single solution that addresses the issue, and as a multidisciplinary firm, we are able to do so without a break in the supply chain.

WHAT GOES INTO DEVISING THE RIGHT PLAN?

In a nutshell, we collect all the necessary information about the client, work out the requirements and related costs and incorporate them all into a full plan. For example, at adi Projects, we work as both project managers and consultants, ensuring our clients get the very best results each and every time.

Recently, adi Projects, as well as divisions of the wider adi Group, worked with leading fresh produce provider Florette, who needed to consolidate its shipment logistics after opening a new salad distribution facility to meet growing demand. In Florette's case, we looked at the volume of products, where it was coming from and how often, and the logistics required to bring it to its destination without compromising the freshness of the product.


Our team at adi Projects carried out a full study into Florette's operational systems and determined that the firm needed an intermediate

storage warehouse to support its new shipment facility. We then began working to deliver a solution that would meet budget as well as timescale and quality requirements.

DIVISIONS THAT WORK TOGETHER

There are many factors to consider when it comes to delivering a new project. From project and warehouse management to creating and supplying the necessary structure and equipment, there are a lot of criteria that need to be met to go from a project to a robust solution.


Our multiple divisions work together to act as a one-stop shop for engineering services, so that clients can rely on one shop without involving third-party providers, which typically complicates and elongates the process. Providing a complete solution starts with adi Projects: we get involved from the early stages of a project and see it through to completion.




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Depending on the project, the help of multiple other divisions can be required and is what also improves speed, efficiency and success whilst reducing cost to the client. For instance, it was the combined efforts of the in-house teams at adi Projects, adi Climate Systems, adi Mechanical, adi Electrical, and adi Automation that brought the Florette project to life. The different divisions work together under a single point of contact for the client, as a unit to deliver a combined solution that

targets the client's needs through and through.

STRENGTH VIA RISK REDUCTION

At adi, we operate based on the three factors of program, quality, and cost. We eliminate and mitigate the risk from any project by devising the right schedule, working with trusted individuals to guarantee quality, and collaborating with the client to provide a cost-effective solution that fully covers their needs. Over 80 percent of all of our projects are self-delivered utilizing our in-house skilled engineering workforce of nearly 750 employees.

This is where partnering with adi Group can provide a real advantage, as our ability to deliver a unique, targeted solution using only in-house resources minimizes the risks associated with working with third parties whilst improving turnaround time and efficiency.

So, our advice to those seeking a full-service engineering project? Enlist the help, support, and expertise

of combined project managers and consultants. ■

IAN HART is business development director of adi Projects, one of the divisions of adi Group. As the partner of choice for leading manufacturers, adi Group ensures there are no breaks in the supply chain, and its expert engineers are recognized for their award-winning engineering solutions, possessing various divisions on hand to support the world's leading brands. The core business sectors adi Group specialize in cover food and beverage, automotive, aerospace and defense, petrochemical, biosciences, as well as manufacturing entities in other industries. Now recognized across the United Kingdom and Ireland, adi Group is a true partner for some of the world's leading brands and household names. For more information, visit www.adiltd.co.uk.

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COMPACT CONTROLLERS INCREASE ROI FOR MACHINE BUILDERS

New programmable automation controllers offer built-in security, open protocols, and high performance out of the box

BY KIM VANSANDT

To stay competitive, today's OEM machine builders must provide equipment that is ready to support analytics and give end users competitive advantage through increased efficiency, speed, and quality. However, as builders develop innovative solutions for material handling, life sciences and more, they can struggle to program and deliver machine control systems on time and within budget with the performance,

security and flexible connectivity customers require.

LEADER OF THE "PAC"

A new family of compact programmable automation controllers (PACs) helps original equipment manufacturers (OEM) successfully meet customer requirements by minimizing the need for specialized software engineering talent. Emerson's release of its PACSystems RSTi-EP

CPE200 controllers will deliver large programmable logic controller (PLC) capability in a small, cost-effective, IIoT-ready form factor so machine manufacturers do not need to sacrifice performance for price.

The CPE200 series solves these problems with security-by-design, open programming, and open communications built in to simplify connectivity to external analytics software platforms while reducing

cost and complexity for OEMs and end users.

CONNECTION IS THE KEY

"Gaining competitive edge in today's marketplace means having the flexibility to connect to the wide array of equipment end users employ as part of their proprietary processes, and supporting secure, open connectivity to allow easy access to on-premises and cloud-hosted analytics platforms," says Jeff Householder, president of Emerson's machine automation solutions business.

The RSTi-EP system is designed for industrial internet applications with modular, plug-and-play connectivity and high channel density. The RSTi-EP station is meant to be installed horizontally on a DIN rail; vertical positioning is also possible but that reduces heat dissipation, which changes the derating values.

It is an I/O solution for stand-alone and networked PLC control systems for a variety of applications, including: equipment skid control, pumps management, material handling, basic machine safety, and conveyance systems.

SPEAKING YOUR LANGUAGE

The controllers offer open communications through native, pre-licensed support for OPC UA Secure and other common industrial protocols for flexible connectivity over high-speed Gigabit Ethernet. IEC 61131 programming languages and C, the world's most popular

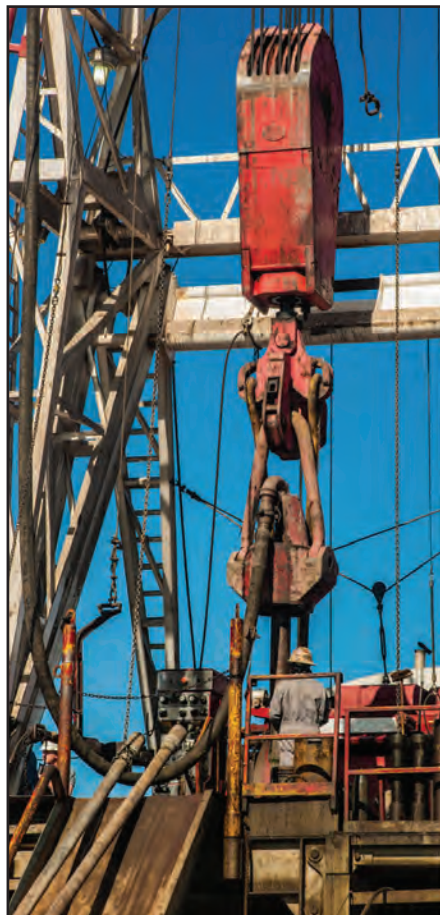


and easiest-to-use programming language, help engineers write and run the high-performance algorithms that enable proprietary production strategies and advanced automation technologies.

"The CPE200 series controllers take advantage of Emerson's

cybersecure-by-design architecture, common programming capabilities, and IIoT readiness to provide options currently missing in legacy compact PLCs," adds Householder. ■

Emerson, headquartered in St. Louis, Missouri, is a global technology and engineering company providing innovative solutions for customers in industrial, commercial and residential markets. Its Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs. Its Commercial and Residential Solutions business helps ensure human comfort and health, protect food quality and safety, advance energy efficiency, and create sustainable infrastructure. For more information visit www.emerson.com.



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FRONTLOADING COMPUTATIONAL FLUID DYNAMICS BENEFITS EVERYONE

Tips for increasing engineering productivity *Part 1 of 2*

BY JOHN MEYER, SIEMENS

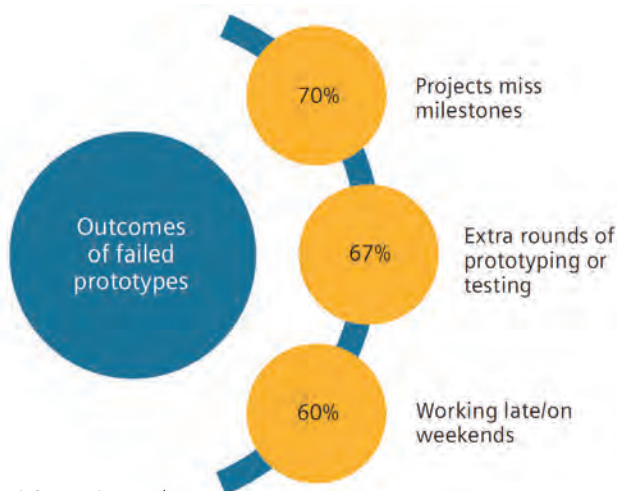
The global competitive landscape for manufacturing is squeezing everyone—from the Tier 1 automotive companies to electronics goods manufacturers. It is shortening the required time to market and with little warning. This high-pressure environment requires high productivity from its players resulting in either doing things faster and leaner without compromising quality or giving the game away to a hungrier competitor who is willing to do whatever it takes.

How do you become more productive? Do you continue to do the same thing over and over again and expect a different outcome? Or do you examine every step in the process to make sure you have an optimal one that enables your team to work smarter and produce more?

Surveys conducted by multiple industry analysts and CAE vendors suggest that successful companies test and assess their designs well before the prototype stage.

Many frontloaded simulation tools are available for use by design engineers. About twenty years ago, the first wave of simulation tools, stress analysis, was introduced for use during the early design stages and it quickly became an integral step in the process. Now, all major MCAD vendors provide design-level stress simulation as a part of their portfolio. By frontloading stress simulation and conducting analysis early during the design stage, manufacturers did not stop simulation during the validation stage. Simulation simply became a method by which trends were examined and less desirable design ideas were dismissed. However, unlike the verification stage, during the design phase, speed is of the essence. Engineers need to simulate not only early but also often to keep in step with the speed of design changes. By iterating rapidly, engineers can discount the less attractive ideas and innovate more. Once a design has been explored and identified as viable, it can continue on to the verification stage.

The practice has now spread to new areas including computational fluid dynamics (CFD) analysis—long the reserve of the specialist during the validation phase. Frontloading provides the best environment for design



(Source: Lifecycle Insights).

TIP #1

Encourage performance assessment as early as possible and promote collaboration and knowledge sharing between analysis experts and design engineers during the design process to immediately improve efficiency and productivity in your organization.

centric CFD. This is similar to what in the past was called “upfront” CFD, except that here we are talking about embedding CFD in CAD, which adds benefits throughout a product’s manufacturing process. Market research data such as this from Lifecycle Insights highlights top objectives for fluid simulation as a design tool:

- Meet product requirements (for example: lower weight, faster speed, complex behaviors etc.)
- Avoid downstream development delays and costs (for example: reduce testing and prototyping, reduce change orders, etc.)
- Satisfy customer contractual obligations or regulatory requirements
- Reduce product lifecycle costs
- Drive production costs lower

In short, design engineers can help reduce the number of prototypes and optimize cost (through use of better materials and quality), efficiency, as well as improve company profit margins.

SUCCESSFUL IMPLEMENTATION IS KEY

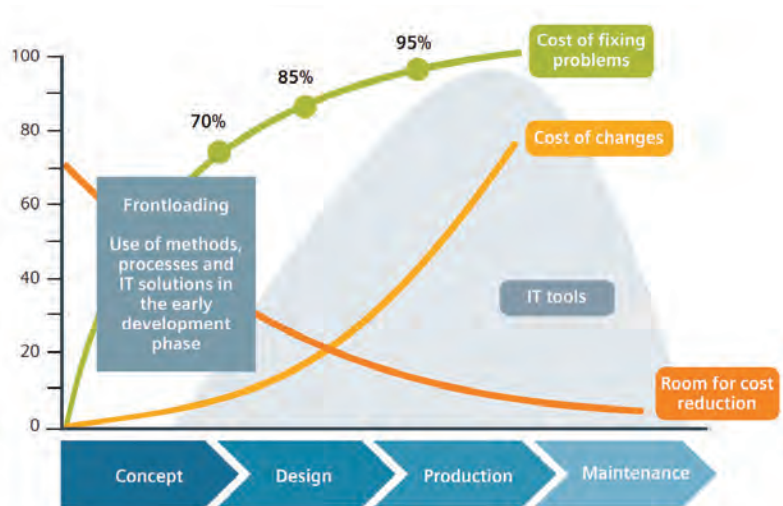
Frontloading CFD has obvious benefits but how best to implement it? Implementing any change requires an examination of the four main elements of design and product development:

- The product being designed
- The process being used to design it
- The designer
- The end user of the finished product

Each consideration is a potential source of complexity and improvement. However, the process and the designer can be adjusted for immediate productivity gains. The product will be automatically improved as a direct result.

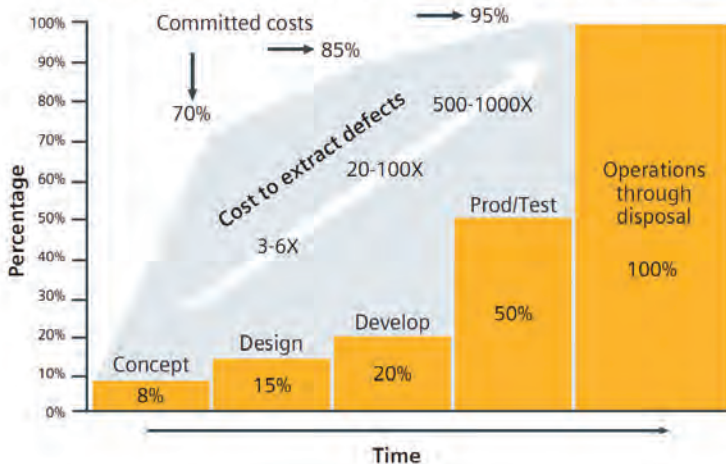
THE PROCESS

True to the concept of frontloading, many leading manufacturers have abandoned the old serial design system, where various functions work along a continuum, in favor of a multi-disciplinary product design process that requires successfully integrating multiple authoring systems and processes. For example, the number of electronic components in cars has grown drastically. Electronics now accounts for 35 to 40 percent of its cost. The Mercedes-Benz S-Class has 100+ ECUs and contains nearly as many ECUs as the Airbus A380 (excluding the plane’s inflight entertainment system). Therefore, designers need access to multiple tools across mechanical and electric/electronic domains to ensure a timely delivery of products that meet with customer specifications.

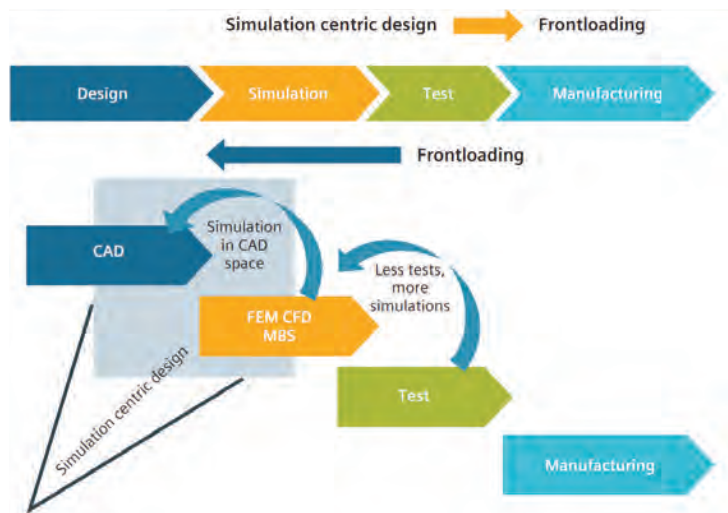


Frontloading economical value (Source: Prof. Dr. Martin Eigner, VPE, TU Kaiserslautern).

Cumulative percentage lifecycle cost against time



Committed lifecycle cost as reported by the Defense Acquisition University. The arrow shows that errors are less expensive to fix the earlier they are removed in the lifecycle (Source: INCOSE).



CAE centric design—CAE frontloading.

TIP #2

Impact efficiency and company profit margins by reducing the number of prototypes and optimizing cost (through use of better materials and quality).

This complex environment requires a high level of interdependencies to function effectively. Despite this complexity, organizations that have successfully implemented frontloaded CFD have not needed to reimagine or change their engineering process to benefit from it. Many engineering team managers originally thought that it would be more convenient to use existing tools, but they quickly realized that they were forcing their teams to use the wrong tools. The key success factor is selecting the right solution that offers the right combination of application-specific functionality and that fits into existing engineering processes without any disruption.

However, not just any CFD tool can be frontloaded. The CFD software that is used during the verification stage is not a good candidate for frontloading in the design process. This can be seen by reviewing the traditional CFD process where the CFD code receives geometry from a stand-alone CAD system versus a CAD-embedded one.

All CFD simulations require use of CAD models, geometry preparation including CAD clean-up and repair, meshing, solving, postprocessing and reporting. But each type of software deals with this process differently. The traditional process requires stepping inside and outside of the CAD package and repeatedly returning to the CAD tool with inherent risks of geometry approximations coming into the CFD simulation. Because design is iterative in nature, this process needs to be repeated for every single

TIP #3

Successful implementation is the key to reaping benefits of frontloading CFD.

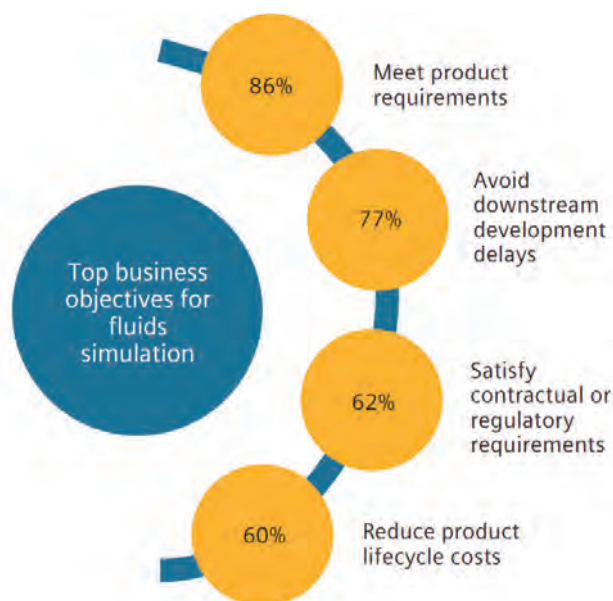
geometry change. In comparison, CAD-embedded CFD is contained within the CAD software; any and all geometry changes take place inside the CAD environment.

Many traditional CFD software programs consist of multiple interfaces – one for preprocessing, one for solution, and another for postprocessing. Traditional CFD software programs also tend to have their own proprietary interfaces that are not integrated with CAD. Every time a model needs to be analyzed, the data has to be prepared and exported out of CAD and imported into the CFD tool where the model can be “healed” for use.

Traditional CFD tools are crammed with technology that requires advanced training and education, which is why dedicated analysts are usually assigned the task. For example, most traditional CFD tools support many types of meshing algorithms. The engineer has to know which one would be the most appropriate for the specific application. In addition, he or she will have to work on the mesh until an optimal mesh for the model and application has been achieved. In short, using traditional CFD tools can be extremely time-consuming and slower than is needed during the design stage.

A LOOK AHEAD

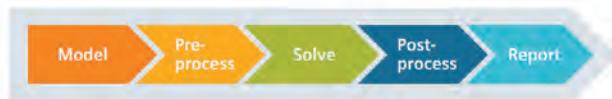
In next month's conclusion, we'll take a closer look at these traditional CFD tools but with an eye toward how they



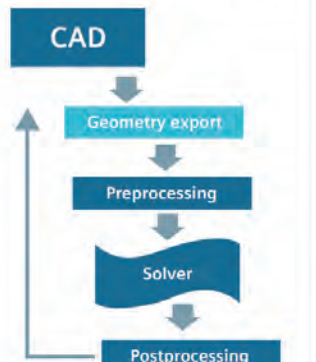
(Source: Lifecycle Insights).



Generally accepted elements of design.

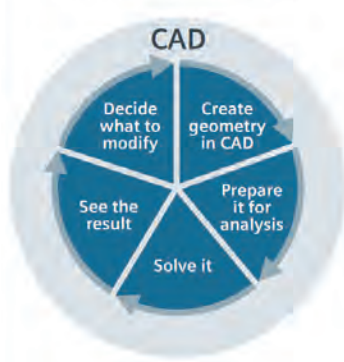


Traditional CFD: Sequential process



The CAE simulation process.

Frontloading of CFD inside CAD



compare against the benefits of design-level frontloaded CAE solutions. Finally, we'll demonstrate how Simcenter FLOEFD technology, first introduced to the market in 1991, has been used by thousands of engineers to frontload CFD in the design process and the successes they've found using it. ■

TIP #4

Select the solution that fits into your existing processes without any disruption.

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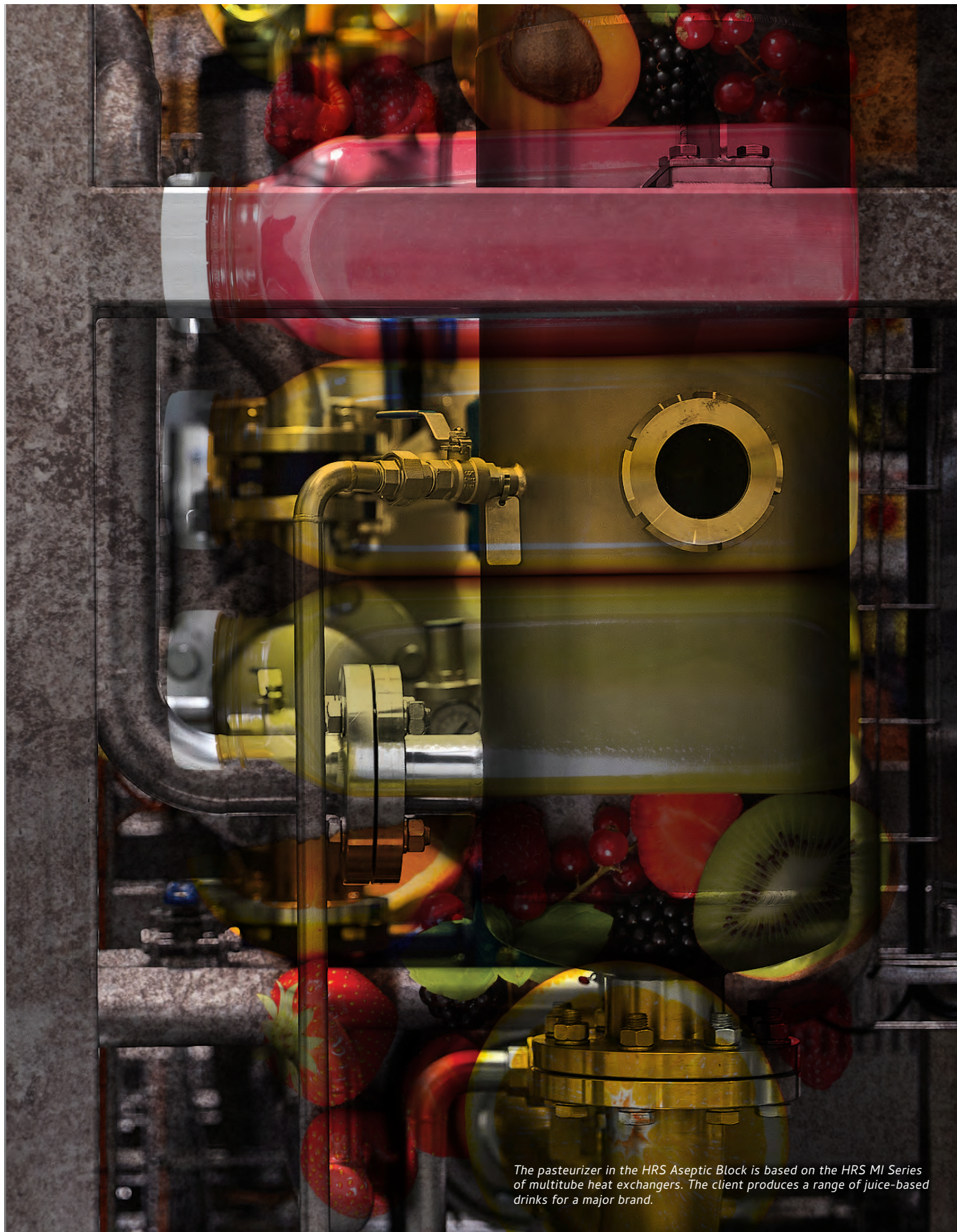
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The pasteurizer in the HRS Aseptic Block is based on the HRS MI Series of multitube heat exchangers. The client produces a range of juice-based drinks for a major brand.

INCREASE PRODUCTION, NOT YOUR FOOTPRINT

Pasteurizer increases capacity for drink manufacturer

BY MATT HALE, HRS HEAT EXCHANGERS

An HRS Aseptic Block pasteurizer and filler has allowed a contract manufacturer of soft drinks in the United Kingdom to increase its capacity in order to fulfil extra orders from its client. The customer is a supplier of contract manufacturing, packing, and distribution services for the food and drink industry. One of their products is a best-selling branded fruit juice drink produced under contract for a major brand.

When they needed to increase production capacity within a limited existing footprint, they approached HRS for a solution, which also needed to preserve the fresh taste and premium quality characteristics of the product.

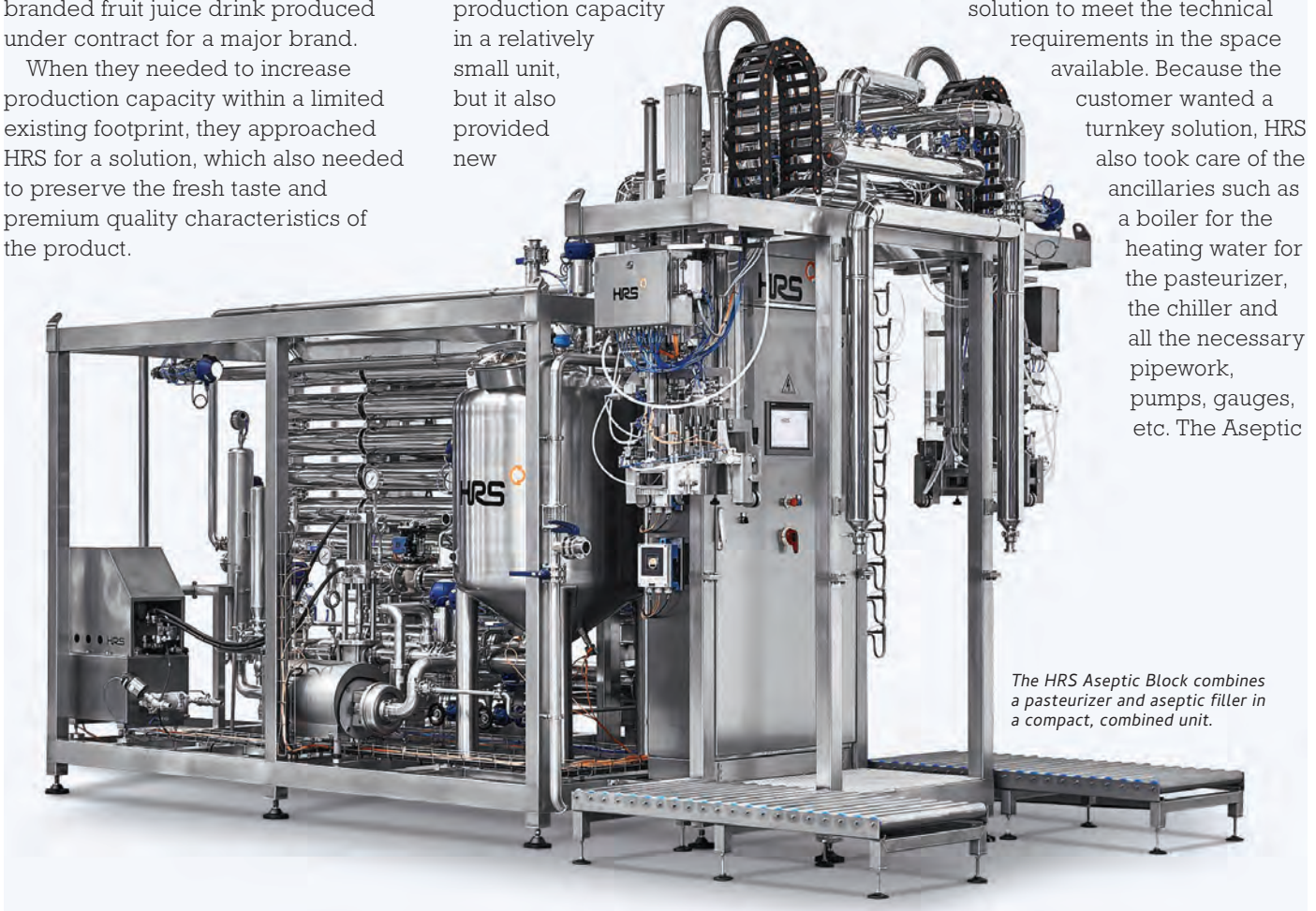
BUILDING UP CAPACITY

The customer had an existing plate heat exchanger for pasteurizing drink products, but this lacked sufficient capacity to meet the increase demand for the product, and due to its design could only cope with a limited range of product types. Using a tubular pasteurizer based on an HRS multitube heat exchanger not only increased production capacity in a relatively small unit, but it also provided new

capacity to handle thicker and more viscous products if required.

HRS ASEPTIC BLOCK UNIT

After consultation it was decided that an HRS Aseptic Block unit—incorporating a pasteurizer based on the HRS MI Series of multitube heat exchangers, pumps and AF Series aseptic filler to fill bulk bag-in-box products—would be the best solution to meet the technical requirements in the space available. Because the customer wanted a turnkey solution, HRS also took care of the ancillaries such as a boiler for the heating water for the pasteurizer, the chiller and all the necessary pipework, pumps, gauges, etc. The Aseptic



The HRS Aseptic Block combines a pasteurizer and aseptic filler in a compact, combined unit.



The Aseptic Block uses HRS's AF Series of aseptic fillers.

Block also included a buffer tank, integrated cleaning-in-place system, and controls.

FEELING THE HEAT

Capable of handling 3.3 tons of product per hour, the pasteurizer raises the temperature of the product from 59 to 203 degrees Fahrenheit

(15 to 95 degrees Celsius), with a holding time of thirty seconds, before the product is cooled to 64 degrees Fahrenheit (18 degrees Celsius) ready for aseptic filling. Since installation, the HRS Aseptic Block has performed to specification, fully meeting the needs of both our customer and their client. ■

MATT HALE is international sales and marketing director for HRS Heat Exchangers. He began his career in the food and dairy processing sectors in the late 1980s before moving into sales in the mid 90s. He has been involved with heat exchanger systems since 1997 and has held a number of sales roles at senior management level. Hale joined HRS in 2013 as international sales manager, where he utilized his expertise in key account management and distribution. Since 2015 he has had responsibility for the HRS Group's global marketing. For more information, visit www.hrs-heatexchangers.com.

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

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KEY CONSIDERATIONS FOR SELECTING A PORTABLE MIXER

How to gain the advantage toward optimizing any fluid mixing application

BY EULIS ESTER, NEPTUNE

The needs of fluid-handling operations are as varied as the kinds of liquids they handle. For those that mix fluids together, some might require small-batch blending while others need to mix large quantities. Some operations need only gentle mixing while others may require vigorous agitation.

Thankfully, there's a piece of equipment that can step up to fulfill the needs of nearly any fluid-blending operation—the portable mixer.

Portable mixers come in a variety of shapes and sizes, with each model designed for specific applications. Properly designed and engineered mixers



can provide the operator with many years of trouble-free service in a wide variety of blending or mixing operations. When configured and utilized properly, the right mixer can handle a number of important tasks, including suspending or dissolving solids, dispersing immiscible liquids, blending fluids of varying viscosities,

and dispersing small amounts of gases in liquids.

So, how do you know what the right mixer is for your operation? This article will identify the variables that should be considered before choosing the mixer technology that will result in an optimized mixing or blending operation.

FLUID VISCOSITY

One of the first and most important things to consider when selecting a mixer is the viscosity of the liquids being handled. In fact, the type of mixer and its related components can only be selected once viscosities of the fluids are known.

Various mixers can handle commodities with viscosities ranging from 1 to more than 25,000 centipoise (cPs), including paints, varnishes, polymers, textile dyes, pharmaceuticals, food products, and soaps. Operators should keep the following information in mind when selecting the perfect mixer for the specific fluid type.

| VISCOSITY (cPs) | MATERIALS APPROXIMATING THAT VISCOSITY |
|-----------------|---|
| 1 | Water, gasoline, kerosene, solvents, milk |
| 100 | SAE 10 motor oil, olive oil, concentrated sulfuric acid |
| 250 | Mayonnaise |
| 500 | Paint, high-concentrate glucose solutions |
| 1,000 | Castor oil, ketchup, glycerol |
| 2,500 | Molasses |
| 5,000 | Honey, corn syrup |
| 15,000 | Cold molasses, molten glass |
| 15,000+ | Resins, high-concentrate polymers |

PORTABLE MIXER CATEGORIES

Once the viscosity of the fluid in question has been determined, the next consideration is the types of portable mixer categories.

BATCH SIZE

For smaller mixing applications, the optimal style of portable mixer is lab and pail. Lab and pail mixers are best suited for, as their name suggests, mixing in small vessels

for labs or industrial applications where a liquid product is provided in a pail. For industrial applications requiring larger containers or higher mixing speeds, drum and tote-tank mixers are the most commonly used. Tote (IBC containers) sizes can vary anywhere from 220 gallons to more than 500 gallons, whereas drum mixers are utilized with the 55-gallon drums in which many industrial chemicals are shipped. Most models

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of portable mixers are either gear-driven with speeds of 350 or 420 revolutions per minute (rpm), or direct-drive, with speeds of 1,750 rpm. Most can be fitted with variable-speed drives or air motors that can provide variable speed, if needed.

MOUNTING

The ideal mounting configuration varies depending on the application at hand. The three main types of mounting configurations for mixers are c-clamp, flange mount, and angle riser. C-clamp mounts normally feature an adjustable angle of entry controlled by a ball-and-socket design. Flange mounts attach to a flange that is located on the lid of the drum, tote, or bulk tank. Angle risers provide a fixed 10-degree angle of entry into the mixing vessel.

PROPS

Like mounting configurations, there are three common types of portable mixer propellers: 1.0 pitch, or marine prop; square pitch; and super pitch. A 1.0 pitch is one of the most effective pumping devices, while super pitch has a 1.5 pitch that delivers high pumping rates at the tradeoff of a higher horsepower requirement.

SHAFTS

Ideal shaft length is determined by the positioning of the mixer's propellers. A good rule to follow is to position the mixer propellers 1 to 2 propeller diameters from the bottom of the tank (only position the prop 1 diameter from the bottom when mixing slurries or products with solids) to gauge shaft length.

MIXER AGITATION RATE

Different applications necessitate different agitation rates, so it is important to know the degree of agitation required. Agitation rates range from mild to violent, with tank turnover varying from 1/2 turns to more than 3 turns per minute.

- **MILD:** 1/2 to 1 tank turnover per minute.

- **MEDIUM:** 1-1/2 to 2 tank turns per minute.
- **VIGOROUS:** 2-1/2 to 3 tank turns per minute.
- **VIOLENT:** Greater than 3 tank turns per minute.

Consult with mixer manufacturers to determine the prop's pumping rate for a specific model type and size at the various rpms at which they will operate. These rates are normally measured in gallons per minute of water pumped. Use this information to select the right agitation rate. For example, a 100-gallon tank of a water-like chemical requires vigorous agitation, or 2-1/2 turnovers. Knowing that a 4-inch square pitch prop at 1,750 rpm delivers a pumping rate of 250 gallons per minute, a portable mixer could be selected. Keep in mind, however, that as liquid viscosity increases the pumping rate decreases.

MIXER POSITIONING

The positioning of the shaft and prop within the mixer container is vital to enabling any portable mixer to blend, dissolve or disperse effectively.

In most mixing applications involving small cylindrical tanks of 1,000 gallons or less, the mixer is clamped to the side of the container. Effective mixing patterns will be achieved if the mixer is angled 10 to 15 degrees away from the vertical, either off-center or on-center. When mixing a slurry, angling the mixer 15 to 20 degrees off the tank's centerline will result in good material turnover. On-center angling is better for gentler mixing and creates a vortex. Vortexing occurs when the contents of the tank swirl around the walls of the tank without much top-to-bottom turnover; this creates a less-efficient mixing operation and the possibility of uneven mixing or blending.

Cylindrical tanks with capacities of more than 1,000 gallons may require that the mixer be mounted directly in the center of the tank with the shaft in a vertical orientation. In this configuration, it is recommended that

the operator put baffles on the walls of the tank in order to prevent the contents of the tank from turning in the direction of the mix, or creating an inefficient vortex. When this occurs, the mixing action in the tank will be poor.

Be advised, though, that the presence of vortexing during the mixing or blending process is not always detrimental. For example, creation of a vortex is desirable when solids or powders are added to the top of the batch, or liquids need to be drawn rapidly into the batch. The level of vortexing also becomes less severe with fluids that have higher viscosities.

CONCLUSION

It's a fact that portable mixers play a key role in industrial manufacturing or fluid-handling applications. The right mixer can streamline any operation and provide operators with a consistent, hassle-free experience. By ensuring that you select the proper mixer for your specific situation, you can gain an important advantage toward optimizing any fluid mixing application. ■

EULIS ESTER is a product manager for Neptune®, a leading provider of reliable and safe handling of critical chemical fluids for water-treatment processes and agriculture applications. She can be reached at 909.222.1310 or eulis.ester@psgdover.com. Neptune is a product brand of PSG®, a Dover company. PSG is comprised of several leading pump companies, including Abaque®, All-Flo™, Almatec®, Blackmer®, Ebsray®, em-tec®, Griswold®, Hydro™, Mouvetex®, Neptune®, Quantex™, Quattroflow®, RedScrew™, and Wilden®. For more information, visit www.psgdover.com/neptune.

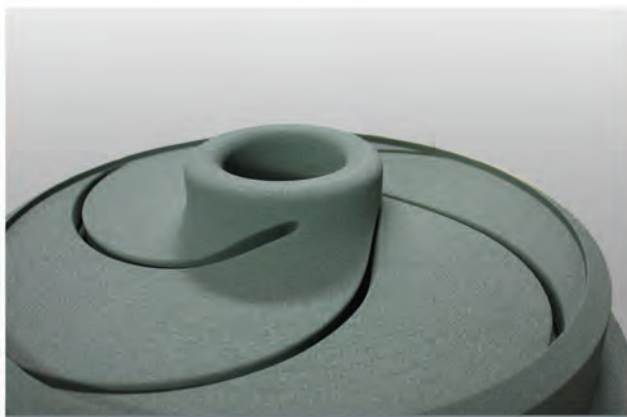


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THIRD GENERATION ACTUATORS TAKE FLIGHT

Providing critical flow control at giant Beijing Daxing International Airport

BY SARAH KELLETT, ROTORK

PARTNER PROFILE: CHINA AVIATION OIL

China Aviation Oil Corporation Ltd. is the largest physical jet fuel trader in the Asia Pacific region and the key supplier of imported jet fuel to China's civil aviation industry. China Aviation Oil's key businesses include jet fuel supply and trading, trading of other oil products, and investments in oil-related assets. Incorporated in Singapore in 1993, China Aviation Oil has been listed on the mainboard of the Singapore Exchange Securities Trading Limited since 2001.

Over 130 Rotork actuators have been installed at the new Beijing Daxing International Airport, Beijing's second international airport. This builds on an existing relationship with China Aviation Oil, which controls the jet fuel supply at Beijing Capital and Beijing Daxing International Airports.

AN ARRAY OF USES

Beijing Daxing International Airport is in competition for the title of

the world's biggest airport, with four runways currently built and a terminal building that covers an area of over 7,500,000 square feet. Rotork actuators carry out several duties at the airport, including the control of the relief valves at the tank farm. These are in place in the event of a dangerous build-up of pressure, which can then be released by the opening of the valve. The pump room, oil tanks, oil station, and landing field ground wells use both IQ3 and IQT3



actuators to operate a variety of valve types, including gate, ball, plug, and butterfly valves. The oil tanks and oil station also use electro-hydraulic linear actuators, which can provide a fail-safe function on power loss.

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The actuators are connected with a Pakscan loop on a General Purpose Field Control Unit. Pakscan is a redundant loop network which enables the remote control of

actuators. It was selected as the unique loop back function and diagnostic ability made maintenance and service much easier. In an airport environment where hundreds of people can be displaced by breakdowns and delays, increasing reliability and reducing maintenance time is essential. Additionally, the customer was pleased that they were able to connect the actuators to the Pakscan loop, alongside actuators from another manufacturer.

TRUE PARTNERSHIP IN PRACTICE

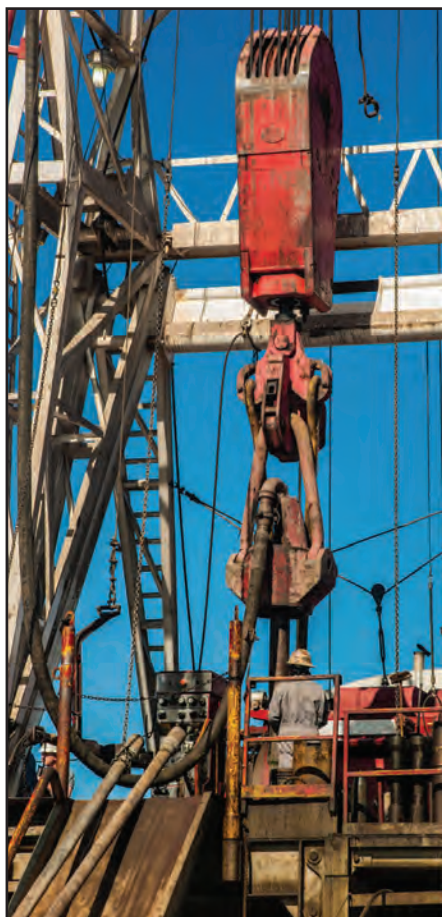
Rotork Site Services (RSS) worked closely with the airport's engineers, providing training to ensure that they understood how to operate and service the actuators installed

on site. This project builds on an existing relationship and reputation, as IQ Rotork actuators have been in operation at Beijing Capital International Airport since 1999. ■

SARAH KELLETT is group marketing communications manager for Rotork and can be reached at sarah.kellett@rotork.com. Rotork is a market-leading global provider of mission-critical flow control and instrumentation solutions for the industrial actuation and flow control markets. These include oil and gas, water and wastewater, power, chemical process and industrial applications. Customers rely on Rotork for innovative, high quality, and dependable solutions for managing the flow of liquids, gases, and powders. For more information, visit www.rotork.com.

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VIBRATION MONITORING THAT ANYONE CAN AFFORD

A Q&A for proximity devices Part 1 of 2

BY RETT JESSE, METRIX INSTRUMENT CO.

Vibration monitoring is a crucial component for almost any manufacturing concern, especially when facility managers are charged with ensuring the performance of high power, not to mention high cost, equipment. With that in mind, Metrix has been committed to stressing the importance of vibration monitoring and providing tools at an affordable price. For over twenty years, we have been ISO-9001 certified, offering reliable equipment for the multiple industries. Below, we draw upon that experience to answer some common proximity device questions our DPS 1.35 customers have shared and our take on best practices you can follow.

WHAT IS CROSS TALK, WHEN DO YOU HAVE TO WORRY ABOUT IT, AND HOW DO YOU ELIMINATE IT?

Cross talk elimination is used when proximity probes are close together, typically less than 1 inch.

This DPS 1.35 feature is used on one of the probes that could interfere electrically with another probe close by. This feature can be used on an MX2033 Driver or MX2034 transmitter proximity probe system. This feature shifts the oscillation frequency of the DPS unit so it is different from the adjacent probe, thereby, preventing cross talk interference. Do not use this feature on both probes that are close by, if you do you will continue to have a cross talk problem albeit at a different frequency. Only use cross talk elimination on one of the probes of the set.

For example, if you request cross talk elimination on one of the two adjacent DPS units is a Metrix DPS system, the pair you receive from our manufacture will have labels "X" and "Y" respectively. The standard DPS unit has no label for cross talk and it is default to "X". However, if you experience cross talk in your application, you can convert one of the two adjacent DPS units to "Y" configuration in the field. Specifically, our technicians have provided this option through the advanced settings in the Metrix DPS configuration and utility software.

In close proximity probe applications, the Metrix DPS can be calibrated with a different driving frequency that allows the probes to be within 0.5 inches of each other and not interfere with each

other probe's signal. This is perfect for the air machine market, due to the small (1-inch) shafts typical of these machines. Competitor probes have to be at least 1.5 inches apart to measure properly.

WHAT IS THE INVERT BUFFERED OUTPUT POLARITY USED FOR?

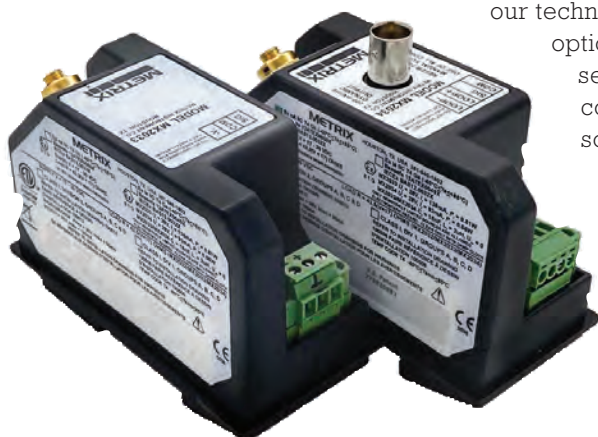
Using the DPS 1.35 some customers want a positive output from the BNC of the MX2034 transmitter. Normal polarity is negative for output at the BNC of the MX2034 transmitter, this feature allows the user to change the output polarity to positive. This feature is only applicable to the MX2034 transmitter.

As with before, this feature is accessible through the advanced settings in the Metrix DPS configuration and utility software.

WHEN WOULD ONE ENABLE SPIKE SUPPRESSION?

Using a MX2034 transmitter, this DPS 1.35 feature is used to inhibit high amplitude electrical noise from outside the vibration monitoring system from impacting the performance of the vibration transmitter system. This feature temporarily suppresses high amplitude, short duration, typically less than 50 millisecond vibration spikes, like those induced possibly by a portable radio when keying the mic.

If this feature is selected, any vibration spike greater than the full-scale range (default), or lesser





value selected by the user, will be suppressed for the default duration of 1 millisecond or the time duration selected by the user up to 1000 milliseconds (1 second). During a spike suppression event, the output of the vibration transmitter will go to 3.0mA for approximately 0.25 seconds to inform the control system that a spike suppression event has occurred.

Vibration amplitudes greater than the spike suppression setting, that last longer than the Spike duration setting, will be reported normally via the 4-20 mA output. The dynamic output via the BNC, on the transmitter, is not impacted by enabling spike suppression.

HOW DO YOU CHANGE THE UNITS TO METRIC FOR VERIFICATION AND REPORTS?

This is a common question asked by our customers, and the answer is simple. Go to the "Advanced

Settings" tab and select "Metric," the units for the table and plots on the "Verification" tab are now in metric units. However, this does not change the configuration of the transducer, which can be changed on the "Home" tab. This feature works for both the MX2033 Driver and MX2034 transmitter.

WHAT DOES THRUST DIRECTION UPSCALE MEAN?

For the DPS MX2034 transmitter the "Upscale" selection will correlate the low value of the full-scale range with the 4mA output of the transmitter, and the 20mA output at the high value of the full-scale range. The "Downscale" selection will correlate the high value of the full-scale range with the 4mA output of the transmitter, and the 20mA output at the low value of the full-scale range. This can be useful for the operator, the control system or display device. This feature can be accessible through the

WHAT IS THRESHOLD AND HYSTERESIS USED FOR WHEN USING THE MX2034 AS A SPEED TRANSMITTER?

This DPS 1.35 feature for the MX2034 transmitter is used to improve the performance of the speed measuring system. The "Auto" setting allows one to use an auto threshold setting, which will trigger the DPS with a large negative pulse (greater than -6Vdc), whereas the manual threshold setting allows the user to select the threshold value (usually -13 Vdc or greater) and a hysteresis band of up to +/- 2.5 Vdc for a negative going pulse. One must ensure the negative-going pulse will produce a more negative voltage than the hysteresis dead band. Hysteresis creates a dead band around the threshold value.

For example, assume the initial gap voltage is set to -10 Vdc, if the threshold was set at -13 Vdc, and the hysteresis was set at +/- 1.0 Vdc, the negative going pulse would have to pass -14 Vdc ($-14\text{Vdc} = -13\text{Vdc} - 1\text{Vdc}$) to have counter within the transmitter see the pulse, and then the counter would not reset until it saw the voltage pass through -12 Vdc ($12\text{Vdc} = -13\text{Vdc} + 1\text{Vdc}$) on its way back to the original gap voltage. Also note that if the initial gap is set to -10 Vdc, and the threshold is manually set to less than -10 Vdc the system will not work because the negative going pulse is always exceeded. This gets extended to the hysteresis dead band: it must always be more negative than the initial gap voltage (for example, if -10 Vdc is gap voltage, then dead band of -12 Vdc to -14 Vdc is okay). Using threshold and hysteresis are great ways to help reduce noise and increase accuracy in a speed measurement system.

HOW DOES ONE CHANGE THE TARGET MATERIAL FOR DPS 1.35?

Using Metrix DPS configuration and utility software, the "Change Configuration" menu option on the "Home" page tab allows one to change the target material from AISI 4140 Carbon Steel to another shaft material. Only Metrix Probe Series

MX8030 and MX2030 allows the user to change to the other available materials listed. The materials listed represented 95 percent of the material types ever ordered from Metrix. All other probe types only have AISI 4140 as the target material in our standard delivery. However, if you have special target material other than AISI 4140 and request a probe series other than MX8030 and MX2030, you can contact Metrix directly for assistance.

HOW DOES DPS 1.35 HANDLE UNKNOWN TARGET MATERIALS?

While connected to a DPS Unit, using Metrix DPS configuration and utility software, the "Unknown Material Calibration" tab functions allow the DPS Proximity Probe System be calibrated to an unknown target material using this process:

1. Take advantage of the Metrix 9060-SCDM (shaft calibrator dial micrometer) or the 9060-SCTS (shaft calibrator touch select) to calibrate the Metrix DPS with the unknown shaft material.
2. These systems allow one to take data directly on the shaft target material.
3. Unknown target materials result in a trial-and-error process. For the first iteration, use AISI 4140 Carbon Steel material type. If the verification check is running cold, then a custom calibration should

be effective. If the verification is running hot, and exceeds 19Vdc, try a less dense material like one of the stainless steels.

HOW ARE CHANGES IN SYSTEM LENGTH ALLOWED FOR DPS 1.35 PROXIMITY PROBE SYSTEMS?

The "Change Configuration" menu option on the "Home" page tab allows one to change the system length of a DPS. This DPS 1.35 feature allows the user to switch between standard system lengths for the Probe Series selected:

The Metrix 7200 and BN 3300XL has 15 to 30 feet system lengths listed only. The 3000 Series probes only have 15 and 20 feet listed.

The Metrix MX8030 and MX2030 Probe Series allow the DPS to take advantage of extended systems lengths from 3 to 40 feet for vibration and thrust, and up to 65 feet for speed measurements. If a user wants to use a length other than listed, like 25 feet, the user would use either a higher or lower system length and perform a verification check to determine which length provided the best results. If the verification is not within limits a custom calibration can be conducted using the verification voltage values.

Users can use the Metrix MX8020-001 cable trimming and connector kit to alter the length of a MX8030 probe or MX8031 extension cable. Users no longer have to keep coils of extension cable in their junction boxes.

HOW DOES ONE CHANGE THE FULL SCALE RANGE FOR THE DPS 1.35?

The "Change Configuration" menu option on the "Home" page tab allows one to change the MX2034 transmitter full scale range. This feature is dependent upon what is selected for the MX2034 transmitter measurement. The MX2033 driver output goes to a monitoring system, so the full scale range is not used.

If the transmitter measurement is for position, then the 4 to 20mA scale can be selected for the appropriate displacement output, either in mils or microns. If the transmitter measurement is set for vibration, then the 4 to 20mA scale can be selected for the appropriate vibration output, either in mils peak to peak or microns peak to peak. Finally, if the transmitter measurement is for speed, then the 4 to 20mA scale can be selected for the appropriate speed output in revolutions per minute.

A LOOK AHEAD

Next month, in the concluding half of this article, we'll address even more common questions customers have brought to use on getting the most out of their proximity devices. From verification reports to custom calibration to comparison against an analog driver or transmitter, there's still a great deal to learn. ■

Metrix pioneered the concept of simple, affordable machinery protection with its mechanical vibration switch offerings, revolutionary 4-20mA vibration transmitters, robust high-temperature velocity sensors, and innovative impact transmitter technology for reciprocating machinery. Metrix has been ISO-9001 certified for more than two decades and is committed to quality and continuous improvement of its manufacturing processes. For more information, visit www.metrixvibration.com.

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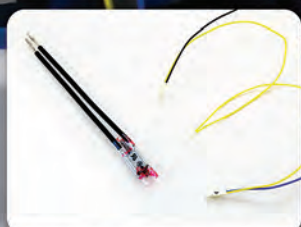
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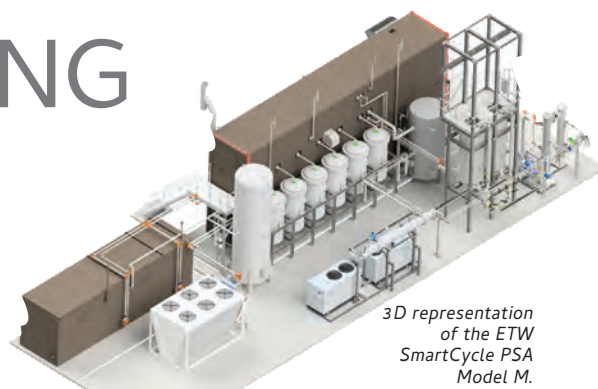


The operator-friendly ETW SmartCycle PSA Model M features fast on-site installation times and compact design (reduced footprint).

OPTIMIZED PORTFOLIO ENABLES MORE EFFECTIVE BIOGAS UPGRADING

*A new range of standardized
ETW SmartCycle biomethane plants*

BY DR. OLIVER JENDE, ETW ENERGIETECHNIK



3D representation
of the ETW
SmartCycle PSA
Model M.

| LAYOUT TYPE | XS 550 | S BMA 950 | M BMA 1350 | L BMA 2000 | XL BMA 3000 | XXL BMA 4000 |
|--|--------|-----------|------------|------------|-------------|--------------|
| MAX BIOGAS INLET (CUBIC NANOMETERS PER HOUR) | 500 | 950 | 1,350 | 2,000 | 3,000 | 4,000 |
| BIOMETHANE OUTLET (CUBIC NANOMETERS PER HOUR) | 293 | 507 | 720 | 1,067 | 1,600 | 2,134 |
| PRODUCT GAS QUALITY | H-GAS | H-GAS | H-GAS | H-GAS | H-GAS | H-GAS |
| AUTOMATIC REGENERATION OF ADSORBENT | YES | YES | YES | YES | YES | YES |
| FULLY AUTOMATIC TURN-DOWN RANGE (%) | 50-100 | 30-100 | 30-100 | 30-100 | 30-100 | 30-100 |
| CONTAINER | 15X3 M | 40 FT | 45 FT | 40 + 20 FT | 40 + 40 FT | 40 + 40 FT |
| STANDARD | CUSTOM | ISO | ISO | ISO | ISO | ISO |
| NUMBER OF CONTAINERS | 1 | 2 | 2 | 2 | 2 | 2 |

The product range of the ETW SmartCycle PSA system.

The specialist for combined heat and power plants and biomethane plants, ETW Energietechnik from Moers, Germany, has optimized the delivery program of its proven biogas upgrading system, ETW SmartCycle PSA, for worldwide use on biogas and waste fermentation plants. The aim of the development was a significant reduction of investment costs as well as execution time. With the new plant standard, the effective upgrading process can be adapted even more specifically and economically to the respective application areas.

MODULAR AND ADAPTABLE

The new modular concept for upgrading biogas to natural gas quality is based on a modular system consisting of ISO standard containers in the standard sizes 20, 40, and 45 feet. With six standardized systems, the delivery program serves plant sizes with a raw gas capacity of 550 up to 4,000 cubic nanometers per hour.

"The result is a compact biogas upgrading system that is also well suited for large biogas volume flows," says product manager Sayethan Kirubaharan, explaining the purpose of the relaunch.

HITTING THE STANDARD

ISO standard containers not only reduce transport costs but also make bureaucracy very uncomplicated—regardless of whether transport is by road, rail, or sea. All container modules are prefabricated at ETW Energietechnik's plant in Moers and



Even the XL plant model experiences a very high degree of prefabrication at the ETW Energietechnik plant in Moers due to its design.

assembled in the newly built 32-foot-high production hall exactly as they will later be erected on site.

This manufacturing principle means that all strategically important intermediate elements such as connecting parts, piping, and external units such as cooling systems and activated carbon filters can be perfectly matched.

"ETW Energietechnik supplies the plants in accordance with both the Pressure Equipment Directive 2014/68/EU and the ASME standard for worldwide use," adds Kirubaharan.

All assemblies are delivered to the construction site in prefabricated modules, so that the plant is ready for operation just two weeks after delivery.

BUILDING ON SUCCESS

This new plant reduces costs by an average of around 15 percent compared to custom-made products; production and installation time on site are reduced by around 30 percent overall. The general benefits of the ETW SmartCycle PSA, such as minimal energy requirements, maximum turndown flexibility, long component service life, and low maintenance requirements, remain. ■



The development team of ETW Energietechnik develops new plant standard for worldwide use. Conceptual model of the ETW SmartCycle PSA Model M.

ETW Energietechnik's highly efficient systems enable it to generate electricity and heat wherever it is needed. With solutions for processing and feeding biogas as biomethane into the natural gas grid, it also creates ways to make sustainable energy usable where it is consumed but cannot be generated. With around 120 highly qualified staff, ETW Energietechnik has been developing and producing energy systems of all kinds and sizes at its Moers location for energy suppliers, agribusinesses, local authorities, and industrial companies since 1997—with creativity and ideas, technical knowledge, and innovation. For more information, visit www.etw-energie.de.

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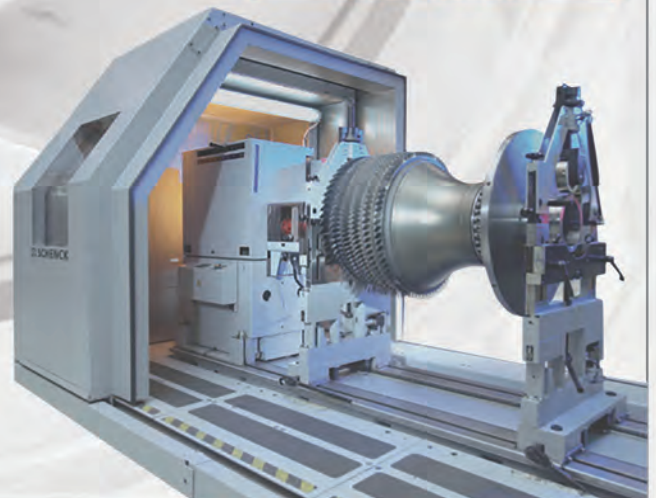
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FEATURED PRODUCT

INDUSTRIAL FLOW SOLUTIONS

OVERWATCH® DIRECT IN-LINE PUMP SYSTEM



PUMPING



SHREDDING



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

APPLICATIONS

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

ELIMINATE THE WET WELL AND IMPROVE SAFETY

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

NO DOWNTIME FROM A CLOGGED PUMP

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

SELF MONITORING SAVES TIME AND MONEY

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

PATENTED DIP CUT® IMPELLER

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

CASE STUDY: SHERMAN, NEW YORK

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

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

For more information, visit

WWW.FLOWSOLUTIONS.COM

WARREN CONTROLS

SERIES 2900 INDUSTRIAL CONTROL VALVES

The 2900 features rugged cast iron bodies with a variety of trim materials. The equal percentages plugs in the two-way valves and linear plugs in the three-way valves provide excellent modulating control of a wide variety of fluids. The Series 2900 is ideally suited where value and long life are important objectives for applications including but not limited to food and beverage, packaged water heaters, pharmaceutical, general service, and wastewater. For more information, visit www.warrencontrols.com.



BISON GEAR & ENGINEERING CORP.

POWERSTAR® HIGH-EFFICIENCY RIGHT-ANGLE GEARMOTOR

Featuring, advanced hypoid gearing technology for improved energy efficiency over traditional right-angle worm gearmotors, PowerSTAR® offers maximum power density in a compact profile that does not compromise performance. Its sleek design offers easy mounting in several orientations, ground gearing for low noise, and a variety of frame sizes to fit numerous design specifications. Ground gearing provides whisper-quiet operation and low backlash precision, while larger diameter pinions offer more surface area contact. For more information, visit www.bisongear.com.

INPRO/SEAL

VBMag BEARING ISOLATOR

Inpro/Seal continues its legacy of developing innovative, reliable sealing products to prevent bearing failure with the introduction of a new magnetic bearing isolator: VBMag. Utilizing magnetically energized faces to create a liquid-tight seal, VBMag is proven to protect against lubrication loss and contamination ingress in challenging applications, such as flooded, high oil splash, or oil mist lubrication environments. For more information, visit www.inpro-seal.com.



HIBER

ATEX-CERTIFIED LORAWAN CONNECTOR

Hiber just made it easier for oil and gas operators to gather even more data from their remote well heads, negating the need to send technical teams into far-flung locations just to check on well-head integrity. The new capabilities, now available for its HiberHilo satellite-powered remote well-monitoring solution, enable connection over LoRaWAN to a wide range of specialized in-field sensors. For more information, visit www.hiber.global.

FEATURED PRODUCT

VAUGHAN COMPANY

THE VAUGHAN ROTAMIX®

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

WE STIR UP EVERYTHING BUT TROUBLE

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

WHAT MAKES ROTAMIX® DIFFERENT?

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

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



Digester efficiency is increased by further reducing solids' size and increasing surface contact.

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

AMERICAN-MADE RELIABILITY YOU CAN COUNT ON

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

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

WWW.CHOPPERPUMPS.COM.

WEIDMULLER INC.

SAI CORD SETS

Weidmuller's industrial-quality cord-sets allow easy plug-and- capability with high reliability. The M12 and M8 cord-sets have PUR drag chain approved jackets and nickel-plated nuts as standard. Alternate cable jacket and nut types are also available and custom lengths are available upon request. These sets offer continuous connection with guaranteed reliable transmission of power, signal, and data. For more information, visit www.weidmuller.com.



WATSON-MARLOW FLUID TECHNOLOGY SOLUTIONS

BREDEL AR

Watson-Marlow Fluid Technology Solutions (WMFTS) launches the Bredel hose pump augmented reality (AR) customer application (app), designed to reduce maintenance time with clear step-by-step visual guidance. The easy-to-use app is the second in a series of AR apps from WMFTS developed for post-sales support so users can quickly identify the tools required for Bredel hose pump maintenance tasks or spare parts. For more information, visit www.wmfts.com.

SENSAPHONE

SENTINEL PRO SYSTEM

The Sentinel PRO remote system seamlessly interfaces with any equipment that uses a PLC with Modbus sensors to centralize and simplify proactive monitoring of critical machines and components. Around-the-clock remote monitoring of equipment provides facility operators instant notification of a possible malfunction, enabling quick response to address the problem. The Sentinel PRO system provides the full monitoring picture with one device. For more information, visit www.sensaphone.com.



ENDRESS+HAUSER

J22 TDLAS GAS ANALYZER

The J22 tunable diode laser absorption spectroscopy (TDLAS) analyzer continues the tradition established by its predecessor with best-in-class accuracy, a user-friendly interface, integrated diagnostics, and a host of modular hardware. The latest updates include support for the Modbus TCP/IP protocol, which enables users to communicate with their analyzers from a central network location in a bidirectional, secure point-to-point manner. For more information, visit www.us.endress.com.

UPCYCLING IN THE CIRCULAR BIO-ECONOMY

KeyLeaf's Justin White on converting waste streams into value-added products



As one of North America's leading experts in upcycling, plant-based ingredient maker KeyLeaf Life Sciences was founded in the 1970s to assist Canadian farmers to better commercialize their oilseed crops. Today, KeyLeaf is finding new sustainable uses for plant-derived biomaterial, which makes sense economically and environmentally.

Below, Justin White, KeyLeaf's vice president of global sales and business development, explains his company's mission to add vital components to the ever-expanding circular bio-economy.

MPT: How would you best explain the term “upcycling” and how it differs from the recycling most people are familiar with?

JUSTIN WHITE: The earth's natural resources are bountiful, but they are limited. Concerned that overuse of those resources could bring about detrimental changes to the quality of life for current and future generations; scientists, academics, and innovation leaders in the early 2000s began to promote a practice they called upcycling, which they defined as “taking an item that is no longer needed or wanted and giving it new life as something that is either useful or creative.” Upcycling has also been defined as “the re-use of discarded materials which results in an increase in value.”

MPT: How has KeyLeaf integrated upcycling into its business?

JUSTIN WHITE: KeyLeaf has been upcycling in the plant-based ingredient space decades before upcycling became trendy. Here at KeyLeaf, we are living upcycling every day. Upcycling plant materials is our entire business. Over the years, KeyLeaf's scientists and engineers have evaluated and processed thousands of seeds, flowers, leaves, cells, and other plant components to best monetize their biochemical contents by creating value-added product streams.

We don't consider used biomaterials to be waste. Those materials all have value—it's just that someone hasn't yet discovered that value. That's our job.

MPT: And how does the upcycling process work?

JUSTIN WHITE: When biomaterial is delivered to KeyLeaf to be processed, KeyLeaf's task is to create a value-added processing stream for the main product. After accomplishing that, the company's objective then becomes to discover and identify all potential value-added streams available from the plant material (that is, co-products) and finding applications for each identified co-product. Clients will often share processing with KeyLeaf when multiple co-products and multiple value-added streams are involved, as in the case of hemp seed.

MPT: Can upcycled materials lend themselves to a greater variety of applications than traditional recycling?

JUSTIN WHITE: Take our previous example. Hemp has a long history of being upscaled into value-added products, including its seeds. Containing all nine essential amino acids, along with essential fatty acids omega-3 and omega-6 and other bio-compounds of value, the seeds are dehulled, leaving their inner hemp hearts available and edible in the form of breakfast cereal and snacks. In additional processing streams, the seed's protein can be obtained by aqueous or solvent extraction or fractionated from dry press cake and milled into flour and protein powder. The seeds' pressed oil has more value-added streams as the oil is processed and upcycled for use in nutritional, nutraceutical, and cosmetic products and applications. Even the seeds' discarded hulls open a value-added co-processing stream as new applications for the hull's fiber are explored and developed. ■



To listen to an extended version of this interview, be sure to subscribe to MPT's podcast, The Efficiency Point.



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