

The background is a complex technical drawing in white lines on a blue background. It features various mechanical components such as pipes, valves, flanges, and a large globe in the upper right corner. The drawing is a detailed wireframe representation of industrial machinery.

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**COVER PHOTO**  
Courtesy of Bradleys

Welcome to the MPT for the month of May. In our Water & Wastewater Focus section, frequent MPT contributor Del Williams provides "10 expert tips to ensure safe sewer cleaning" that the industry could benefit from observing (pg. 16). Municipalities must safely clean and maintain many miles of sewer line annually to eliminate blockages and prevent sanitary sewer overflows, and this article lays out some of the key factors to consider.

Also, a Peruvian mining company reuses process water as part of their iron ore processing. Until November 2019, however, this was made difficult by the fact that the medium, which is collected in a tank on site, has a very high solids content of 60 to 70 percent. As you'll see in this month's Pump Solutions section (pg. 26), the experts at Netzsch Pumps and Systems recommended a range of solutions to get the job done.

Lastly, it's summer—care for a cold one? Also in this month's Pump Solutions section, David Allen of Xylem shares how his company's pumps meet the exacting standards in transporting beer from the keg to the bar, maintaining both hygienic and customer standards (pg. 30). Enjoy!



**J. Campbell, Editor**  
*Modern Pumping Today*

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# CONTENTS

## INDUSTRY NEWS

**What's happening in the industry** ..... 6

## TRADE SHOW

**AWWA ACE23** ..... 10

## CASE STUDIES

**Biogas benefits at the farm  
with tough new mixers** ..... 12

*Large production requires sturdier equipment*

## WATER & WASTEWATER FOCUS

**10 expert tips to ensure safe  
sewer cleaning** ..... 16

*How to protect operators from some of the industry's most common mistakes*

## MAINTENANCE & RELIABILITY

**Supply chain resilience** ..... 20

*What it means and why it matters Part 2 of 3*

## PUMP SOLUTIONS

**Reusing process water at  
a Peruvian iron ore mine** ..... 26

*A robust, low wear rotary lobe pump successfully extracts high solids content slurry*

**From barrel to bar** ..... 30

*A beer pump application guide*

## MOTOR SOLUTIONS

**The world's largest untapped resource:  
excess heat** ..... 34

*American industry is sitting on a potential gold mine Part 1 of 3*

## MODERN PUMPING PRODUCTS

**FEATURED PRODUCT: Check-All Valve** ..... 38

*Adapter Valve*

## EFFICIENCY POINT

**Showcasing energy efficiency  
and productivity** ..... 40

*RMI Pressure Systems' Sean Heary sees AISTech as a launchpad to the future*



12



16



30



34



38





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## ASAHI/AMERICA ANNOUNCES NEW TEAM LEADER, SERVICE TECHNICIAN

Thermoplastic fluid flow technology company Asahi/America, Inc. announces the promotion of Shane McDaniel to business develop manager team leader. McDaniel's new role will manage the company's business development team's short- and long-term goals to align with various market-focused objectives. McDaniel has been with Asahi/America for over two years as a business development manager for valve and actuation products. During his time at Asahi/America, he was instrumental in leading technical training and development of the company's actuation program, including the latest Series 19 actuator product launch. He is based out of the Houston, Texas, area. The company also adds Jessica Chase to the technical field service team. Chase will assist customers with training and installing Asahi/America's single and double wall industrial and high purity piping systems through thermofusion processes. This includes properly training and certifying customers how to use Asahi/America's available welding equipment with the company's piping products.

Chase comes to Asahi/America with thirteen years of experience in the oil and gas industry. At her previous position, she worked at a major multinational chemical manufacturer as an associate operator where she maintained and repaired process equipment.

## INNIO IN JENBACH RECEIVES AEO-F CERTIFICATE FOR CUSTOMS SIMPLIFICATIONS

INNIO in Jenbach has achieved certification as an Authorized Economic Operator–Full (AEO-F). The internationally recognized world customs certificate, which was issued by the Austrian customs bureau, verifies that the provider of Jenbacher energy solutions and services is a highly trustworthy and reliable partner within the global supply chain.

AEO-F status is a quality mark awarded to companies based on their reliability, safety, and security in the international trade of goods. Thanks to reduced checks and preferential customs treatment, the world customs certificate speeds up customs clearance for both imports and exports. It also makes it easier to obtain further customs simplifications.

To be approved as an AEO-F involves meeting a wide range of requirements. As part of the certification process for INNIO in Jenbach, checks included an examination of the company's financial solvency, compliance measures, sound accounting methods, and observance of customs legislation, as well as its management of safety, security, and quality matters.

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consumer," explains Martin Mühlbacher, vice president and site manager of INNIO in Jenbach.

## SVT ROBOTICS APPOINTS NEW CHIEF FINANCIAL OFFICER

SVT Robotics, a leader in enterprise software for the implementation of industrial robotics, announces the appointment of Cole Heffernan as chief financial officer (CFO). Heffernan joins the SVT executive team having most recently served as head of operations at SEI Novus, a cloud-native portfolio intelligence and analytics platform for institutional investors. Prior to SEI Novus, Heffernan served as CFO at Novus Partners, Inc., where he reconstructed the finance function of the organization and reduced operational costs, while accelerating growth.

"Cole comes to SVT Robotics having assisted founders and private equity-backed organizations in implementing systems, processes, and KPIs necessary to meet strategic goals," says A.K. Schultz, CEO of SVT Robotics. "We're thrilled to welcome him to the team, and we look forward to what he'll achieve both personally and for the future of SVT."

"Over the years, I have worked to improve productivity, communication, and execution to drive strategic business development. It is a pleasure to join the innovative team at SVT Robotics," says Heffernan. "SVT is providing the

solution to automation's greatest barrier, and I am eager to work."

## DANFOSS TO POWER ALL NORTH AMERICA FACILITIES WITH SOLAR ENERGY BY 2025

Danfoss North America recently signed a power purchase agreement with CIG Capital, a U.S.-based project financing firm, to purchase about 75 MW of solar power from a solar farm in Texas, starting in 2025. The initial agreement term is twelve years, allowing Danfoss to fully replace its annual electricity usage in North America with green energy through at least 2037.

The new agreement will provide Danfoss with green certificates, signifying that they are supplying the North American electrical grid with the full amount of green electricity needed to power all 24 factories and 36 locations in North America, and will reduce Danfoss's carbon footprint in the region by 75 percent.

Soren Revsbech Dam, head of ESG and decarbonization, global services real estate, at Danfoss says, "As part of our ESG goals, Danfoss has committed to achieving carbon neutrality across our global operations by 2030. This agreement to secure green energy for our North America operations will reduce our global emissions by 21 percent. This significant step demonstrates that we are serious about putting sustainability at the heart of our business." ■



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Planning for the future is a heroes' journey. Being part of the water revolution means addressing critical issues about the world's most important resource. With that in mind,

"Water 2050" is an initiative to collaborate and champion a course for a successful and sustainable water community. AWWA brings vast resources for the water community.

## THE FUTURE OF WATER IS 2050

Water 2050 is an AWWA initiative to collaborate and champion a course for a successful and sustainable water sector. AWWA's Water 2050 initiative seeks to establish a long-term vision of the future of water. This collaborative exploration will chart a course for a successful and sustainable water sector. The conference will engage in a thoughtful, intentional, and inclusive discourse that results in bold, achievable goals.

Ultimately, Water 2050's influence will extend beyond the water community, fostering partnerships and cross-sector collaboration for mutual and global benefit. AWWA has identified five critical drivers that will influence progress toward a sustainable and resilient water future: sustainability, technology, economics, governance, and social/demographic. ACE23 serves as a launchpad for this important initiative, and if you're a water professional you'll want to be there.

## FACILITY TOURS: HOW WATER WORKS

Each year, ACE provides attendees the chance to see how the water industry works up close with guided facility tours of the host city. ACE23 provides an inside look at some of the Toronto area's best water facilities.

The F.J. Horgan Water Treatment Plant is a direct filtration plant that has been producing excellent quality drinking water since 1980. The plant underwent an expansion between 2009 and 2013 that included the addition of ozone for disinfection and taste and odor control to treat the full plant capacity as the first treatment step, modifications to coagulation and flocculation systems, addition of five new deep bed biological filters and extensive modification to the high lift pumping station to incorporate additional functionalities and isolation capabilities.

John Street Pumping Station (JSPS) is Toronto's largest and houses nine pumps with a combined installed capacity of 262 million gallons per day. It serves as a key element to move treated water northward to the higher pressure zones. JSPS also houses a deep lake water cooling plant.

The R.C. Harris Water Treatment Plant produces roughly 33 percent of the city of Toronto's drinking water. Dubbed "The Palace of Purification," this facility is a conventional filtration plant which was initially rated at a capacity of



## AT A GLANCE

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100 million gallons per day. It is Toronto's largest water treatment facility. The site was declared a National Historic Civil Engineering Site and recognized as a Canadian Water Landmark by the American Water Works Association.

### PUBLIC OFFICIALS TRAINING

Shepherding the world's most valuable resource into the future demands incorporating ideas from the public sector. ACE offers a targeted program for new and returning public official attendees to

help them make informed decisions around utility operations and finances. The courses are designed to help mayors, water and wastewater board commissioners, and council members better understand key water issues and take smart steps to address them. Courses may be taken individually or together, depending on what topics are most relevant to attendees.

### INNOVATION HUB

The ACE23 Innovation Hub will tie in global trends and address regional challenges that demand creative

approaches. The Innovation Hub is where conversations are taken a step further, whether it's step changes of innovation to the core business or industry to transformative innovation.

Solving the complex challenges facing the water community in 2050 will take innovation and collaboration. The Innovation Hub is a curated space designed to celebrate and embrace change, highlight emerging technologies and trends, and engage in meaningful conversations to advance a sustainable and resilient water future. ■

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*Landia's POP-I mixers have had an immediate positive effect on the biogas process at the farm.*

# BIOGAS BENEFITS AT THE FARM WITH TOUGH NEW MIXERS

*Large production requires sturdier equipment*

BY SOREN RASMUSSEN, LANDIA

A farm in the northwest of Kent has significantly enhanced its biogas operation by upgrading the mixing system for its two 1.1-million-gallon anaerobic digesters. Oncoland Farm (part of The Billings Group) had been experiencing problems with the

mixers that were installed when the gas-to-grid AD plant was built in 2020 as part of its continuing diversification. Traditionally, a mixed farm of arable, dairy, and beef, Oncoland has successfully added hops, vines, and renewable energy to its portfolio as part of its drive towards Net Zero.

However, as Plant Manager Carl Woolley discovered, the mixers that were included as part of the package deal, were unsuitable for the feedstock that combines the farm's cattle slurry with waste from vegetables grown at the 2,500-acre site, such as cabbage, potatoes,



and carrots. Oncoland's feedstock also includes waste pomegranate and mango that is first sent through a hammer mill.

"The mixers would have probably been fine for a standard mix or maize and slurry," says Woolley, "but for a plant such as ours with varying types of waste, you need much sturdier equipment. Only six months in to us producing biogas, we started to see that the submersible mixers were beginning to fail due to the ingress of water. Although the separate, paddle mixers in the digesters continued to do their job, over time, the submersible mixers, one-by-one, gave up the ghost."

Working closely with James Gorridge at Mid-Kent Electrical Engineering (MKE), Woolley looked at how best to resolve the issue with the submersible mixers and get the plant to its optimum operation.

"We weighed up the costs of retrieving the faulty mixers for repair and rewinding," says Gorridge, "but

we both knew how disruptive that would be to the whole process, and the fact that we'd be fixing equipment that was inevitably going to fail again in only a short period of time."

### **MORE COST-EFFECTIVE AND RELIABLE IN THE LONG TERM**

Woolley adds, "Removing the submersible mixers would have first involved waiting for dry, calm weather and hiring in a crane. Then, two full days of arduous work and a huge amount of downtime in halting the biogas process, emptying the digesters, and then starting everything up again. We both went away to consider the best, long-term solution. MKE have always supplied us with very good quality motors and drives, with a very good turnaround and attention to detail, so I knew they believed in quality. During my career I'd seen just how robust mixers and pumps are from Landia. And based on his separate previous experience with Landia equipment,



At Oncoland, new Landia mixers have saved considerably on energy consumption.

James agreed that despite the higher capital investment, their mixers would actually work out to be far more cost-effective and reliable in the long term, significantly reducing our maintenance costs."

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Oncoland Biogas Plant Manager Carl Woolley (left) with James Gorridge, business development manager at Mid-Kent Electrical Engineering.

When the four failing submersible mixers were finally removed, it was discovered that their propellers had actually experienced very little wear.

"This was because they were the wrong shape and didn't really do anything," continues Woolley. "With just a couple of basic seals, they just weren't designed for this type of biogas application, so had started to let liquid in very early after they were installed."

To optimize the process, Woolley and MKE also saw that the mixers has been underspecified, so chose to go up a mixer size.

"We knew this would further improve the mixing, which is crucial for any biogas plant," adds Gorridge. "It would also have less impact on the new mixers from Landia, which would only have to run for twenty minutes per hour (compared to 24/7 for the failed mixers), saving considerably on energy consumption."

Four of Landia's POP-I (18.5kW 300 RPM) mixers were installed (two on each digester), with an immediate positive effect on the process, which typically handles dry solids of around 8 percent and higher.

### COMPREHENSIVE MIXING

"Previously," says Woolley, "it took time for everything in the tanks



Sturdy new Landia mixers have significantly reduced maintenance costs at Oncoland's biogas plant.

to get going, but the new Landia mixers resuspended the contents almost immediately. We now get comprehensive mixing and no crust whatsoever. The other important benefit is that the mixers are easy to maintain, especially with their twin-mechanical seals."

In addition to the two primary digesters, Oncoland's pre-treatment tank (18,000 gallons) has also benefitted from an upgrade to more suitable equipment; this time with a Landia Chopper Pump (invented by the company in 1950).

### CONSTANTLY CONDITIONED

"We took the opportunity to widen our upgrade to the pre-treatment tank," says Woolley. "Again, the submersible mixer that was supplied as part of the plant package wasn't up to the job, leaving lumps in the feedstock and dead spots in the tank. But now with the Landia Chopper Pump (11kW), which is extremely reliable, the feedstock of slurry from our dairy unit, plus the vegetable and fruit waste, is constantly conditioned so that our process benefits from a consistent soup. The Chopper Pump's blades remain fine and sharp."

He adds, "With both the Landia pump and mixers, we now have



Waste pomegranate is part of the feedstock at Oncoland.

peace of mind. Working with James at MKE, we saw that we could have bought mixers at around £4K less per unit, but biogas feedstocks are unforgiving. The whole process is about learning and nurturing. There's just no hiding place for equipment that isn't sturdy. We bought on reputation and can see already what a sound investment it has been. Biogas is a different beast here in the United Kingdom, so best buy the mixers and pumps that are fit for purpose." ■

**SOREN RASMUSSEN** is the director of Landia, Inc. Landia uses its nearly ninety years of experience to continue to develop new and efficient products and solutions. Together with its customers, Landia is aiming for new heights. Customers get a partner with a strong team of happy employees who focus on what matters most to them: good solutions that solve the task at the lowest possible cost. For more information, call 919.466.0603, email [info@landiainc.com](mailto:info@landiainc.com), visit [www.landiainc.com](http://www.landiainc.com).





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# 10 EXPERT TIPS TO ENSURE SAFE SEWER CLEANING

*How to protect operators from some of the industry's most common mistakes*

BY DEL WILLIAMS

Municipalities must safely clean and maintain many miles of sewer line annually to eliminate blockages and prevent sanitary sewer overflows, which are regulated by the Environmental Protection Agency (EPA). However, the use of high-pressure equipment in underground sewers can be dangerous unless operators are well trained and fully understand the hazards.

Understanding and correcting some of the most common operator mistakes in sewer cleaning can go a long way toward keeping them safe. Therefore, safety expert Dan Story, operations manager at KEG Technologies, who has instructed operators for decades, provides ten tried-and-true sewer cleaning safety tips that address the most common errors that he has observed. The

Spartanburg, South Carolina-based company is a manufacturer of sewer and storm line products including Tier 1 to Tier 3 nozzles, chain cutters, floor cleaners, and camera nozzle systems.

As a national trainer of best-practice techniques, the company is a member of NASSCO, the National Association of Sewer Service Companies, and its Tier 3 High Efficiency nozzles,



such as the Torpedo, Royal, and OMG, provide up to 98 percent efficiency.

1

### PROPERLY SET UP THE AREA AROUND THE SEWER VACUUM TRUCK TO ENSURE OPERATOR SAFETY IN STREET TRAFFIC

"To start sewer cleaning, when you park the vacuum truck in the middle of the road, you need to block off the traffic so it can pass in a safe manner. Set safety cones in front and behind the work zone and make sure the hazard flasher lights are functioning correctly," says Story.

2

### KEEP EQUIPMENT NOISE LEVELS LOW ENOUGH TO HEAR TRAFFIC

Revving the sewer truck engine and running its vacuum pump can be noisy. So, Story advises keeping RPMs low enough so operators can hear and avoid approaching vehicles and converse with co-workers as needed.

One way to lower sewer vacuum truck RPMs during engine operation is by only using the vacuum when needed and allowing the water to pass through as the solids remain.

"You can put the nozzle in the bottom of the sewer pipe and let the water run around it. The solids remain to vacuum as needed. You do not need to run continuously high RPMs," says Story.

Another method is using more efficient nozzles, which enable sewer cleaning with lower pressure water, reducing engine RPMs.

3

### UNDERSTAND HOW YOUR SPECIFIC SEWER TRUCK BOOM OPERATES

There are differences in how every sewer truck manufacturer configures, deploys, and extends the booms that control the vacuum hose. Some deploy rapidly, some articulate, some telescope. Operators must understand these differences before operating a boom in the field around their co-workers.

"Because you may go out in different vehicles from day to day with different crew members, it is important that you understand your boom equipment. For everyone's safety, do not rush the job because the boom can cause injuries if it is not used with full understanding and control," says Story.

4

### USE PERSONAL PROTECTIVE EQUIPMENT (PPE) AND PRACTICE GOOD HYGIENE

"Protect your hands and feet with waterproof gloves and work boots. Protect your eyes with goggles or a face shield. Of course, protect your head with a hard hat to avoid injury from a swinging boom or a falling object," says Story.

When cleaning sewers, operators exposed to sewage or human waste may be at increased risk of becoming ill from waterborne diseases. To reduce this risk and protect against illness, operators should wash hands with soap and water immediately after cleaning sewers before eating or drinking. Avoid touching the face, mouth, eyes, and nose



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To prevent free spooling the nozzle up the line and losing control, use a nozzle skid and hold the nozzle back.

while handling sewage, and cover any open cuts, sores, or wounds with clean, dry bandages.

In addition, Story points out that the CDC advises vaccination against Hepatitis A and B and other contagious diseases that could put operators at risk when exposed to sewage or human waste. The CDC, in fact, also recommends vaccinations for tetanus, polio, and typhoid fever in these environments.

## 5 OPEN THE UPSTREAM SEWER MANHOLE FIRST

In underground sewers, operators can be at risk from toxic inhalation. High concentrations of methane in enclosed areas can lead to hazards as large amounts of methane decrease the amount of oxygen in

the air. Oxygen deficiency can cause headache, nausea, dizziness, and even unconsciousness.

Story says that one of the first things that operators must do is open the upstream manhole as a precaution to enable drawing in clean air.

"For safety in sewer pipe, the first thing you always want to do is open your upstream sewer manhole. That will allow the system to draw in fresh air. On the other hand, if the air were to be drawn directly from the homes, it could fill them with sewer gas, which is unsafe and unpleasant for homeowners," says Story.

## 6 TO AVOID INJURY, DO NOT START HYDRO JETTING OUTSIDE A PIPE

With hydro jetting, sewer cleaning nozzles are designed to direct water

at exceedingly high rates of pressure. For typical cleaning, 1,000 to 1,500 PSI is normal. To remove a blockage, pressures as high as 5,000 PSI may be reached.

"Sewer cleaning nozzles at extremely high pressures should only be used in a pipe," cautions Story. "If a nozzle is used outside of a pipe, it can whip around like a fire hose. I have seen sewer nozzles and hose go up and wrap around telephone wires. I have seen nozzles over 60 feet in the air."

## 7 USE A HOSE WITH A ROBUST SAFETY FACTOR TO PREVENT BURSTING

Since hose and nozzle pressures can be so high, it is important to utilize only robust hose of sufficient strength to ensure safe use over time, according to Story.

"Most operators and municipalities overlook the possibility of burst hoses. However, hose is gradually cut going in and out of sewer pipe. The braided nylon weave remains, but every layer that is cut reduces hose strength and the corresponding PSI that can be run," says Story.

## 8 PROPERLY SIZE THE NOZZLE-TO-HOSE CONNECTION TO PREVENT NOZZLE "RICOCHET"

If the nozzle-to-hose connection is not sized properly, it can lead to a dangerous, high-pressure "ricochet," where the nozzle and hose can suddenly turn around and come back at the operator. One way to prevent nozzle "ricochet" is to size the nozzle-to-hose connection properly, according to Story.

"As a rule of thumb, the distance from the tip of the nozzle to where the hose connects needs to be approximately one-and-a-half times the size of the pipe diameter you are cleaning. Sizing it in this way can help to prevent the nozzle from turning around and coming back at you," he says.

He also advises against "free spooling" a nozzle up the sewer line.

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"Any time you free-spool a nozzle up the line, you lose control of the nozzle—and it can ricochet back at you. To prevent this, use a nozzle skid and hold the nozzle back," says Story.

## 9 CHOOSE THE RIGHT NOZZLE FOR THE JOB TO REDUCE TURBULENCE AND WEAR

As is known throughout the industry, there are several tiers of nozzles, rated for water efficiency from Tier 1 (about 30 percent efficient), Tier 2 (50 to 60 percent efficient), to Tier 3 (75 to 98 percent efficient).

What sets the most efficient Tier 3 nozzles apart from others in the category is fluid mechanics engineering on a par with the aerodynamics of race cars or jet fighters. In the case of KEG Technologies' Tier 3 nozzles, the high-performance fluid mechanics design leaves little room for power losses and excessive turbulence.

By more effectively containing, controlling, and directing high-pressure water with less turbulence, a Tier 3 nozzle can deliver more cleaning power at lower PSI. This eliminates the need for operators to compensate for the lack of power from Tier 1 or 2 nozzles by increasing the pressure to higher PSI on the way back through the line. Ultimately, less PSI (with a better, faster result) makes for safer sewer cleaning, as outlined in many of the tips above.

10

## SLOW AND STEADY WINS THE RACE—AND IS SAFER FOR OPERATORS

The number one mistake of most sewer cleaning operators that puts them at risk is rushing through the process, according to Story.

"Most operators run their nozzles way too fast. Rushing to clean more footage of sewer pipe is dangerous. To clean safely, keep the nozzle slow and steady and let it do its job," says Story.

To stay safe and productive, Story advises contractors to never outrun their water, or they risk losing control of the process and will eventually run into a blockage.

"Sooner or later operators will run into a blockage of roots, grease, mineral deposits, or cave-ins that will plug up their front jets. Then they no longer have a penetrating tool but a battering ram—a nozzle with no forward jets trying to feed its way through the blockage," says Story.

He advises, "For greater operator safety, slow down even more to remove a blockage and let the nozzle do the work. The reason we put forward jets on the nozzles is to safely open the blockage before the nozzle arrives. Slow down and the water will open the blockage before the nozzle ever gets there."

While there is much more to the practice of sewer cleaning, following



*For safety in sewer pipe, open the upstream sewer manhole first, and this will allow the system to draw in fresh air.*

these ten tips will go a long way toward keeping operators safe and productive on the job for many years to come. Those seeking a more comprehensive understanding of best-in-industry safety practices can train in person or virtually with KEG Technologies in the timeframe most suitable for them. ■



*What sets the most efficient Tier 3 nozzles apart is fluid mechanics engineering on a par with the aerodynamics of race cars or jet fighters.*

**DEL WILLIAMS** is a technical writer based in Torrance, California. KEG Technologies Inc. is headquartered in Spartanburg, South Carolina. KEG's patented fluid mechanics directs high pressure water from a truck or jetter hose in a manner so efficiently they were granted a United States patent, meaning operators can usually clean pipes using less pressure, less fuel consumption, and less time than other less efficient nozzles. For more information, call 866.595.0515 or visit [www.kegtechnologies.net](http://www.kegtechnologies.net).





# SUPPLY CHAIN RESILIENCE

## *What it means and why it matters Part 2 of 3*

BY MERRITT GURLEY AND CHANDRAKANT ISI, HUBS

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In the first part of this series, we introduced how the vulnerabilities now exposed within lean manufacturing models are threatening supply chain reliability for various sectors. Below, we begin a run-down of these different threats. First, however, we should provide some general context for how these vulnerabilities are viewed by the industry as a whole. In brief, some key differences between the finding

of 2021 and 2022 surveys include the following:

1. The results of the 2022 survey show that 70 percent of participants have implemented measures to improve their supply chain resilience, compared to 63 percent in 2021. This indicates that companies are increasingly recognizing the importance of preparing for supply chain disruptions.

2. In the 2021 survey, 26.8 percent of respondents considered the pandemic as a major supply chain concern. This number has increased significantly in the 2022 survey, with 57 percent of respondents citing it as the second biggest concern.

3. 49.4 percent of respondents reported experiencing more raw material shortages in 2022 compared to 2021.



The following sections analyze a range of disruptions that were a major concern in 2022.

## GEOPOLITICAL ISSUES

First, the Ukraine war brought global supply chain to its knees. In addition to the tragic loss of lives, the ongoing Russia-Ukraine war has significantly impacted global supply chains. The conflict has disrupted essential air freight and shipping routes, leading to disruptions in the supply of raw materials and finished goods. Unsurprisingly, 45.3 percent of businesses reported being impacted by the war in our 2022 survey.

The war has far-reaching consequences. In 2020, Russia accounted for approximately 29 percent of crude oil and 43 percent of natural gas imports into the European Union. The fresh round of sanctions against Russia has led to a significant increase in energy costs across Europe. As a result, many metal and chemical factories

in Europe went dark in 2022. This aligns with the findings of our survey, where 55 percent of respondents expressed concern about the impact of rising energy costs on their businesses, and 55.6 percent of participants were worried about the impact of these costs on Europe's manufacturing capabilities.

Another issue concerns how the United States-China trade war shows no sign of slowing down. The increased tariffs and trade barriers between the United States and China have disrupted the flow of goods and materials between the two countries. This has made it more expensive and difficult for businesses to import and export goods. As a result, many businesses have had to find alternative suppliers or production locations, disrupting their supply chains and increasing their costs. The uncertainty and instability caused by the trade war have also made it harder for businesses to effectively plan and manage their supply chains.

In what's now considered a new cold war, the United States recently doubled down on its efforts to deprive China of semiconductor technology. In addition to the organizations, the U.S. government now bars its citizens from supporting the development or production of advanced chips at Chinese facilities.

Additionally, the United States saw more worker strikes in the first half of 2022 than in all of 2021. North of the border, Canada was hit by the truckers' protest that impaired the supply chains in the country. Across the pond, U.K. port worker strikes strained the supply chains. Spain also faced supply chain issues driven by truck drivers' strikes. Meanwhile in South Korea, the truckers' protests disrupted production as well as the supply chain.

Lastly, rising shipping costs hurt the bottom lines of businesses. The steep rise in shipping costs significantly impacted businesses across the globe. In March 2022, it

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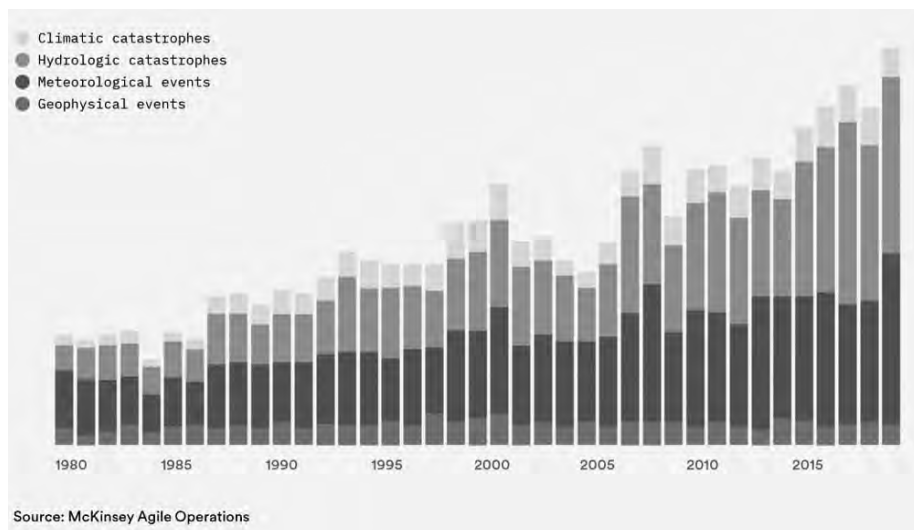
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**FIGURE 5: THE RISING NUMBER OF NONECONOMIC DISRUPTIONS**


cost an average of nearly \$10,000 to ship a 40-foot freight container, almost seven times more than in March 2020.

The higher freight costs contribute to the overall cost of goods and materials, making it more difficult for businesses to compete in the global marketplace. The increased shipping costs are an obstacle for businesses looking to access new markets and eat into profits for established businesses, making supply chain management more challenging.

## NATURAL DISASTERS

In recent decades, the world has faced more frequent and increasingly severe natural disasters. Hurricanes, floods, fires, and droughts have

devastated communities and entire ecosystems. They also have a major impact on supply chains. They can halt or slow production, reroute resources, damage vital infrastructure, and more. Natural disasters cannot themselves be prevented, but their impacts can be mitigated through strategic investments and reinforcing supply chains.

In the year 2021 alone, 401 natural disasters were recorded globally. In the United States, natural disasters cost the economy to the tune of \$145 billion in 2021, making it the third costliest year after 2017 and 2005.

In summer 2022, a record-breaking heat wave and drought in China caused disruptions and even closures of shipping routes such

as the Yangtze. As a consequence, China experienced an energy crisis. Automakers with facilities in Sichuan—both Toyota and Tesla have operations there—were forced to halt production due to power cuts, causing knock-on effects for the Chinese economy and global automotive supply chains.

Cargo shipments along the Rhine, one of Europe's key trade routes, were also slowed due to a drought in summer. Delays caused by the drought are expected to slow Germany's economic growth in 2022 by as much as half a percentage point.

In the United States, Hurricane Ian caused over \$60 billion in damages and is expected to cut Florida's economic growth in Q3 by three percentage points and two percentage points in South Carolina. Flooding in Southeast Australia in October 2022 is expected to cost the country \$5 billion in lost economic activity and drive inflation up by 0.1 percentage points.

## CYBER SECURITY

As companies become increasingly reliant on digital solutions to accelerate and streamline operations, it becomes more important to invest in robust cybersecurity measures and technologies. Today, cybersecurity threats, such as data breaches and ransomware, pose a real danger to intellectual property (IP) and supply chains. Weak security systems, software vulnerabilities, supplier

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fraud, and third-party integrations can lead to financial losses and operational disruptions.

In Japan, manufacturers have been the biggest targets for cyberattacks, with data and entire digital systems held for ransom. Toyota was forced to shut down domestic production in Japan after a cyberattack at a major supplier in Q1 2022. The event illustrated how a single supplier undergoing a cyberattack can bring an entire production chain to a standstill.

In 2021, IT solutions company Kesaya was the victim of a supply chain ransomware attack, which in turn compromised as many as 1,500 businesses around the globe. In Sweden, 800 Coop grocery stores were forced to close because the attack had shut down their cash register operating systems.

Cybercrime reportedly cost the US businesses over \$6.9 billion in 2021—an increase of \$2.7 billion from 2020. The same year, 62 percent of large enterprises in IT, security, development, and DevOps, reported experiencing a software supply chain cyberattack—and 31 percent reported it having a significant or moderate impact.

## FIVE SUPPLY CHAINS RISKS TO WATCH

As we move through 2023, many of the supply chain challenges experienced in 2022 will likely stick around or even escalate. To make matters trickier, there may be other disruptive events on the horizon.

### 1. China-Taiwan crisis could worsen the global semiconductor shortage

Escalating tensions between China and Taiwan have raised concerns about a military conflict in the region. This could destabilize Asia and have serious consequences for global supply chains. Taiwan is a leading producer of semiconductor chips and disruptions to its production capability could further exacerbate the global

chip shortage and impede the production of smartphones, computers, vehicles, and electronic appliances. The involvement of other countries, such as the United States and Japan, could further increase trade tensions with China.

### 2. No swift solution in sight for port congestion

Global shipping delays initially triggered by the COVID-19 pandemic and subsequently aggravated by the Suez Canal blockage and the invasion of

The advertisement features a dark background with a large, glowing blue industrial pump system. The pump has two vertical cylindrical tanks and a central rotating mechanism. The text 'OverWatch' is prominently displayed in white, with 'Direct In-Line Pump System' in a smaller font below it. The tagline 'Changing the world one wet well at a time' is written in large, bold, white letters. In the bottom left corner, there is a circular QR code with the OverWatch logo in the center. In the bottom right corner, the OverWatch logo is repeated next to the text 'INDUSTRIAL FLOW SOLUTIONS™' and the website 'www.flowsolutions.com'.

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Ukraine are expected to continue into 2023. Barring any other unpredictable obstructions or major labor disputes, port congestion and the consequential higher shipping rates are expected to improve gradually as early as Q2 2023.

### 3. Inflation can disrupt supply chains by causing uncertainty in demand

With inflation at its highest in three decades and the cost of labor, materials, energy, and transportation rising, supply chain costs are also rising. These higher costs are reflected in commodity prices, and as the cost of living increases the more consumer behaviors and demands change. A rigid supply chain can collapse if it can't adapt to uncertainty in demand. Inflation also comes with other risks, such as labor strikes and a greater chance of

bankruptcy, which can disrupt trade networks.

### 4. Surge of COVID cases in China may hamper manufacturing capabilities

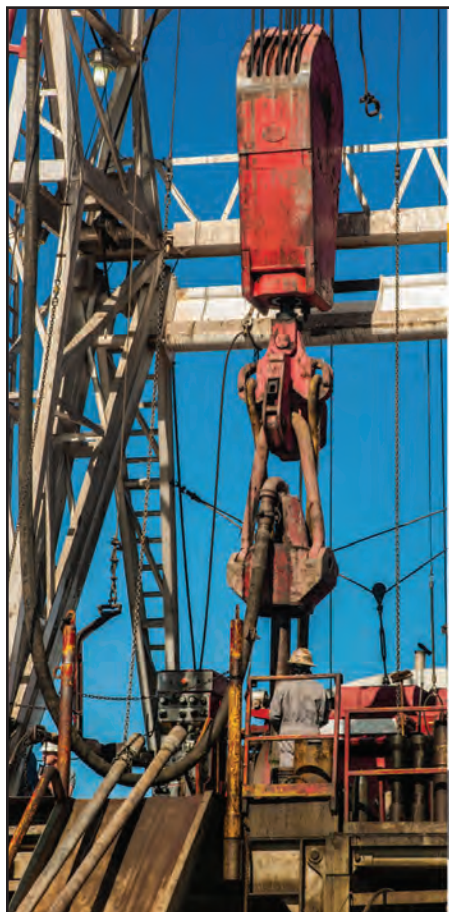
China's enduring zero-COVID policy and an increase in outbreaks in various cities led to a number of major lockdowns in 2022, which has impacted supply chains. A lockdown in Zhengzhou in November 2022, where Apple operates its biggest iPhone production facility, caused delays for Apple customers around the world. Although the country's zero-COVID policy is no longer in effect, supply chains are still susceptible to sudden disruptions due to factory closures or capacity reductions.

### 5. New carbon emission regulations may lead to slower movement of goods

New regulations designed to curb carbon emissions may lead to slowdowns in shipping speeds. As instructed by the International Maritime Organization, cargo ship operators must monitor and decrease emissions in 2023. In order to meet their emission targets, older cargo ships will either have to be upgraded or cruise at 10 percent slower speeds. The decrease in transport speeds is expected to create supply chain lags.

## A LOOK AHEAD

In the conclusion to this series, we'll explore six industries that will face supply chain disruptions in 2023 as well as a closer examination of the global online manufacturing supply capacity. Finally, we'll conclude by discussing five solutions for strengthening supply chains in 2023 and in the years ahead. Truly, adaptive models of supply chain management will be a constant point of emphasis for any growth-oriented business in the future. ■





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# REUSING PROCESS WATER AT A PERUVIAN IRON ORE MINE

*A robust, low wear rotary lobe pump successfully extracts high solids content slurry*

BY MONICA MITTERSTEIN, NETZSCH

A Peruvian mining company reuses process water as part of their iron ore processing. Until November 2019, however, this was made difficult by the fact that the medium, which is collected in a tank on site, has a very high solids content of 60 to 70 percent. After an attempt to drain the water and remove the sediment in the tank with shovels had failed after four days, the owner decided to purchase a submersible pump with an agitator. The experts at Netzsch Pumps and Systems instead recommended a Netzsch Tornado® T1 rotary lobe pump for pumping the slurry from the tank.

This self-priming pump uses the positive displacement principle: Two intermeshing rotors continuously transport the medium from the intake side to the delivery side. The strong suction capability allows the pump to work with a high flow rate and handle a high solids content, while a geared motor with low speed reduces the level of wear. A double mechanical seal and a rotary lobe made of Nitrile rubber minimise the risk of abrasion damage. The Tornado T1 in size XLB-3/2 was installed on a mobile trolley and placed near the tank in March 2021. The staff were able to move the hose freely inside the tank and the sediment could be removed without any issues.

with a crushing plant that reduces the ore by 95 percent as well as a magnetic separation plant, a filter plant, and a pelleting plant. The separating plant further crushes and concentrates the ore with cyclones, magnetic separation, and flotation. This process separates the sterile ore from the iron ore, which is then divided into two different product types: a high-grade iron concentrate for sintering and another that is sent to the pelleting plant after a filtration process.

## REUSE OF PROCESS WATER AFFECTED BY HIGH SLURRY CONTENT

Water is required for many of the mine's working steps. It comes from a 230 x 60 x 27 feet (l x w x h) process tank, which is fed with the medium from concentrate and tailing thickeners. In addition to the water, slurry with magnesium and iron deposits also accumulates in the tank. The liquid rich in solids is pumped over in the tank to then be used in different processes and locations, such as in the magnet plant.

A flocculant is used to recover the slurry from the underflow. The water coming from the overflow carries along solids that have accumulated in the tank over the course of many years. However, the water has to be as clean as possible to be reused in other processes. Due to years of solids accumulation, there are too many coarse particles in the water that prevent using it in the

At the deposits on the South coast of Peru, around 330 miles from the capital Lima, the Shougang Hierro Perú S.A. mining company mines iron ore and processes it into different products. In addition to an open pit of around 60 square miles, the complex comprises a processing area in the town of San Nicolás



Netzsch recommended a Tornado T1 rotary lobe pump for pumping the slurry from the tank.

downstream processes. This made pumping the fluid so difficult.

The mine owner initially decided to resolve the issue with a plant stop. The water was drained from the tank and the employees tried to remove the slurry layer, which was already up to 16 feet thick, with shovels. This procedure turned out to be very unsatisfactory, though, because the slurry had become extremely compressed and we had to introduce water again to peel it from the surfaces. When the deposits had not been removed after four days, those in charge decided to apply a different method. They were now considering the option of using a submersible pump with an agitator to remove the slurry during ongoing operation without having to stop the plants and to drain the water again.

## SUBMERSIBLE PUMP NOT AN OPTIMUM SOLUTION

To procure the required pump, the mine owner contacted Netzsch



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Pumps & Systems, but the experts there advised against a submersible pump. Customers often consider a submersible pump to be the right solution for them. However, in this case such a unit would have had to be very big in order to achieve the required flow rate. In addition, centrifugal pumps usually run at 3,500; 1,800; or 1,200 rpm—the high speed and the increased solids content would have caused damage to the internal parts of the pump very quickly. If the speed has to be reduced even further, for example to an eight-pole motor with 950 rpm, then these pumps need to be even bigger to maintain the flow rate. And the motor gains in size as well. Because submersible pumps have to be made of stainless steel, the Peruvian mining company would have been faced with very high purchasing costs for this pump.

In addition to all this, this type of agitator pump requested by the mine owner is usually only designed for a solids content of up to 50 percent. However, the solids content in the application in Peru is 60 to 70 percent, which would have made operation difficult including frequent failures.

### **TORNADO T1 BETTER SUITED FOR WATER WITH A HIGH SOLIDS CONTENT**

After a detailed analysis of the problem and the liquid to be pumped, Netzsch suggested using a Tornado T1 pump of size XLB-3/2, which offers a number of advantages over the originally selected submersible pump. The key benefit is that this model is a self-priming displacement pump that can ensure continuous pumping due to its design.

Two synchronised rotors inside the pump intermesh, generating negative pressure at the intake side



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that continuously pulls the medium towards the rotary lobes, which then transport it to the delivery side. This powerful negative suction allows the Tornado T1 to pump almost any type of medium. This applies to low viscosity and high viscosity substances as well as to thixotropic or dilatant substances, lubricating, non-lubricating, shear-sensitive or abrasive media. It is therefore ideal for the process water at the mine in Peru and can pump out the medium at a high flow rate despite the high solids content of up to 70 percent.

The material and design of the T1 are always adapted to the special requirements of the designated medium. For viscous and abrasive materials and those containing solids, Netzsch offers different rotary lobes with suitable geometries in each case. Materials adapted to the medium additionally increase the durability of the rotary lobes as well as their service life. Tri-lobe helical rotors made of Nitrile are used for the application in Peru to minimise the risk of abrasion damage. In addition, double cartridge mechanical seals are installed which are not sensitive to the solids in the medium. The gear motor of the pump works at a lower speed, which also causes less wear. Overall, this lowers the maintenance costs for the pump significantly.

### **TORNADO T1 SUCCESSFULLY PUMPS OUT SLURRY**

To make handling easier for the mining company's staff, the rotary lobe pump was installed on a mobile trolley and equipped with flexible hoses. This makes it easier to extract the slurry from the tank through the ten ventilation openings at the top of the tank as well as through the corners. The function and capacity of the pump was checked on site in April 2021. For this first test, the customer used a six-inch hose for intake and delivery. However, they attached a 5-foot-long metal lance to the end of the intake hose which made the hose more difficult to handle. The pump was started up and

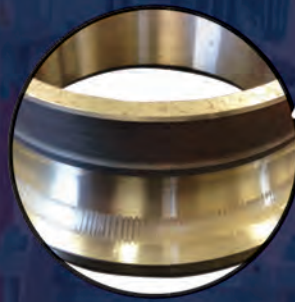
took about seven minutes to transport the water to the agitators.

While pumping the water with the solids, the pump maintained the required flow rate. The solids content was 20 percent on average, with peaks at 30 percent.

For the second test, the intake hose was replaced with a 4-inch model and a smaller lance was used. Another hose supplied water with a pressure of 6 bar to loosen the slurry that had settled fully. With the new hose and the improved handling of the smaller lance, it was possible to remove the required minimum volume of solids. After the successful second test, the pump now runs without any problems. The hose can be moved through the tank easily extracting the solids. The Tornado XLB-3/2 continuously provides the required flow rate without pressure loss. After these measures, the process water from the tank still has the required quality for being used in the ore processing without any issues. ■

**MONICA MITTERSTEIN** is global manager of mining and explosives at Netzsch. The Netzsch Group is an owner-managed, international technology company with headquarters in Germany. The Netzsch business units Analyzing & Testing, Grinding & Dispersing, and Pumps & Systems represent customized solutions at the highest level. More than 4,000 employees in thirty-six countries and a worldwide sales and service network ensure customer proximity and competent service. For more information, visit [www.netzsch.com](http://www.netzsch.com).

# FAILED BEARINGS



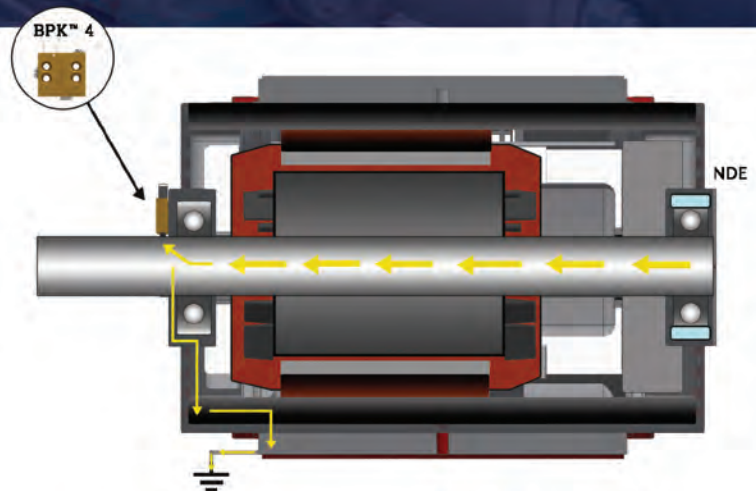
arcing,  
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## DID YOU KNOW?

Beer has a natural carbonation level that is essential for texture and taste. The point where the pressure on the beer is just enough to keep the carbon dioxide in the beer is called the equilibrium pressure. If the beer is maintained at equilibrium pressure, its texture and taste will be exactly as the brewer intended it to be.



# FROM BARREL TO BAR

## *A beer pump application guide*

BY DAVID ALLEN, XYLEM

In a competitive environment, it is essential that a “live” product like beer reaches the consumer in prime condition in order to retain its flavor and the characteristics that make it unique, just as the brewer intended. The beer also needs to be dispensed at a rate that supports venue business levels, and the skill level of the serving staff behind the bar.

To meet the above requirements, one of the most effective methods of packaging beer is in stainless steel or aluminum kegs. Kegs transport and dispense mass quantities of beer without impacting its quality or taste by protecting it from exposure to oxygen and sunlight. Kegs also allow the beer to be dispensed easily and quickly for more fast and efficient service.

Because space in the bar is often limited, kegs are normally stored remote from the bar area, so the beer needs to be moved from the cellar or storeroom to the tap on the bar. However, the taste of every beer dispensed from a keg that’s stored remotely can be hit or miss depending on the distance it needs to travel and the temperature at which it has been stored.

With so many variables at play, having the right beer dispense system is critical to ensuring the perfect pour—from the barrel to the bar, every time.

## PERFECTING THE POUR

Typically, systems that push beer through dispensing systems are carbon dioxide gas or blended gas assisted, which is why it can be challenging to perfect the pour. To transport the beer from the keg to the bar, gas pressure above the level required to maintain the beer at brewery standard is applied to the top surface of the beer, pushing the beer through the tubing to the bar.

Head pressure, as recommended by the brewer, effectively delivers the beer to the glass over short line distances. The further the keg is from the bar, the greater the applied gas pressure needs to be—this means recommended head pressure plus added pressure transports the beer from the keg to the glass. Whenever the head pressure applied to the beer exceeds the equilibrium pressure recommended by the brewer, it is easy for the incorrect pressure to be set. This results in conditions where the pressure is either too high or too low.

Over time, excess pressure leads to more carbon dioxide being absorbed by the beer. This is known as over carbonation and has two major drawbacks:

- **Foaming:** Carbon dioxide released on dispense leads to too much foam on the beer head, making it difficult to dispense.
- **Flavor:** Too much foam impacts the texture and taste of the beer, resulting in a negative experience for the consumer.

The opposite of over carbonation is under carbonation or flat beer. This occurs when the pressure applied to the keg is too low. In under carbonation conditions, the carbon dioxide gas in the beer escapes in the keg until the equilibrium pressure is reached. The result is a flat beer, which destroys the taste and texture of the beer, spoiling the experience of the end customer.

## DID YOU KNOW?

If every faucet on a bar wastes just one drip tray of beer each day, and that bar or restaurant trades for 312 days in a year, an equivalent of 58.5 gallons (468 pints) of beer are wasted.

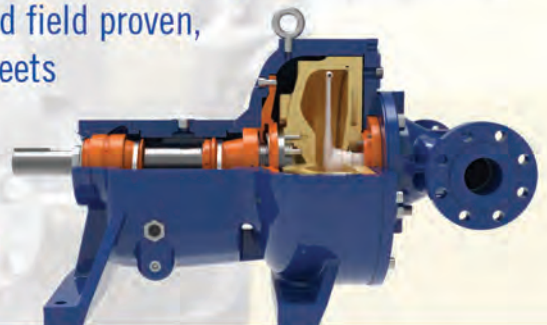
The beer pump was developed to overcome such challenges. Unlike traditional (non-pump) dispense methods, the pressure on the keg remains constant at the equilibrium pressure. Maintaining constant equilibrium pressure on any keg means the taste of the beer remains exactly as the brewer intended and the consumer gets a distinct, satisfying, truly enjoyable glass of beer with every pour.



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## PUSH AND PULL PUMPING

The use of beer pumps, particularly in environments where excess top pressure is required to traverse a distance, allows an installer and operator to maintain equilibrium pressure in any given circumstance. There is no need to put extra pressure on the beer to effectively move it through the system. Instead, drive pressure is applied to the pump to move the beer. The drive pressure effectively acts like a car accelerator—the

more you put into the pump, the quicker it operates.

Beer pumps consist of an air chamber, where the drive pressure comes in, and two wet chambers where the beer passes through. The two wet chambers are separated by seals known as diaphragms. Because of this design, the drive gas never comes into contact with the beer. A special shuttle valve forces the air pressure behind each of the diaphragms in turn, allowing one piston to gently suck the beer in, while the other pushes it out the other side.

This push-pull action draws the beer from the keg and gently pushes it through the tubing to the bar. When the dispense tap is opened, pressure in the line drops below the drive pressure in the air chamber so the pump runs, feeding the beer line to the bar. When the faucet is closed, the pressure in the line rises to a point where the beer pump stops. It

remains stopped until the faucet is opened again to dispense beer.

## BENEFITS OF BEER PUMPS

For those in the know, there are several benefits found by using beer pumps—benefits that range from serving quality and storage to adaptability and the bottom line:

- Beer is maintained at equilibrium pressure, preventing over carbonation.
- Beer can be moved over longer distances, allowing kegs to be stored remotely.
- Dispense speed can be adapted to meet business demand and skill level of serving staff.
- Dispense speed and presentation is consistent with every pour.
- The perfect pour prevents beer wastage, saving money.
- Less carbon dioxide is used as the beer pump can be driven using a compressor.

## TOP TIP

A multiple beer faucet system using Flojet G56 Beerjet pumps with the Flojet Line Buddy flow reversal valves allows for multiple lines to be cleaned at one time!

## SOLUTION SPOTLIGHT: XYLEM FLOJET G56 BEERJET

Designed to take the variability out of beer dispensing systems, Xylem's Flojet G56 Beerjet pump offers enhanced beer quality—from the top to the bottom of every barrel—without impacting taste. Powered by gas or compressed air, the beer is pushed through the lines to the tap without the gas or air ever coming into contact with the beer.

The result? A perfect pour, from the barrel to the bar, every time. Key product features include:

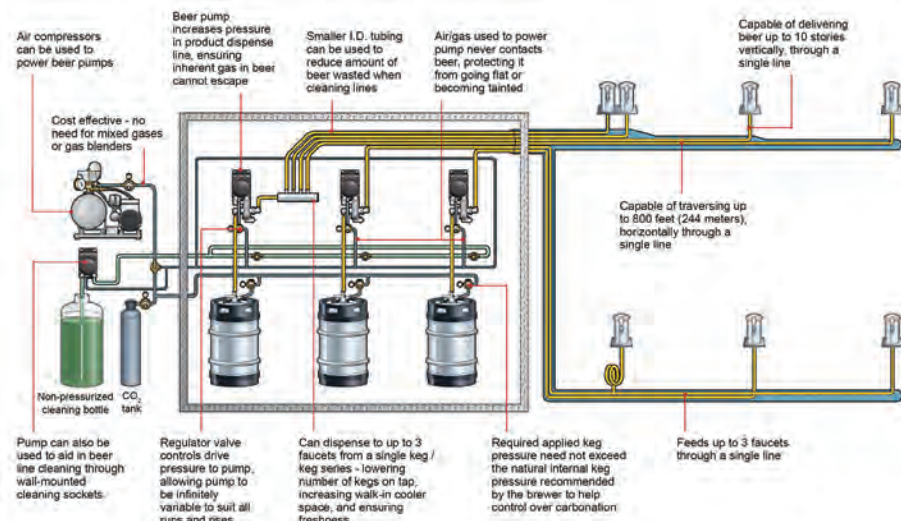
- Can traverse up to 800 feet horizontally through a single line.
- Can deliver beer neatly over 100 feet vertically through a single line.
- Can dispense multiple faucets (up to three) from a single key or keg series, lowering the number of kegs on tap.
- Can dispense 300 gallons (2,400 pints) of draft beer per hour.
- Has a service life of more than 70,000 gallons (560,000 pints).

The Flojet G56 Beerjet pump is also easy to clean and maintain and can be used as a line-cleaning pump. By disconnecting the keg coupler and submerging it in a line cleaning solution, the pump will gently draw the solution in and pump it through the system right through to the faucet.

Compatible with the Flojet Line Buddy flow reversal valve, operators can optimize line cleaning processes by running cleaning solutions through the Flojet G56 Beerjet pump in both directions. Running a cleaning solution through a beer system in alternating directions—from the faucet to the tap and back again—has been found to optimize line and pump sanitation. Flow reversal valves are an important accessory in beer pump systems.

### PUMPING IN ACTION

In conclusion, let's do a brief rundown of installation tips before you try out your next perfect pint:



1. Clean, dry gasses (carbon dioxide, nitrogen, blended gasses, or compressed air) should be applied at 15-90 PSI for gas inlet operating pressure. Calculations for gas pressure additions are used as a starting point to power the pump. Only the equilibrium pressure specified by the brewer should be maintained on the keg

2. For optimal results, beer pumps must be mounted directly inside the cooler or cellar wall. Universal mounting brackets can be used to aid installation

3. When using a carbon dioxide or nitrogen exhaust, gas must vent outside of the cooler or cellar into a space that is well ventilated, preventing buildup of carbon dioxide or nitrogen. Always check gas or liquid connections to prevent against gas or beer leaks within the system

4. To improve system efficiency, "Foam On Beer" (FOB) detectors are recommended. Installing FOBs on each beer line stops pumping action when the keg or tank is empty, which also supports key change overs

5. For multi-pump installations, incorporating a flow reversal valve will help clean lines in a loop,

using the beer pump to drive the cleaning solution through the system rather than needing a separate pump

6. When installing the system, it is important to ensure that the dispense rate, which is determined by setting the drive gas pressure on each pump, is set to match the skill level of serving staff

7. If you have any application questions before, during or after installation, always contact your solution provider ■

**DAVID ALLEN** is director of product management and marketing for Flojet, Jabsco, and Rule. Xylem is a leading global water technology company committed to solving critical water and infrastructure challenges with innovation. The company's 17,000 diverse employees delivered revenue of \$5.2 billion in 2021. Xylem is creating a more sustainable world by enabling its customers to optimize water and resource management, and helping communities in more than 150 countries become water secure. For more information, visit [www.xylem.com](http://www.xylem.com).





# THE WORLD'S LARGEST UNTAPPED RESOURCE: EXCESS HEAT

*American industry is sitting on a potential gold mine Part 1 of 3*

BY ASTRID MOZES, DANFOSS

Among experts there is increasing consensus that spiking energy prices are likely to linger on for the next few years, at least. While the energy crisis escalated because of the devastating war on European soil, the consequences are felt globally. Across the globe, high inflation has sadly pushed families into economic distress, forced factories to curtail production, and slowed economic growth to the point that several countries are now facing a recession. In Europe, where gas supply is

vulnerable because of reliance on Russia, gas rationing and significant risk of blackouts might be the result of power supply shortage and grid instability.

What have been the political responses to the energy crisis? Overall, most attention politically has been devoted to supply side measures. In an unexpected positive development, the global energy crisis has triggered unprecedented momentum behind the build-out of renewables. The world is now set to add as much renewable power in the

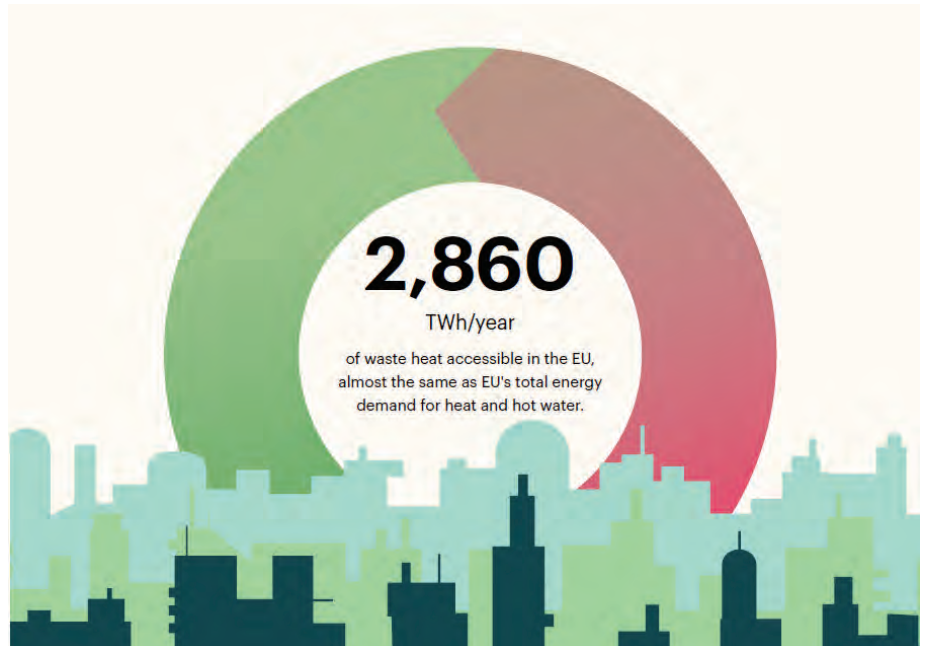
next five years as it did in the past 20 years. This is indeed encouraging and necessary.

But since the build-out of renewables is not a short-term fix, one of the main components in the political response to the crisis has been for governments to increase imports of LNG. This is not a long-term solution since competition to attract LNG will be stronger as Chinese economic activity is likely to pick up again. In addition, most emergency fiscal measures have focused on subsidies, such as income

support to households. In contrast, measures to reduce energy demand structurally, such as investment incentives or regulations to push for higher efficiency, are almost absent in current crisis policies (Germany being one of the few uplifting exceptions to this).

Despite skyrocketing energy prices and unprecedented uncertainty on energy supply, we are far from the average efficiency improvement of 4 percent per annum that is necessary if we are to reach Net Zero emissions. Structural efficiency measures, including regulation to reuse excess heat, are almost absent in the political responses to the crisis. This is the case despite the fact that efficiency measures constitute the fastest and most cost-effective tool to mitigate the energy crisis.

Most remarkably, only very few initiatives have pushed for more efficient use of the vast amounts of wasted energy in the form of excess heat.



As we will see, every time an engine runs, it generates heat. Industries, wastewater facilities, data centers, supermarkets, metro stations, and commercial buildings all generate large amounts of heat that

is currently let out in the air with no efforts to reuse it.

#### WHAT IS EXCESS HEAT?

Excess heat, also called surplus heat or waste heat, can be reused through



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existing and well-proven technologies, most notably heat pumps. Heat pumps are electrically powered devices able to transport heat from one place to another. They can, for example, harness heat from the exhaust fumes of a factory or the heated water from the cooling systems in data centers and circulate it in the heating system of nearby homes.

Reusing excess heat will lower costs for consumers. It is much cheaper to reuse energy than it is to buy or produce it. On a societal level, excess heat can replace significant amounts of electricity or gas that are otherwise needed to produce heat. This way, excess heat can help stabilize the future electricity grid. Paraphrasing Amory Lovins, using high value energy carriers like gas or electricity for heating is like “using a chainsaw to cut butter,” as heating can easily be covered by low-value heating sources such as excess heat. Adding to this, in the future energy system, new excess heat sources such as power to X facilities will emerge and grow in number—generating large amounts of excess heat that can be utilized on large scale.

Compared to a conventionally decarbonized scenario, a full implementation of technologies that tap into synergies between different sectors and enable a utilization of excess heat has the potential to save tens of billions of dollars per year once fully implemented (in 2050). These savings result from large fuel savings leveraged by interconnecting the heating and cooling sector with other parts of the energy system and

more flexibility resulting in the better integration of renewable electricity sources in the wider system.

In short, ramping up the use of excess heat will lower overall energy demand, give a productivity boost to the economy, and ease the transition to a green energy system.

### WASTING HEAT MEANS WASTING MONEY

Imagine you passed through a building and the floor is full of one-dollar notes. Would you keep walking and go about your day? Surely most people would make a small effort to bend down and collect the money. When it comes to excess heat, this is not happening: We are metaphorically letting the money flow as we make no efforts to reuse excess heat in our buildings and industries.

Every time an engine runs, it generates heat. Anyone who has felt the warmth behind their fridge can confirm this. The same is true on a larger scale in supermarkets. Keeping food fresh in cooling displays and freezers generates significant amounts of excess heat. A similar process goes for the cooling of the thousands of data centers that are popping up around the world. This excess heat is currently released into the air without any effort to reuse it. Let us take a closer look at this hidden resource of energy.

In general, there is a lack of overall information on the excess heat potential of different areas. However, we do know that currently very little of the existing excess heat both from

conventional and unconventional sources is recovered and used in large-scale applications. Some of the best data on overall excess heat sources is made by experts at the University of Aalborg and Halmstad University and covers excess heat from a number of sources in the European Union.

### EXCESS HEAT BY THE NUMBERS

If nothing else is mentioned, the following estimates are so-called “accessible excess heat,” which means that the numbers consider the practical utilization potentials of the available excess heat. In that sense, the numbers are conservative because they only consider sources located within a few miles of urban district heating areas. As we will see, there are ways to exploit excess heat that do not rely on such networks, for instance on-site heat recovery. In addition, it should be noted that excess heat comes in different temperatures. At higher temperatures, it can often be exploited directly, whereas at lower temperatures, it can be boosted by a heat pump. Therefore, the actual utilization of excess heat potentials also relies to some degree on electricity used by technologies such as heat pumps.

When looking at specific cities and regional areas, the numbers are found by using the planning tool, “The European Waste Heat Map.” This tool displays excess heat in the European Union countries and the United Kingdom from both conventional industrial sources and unconventional sources such as metro stations, food production facilities, food retail stores and wastewater treatment plants. The numbers can be considered conservative since the tool displays neither residential and service sector buildings, nor data centers. Moreover, this tool also focuses on sources within a few miles of urban areas, therefore discarding remote locations. Plus, the expansive geographic range provides a corollary for possible approaches to harnessing excess heat within the United States.

Heating is one of the largest energy consumers. In Europe, heating accounts for over 50 percent of the annual final energy consumption, and most European heat is still generated using fossil fuel-based sources, almost half of which is natural gas. At the same time, all urban areas in Europe have access to numerous excess heat resources. There is about 2,860 TW hours per year of waste heat accessible in the European Union, much of which could be reused. To put this number into perspective it corresponds almost to the total EU energy demand for heat and hot water in residential and service sector buildings, which is approximately 3,180 TW hours per year in the European Union and United Kingdom.

In some countries, the excess heat potential matches the heat demand. In the Netherlands for instance, excess heat amounts to 156 TW hours per year, while the water and space heating demand is only 152 TW hours per year.

The picture is similar across the rest of the world. For instance, looking at the industrial sector in Northern China there is around 813 TW hours during heating season alone—imagine what the total amount of excess heat in all sectors in the whole of China then looks like!

#### A LOOK AHEAD

In the coming pieces of this series, we'll explore how excess heat can accelerate decarbonization of the industrial sector. The industrial sector accounts for 39 percent of all global energy-related carbon emissions and is—with its current rate of energy efficiency improvements of 1 percent per annum—not on track to meet the milestones of the Net Zero scenario that would require improvements of 3 percent.

However, by the conclusion of this series, we will be able to layout specific example and policy recommendations that can take industry toward a more optimistic and sustainable future. ■

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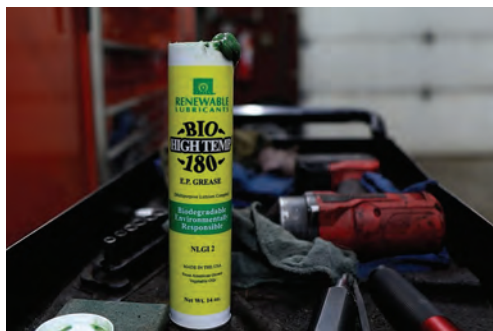
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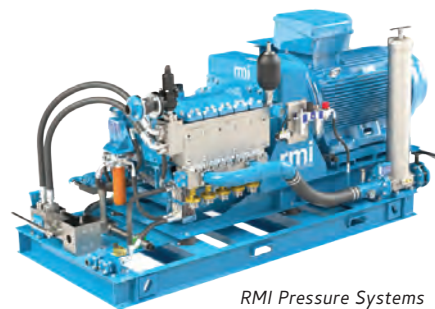
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# SHOWCASING ENERGY EFFICIENCY AND PRODUCTIVITY

*RMI Pressure Systems' Sean Heary  
sees AISTech as a launchpad to the future*



RMI Pressure Systems will be showcasing its S Series range, including the QUINMAX five-plunger pumps.



Sean Heary, global sales manager, mining and industrial at RMI Pressure Systems.

With the viability of steel industry seriously impacted by high energy costs, RMI Pressure Systems will be showcasing its energy-efficient high-pressure reciprocating pump solutions at the Association for Iron and Steel Technology (AISTech) conference, the steel industry's largest annual trade show and exposition,

this month. Below, RMI Pressure Systems' Global Sales Manager Sean Heary breaks down what to expect.

**MPT:** *As you were preparing for AISTech, what concerns do you see rising to the top for the steel industry as a whole?*

**SEAN HEARY:** Among the key issues on AISTech delegates' minds will be the dramatic increases in energy costs, as well as inflation, and rising capital costs. Other challenges facing the industry include the disrupted supply chain resulting from Covid-19 economic lockdowns, followed by the Russia-Ukraine war. The sector is looking for lower capital and operating costs, which is what RMI Pressure Systems can deliver through our years of experience with best-in-class plunger pumps.

**MPT:** *What are you hoping to share with customers at AISTech?*

**SEAN HEARY:** At our exhibition booth at AISTech, the company will be sharing insights with visitors on

our hydraulic power packs and systems for heavy industry—for applications including descaling, forging, and extrusion. We will also be promoting solutions for high-pressure flow applications such as cleaning, cooling, and dust suppression.

With its global installed base, RMI Pressure Systems has local service infrastructure in key markets to support customers. Our company's manufacturing hub in Manchester, England, includes an in-house research and development capability to drive continuous innovation of its products and solutions. It has operations in the United Kingdom, Europe, the United States, China, India, and Australia.

**MPT:** *Are there any products you'll be placing emphasis on at the show?*

**SEAN HEARY:** The two models in the RMI Pressure Systems' S Series range—the TRIMAX three-plunger pumps and the QUINMAX five-plunger pumps—have proven volumetric efficiencies up to 98 percent. Their fluid end components are designed with computational fluid dynamics (CFD) to maximise efficiency.

Our pumps feature a quality and robust design that facilitates extended operating life, optimal uptime, productivity, and low total cost of ownership. RMI reciprocating pumps deliver 95 percent energy efficiency; variable speed technology reduces pressure when it is not required, so there is less wear and tear on system components—for longer life. ■



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# Making it easy to get what you want

Let's face it, there's never a good time for failed equipment, especially when it's preventable. Clogged pumps lead to downtime and downtime leads to frustration, to say the least. With thousands of installations solving clogging issues, the XFP submersible pumps, utilizing the Contrablock Plus system, have proven themselves to prevent problems before they even start. With superior solids and rag handling and lower maintenance costs for long-term reliability, the choice is easy when it comes to replacing your failing equipment.

And to make it even easier, the XFP is available with a wide range of competitor retrofitting solutions for drop-in replacements, saving time and costly rehabilitation of a pump station. From retrofit brackets to controls to custom solutions, Sulzer makes it easy to get what you want. Don't you think it's time for change?

