

# VALVE


SUMMER 2025

Thermal Energy Storage

Seals in Flange Assembly

Case Study: SIS Management

Check Valve Chatter



## The Critical Role of Cooling for Data Centers

VOLUME 37 | NUMBER 3 | [VALVE-MEDIA.COM](http://VALVE-MEDIA.COM)

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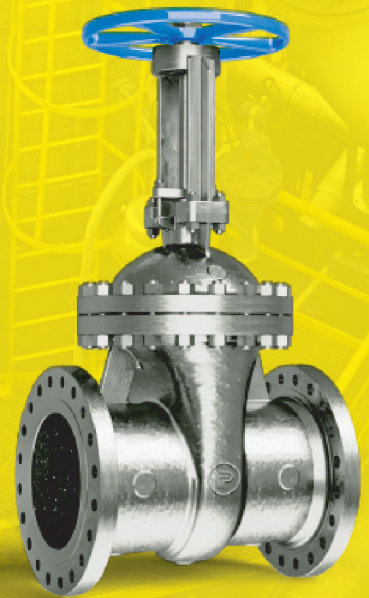
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# The Critical Role of Cooling for Data Centers

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BY HEATHER GAYNOR

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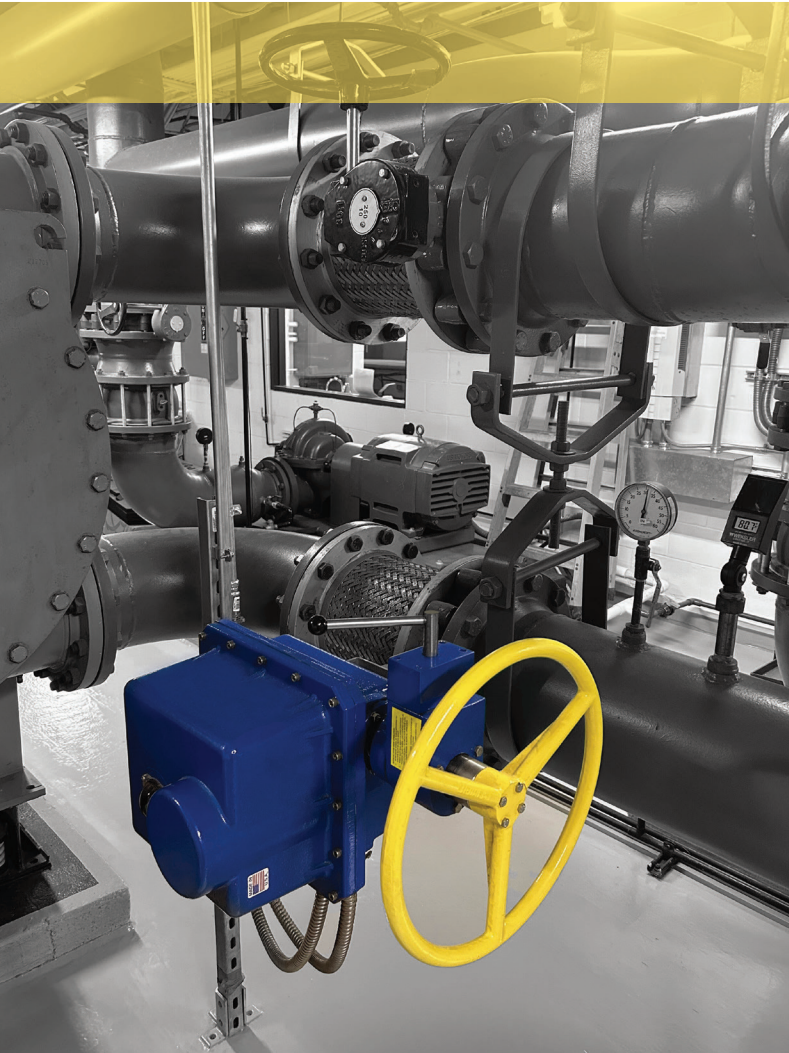
## Latest Launches

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- Bolted bonnet valve
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# Challenges and Opportunities Are Everywhere

Regulatory changes and updates, as well as tariff uncertainty, are keeping us on our toes.

To say that this year has started off with more uncertainty than expected is an understatement. There have been natural disasters including flash floods, landslides, earthquakes and record-breaking heat, as well as political unrest and discord across the globe. And those in the industrial world are not immune to these challenges with new bills, regulations and tariffs, but also significant opportunities to boost some manufacturing sectors in the U.S., including flow controls.

The recently passed U.S. tax reconciliation bill offers substantial advantages for many businesses. The Tax Foundation, a nonprofit, nonpartisan tax policy organization, estimates that the new bill will increase long-run GDP by 1.2% long term but will also increase federal budget deficits and add higher interest costs on that debt.

A major win in the bill for manufacturers is the ability to expense domestic research and development costs in the year they are incurred. A bonus depreciation for short-lived investments was also restored. Additionally, interest expenses are now deductible in more capital-intensive businesses, helping to offset some of the higher interest rates of the last few years.

In the energy sector, while many of the green energy credit incentive programs were phased out, oil and gas and coal-fired energy producers will find some benefits. The Department of the Interior and Bureau of Land Management will now hold regular lease sales for land and waterways to allow for more exploration, increasing government revenue from leasing up to \$17 billion in the next decade. The new bill also allows deductions for intangible drilling costs to be taken upfront instead of spreading over the life of the well, reducing taxable income and freeing funds for drilling operations costs. Numerous federal fees that were previously imposed on industry activities, including methane emissions, were also repealed. That's a lot of detail and doesn't even begin to scratch the surface of all that's included in the bill.

Specific to valve manufacturers and flow control companies, there also seems to be a lot of merger and acquisition activity happening right now. *Industry News* covers a number of high-profile transactions including Baker Hughes, Flowserve and Parker Hannifin announcements from the last quarter. This is creating larger organizations that can better serve their customer base as one supplier and should benefit end users.

We will continue to keep you abreast of the biggest news as it happens on [ValveMagazine.com](http://ValveMagazine.com) and the pages of the print edition. Please reach out with any news you have to share or if you have ideas for things you'd like to see.

Cheers! 🍷



**Heather Gaynor**, *Editor-in-Chief*  
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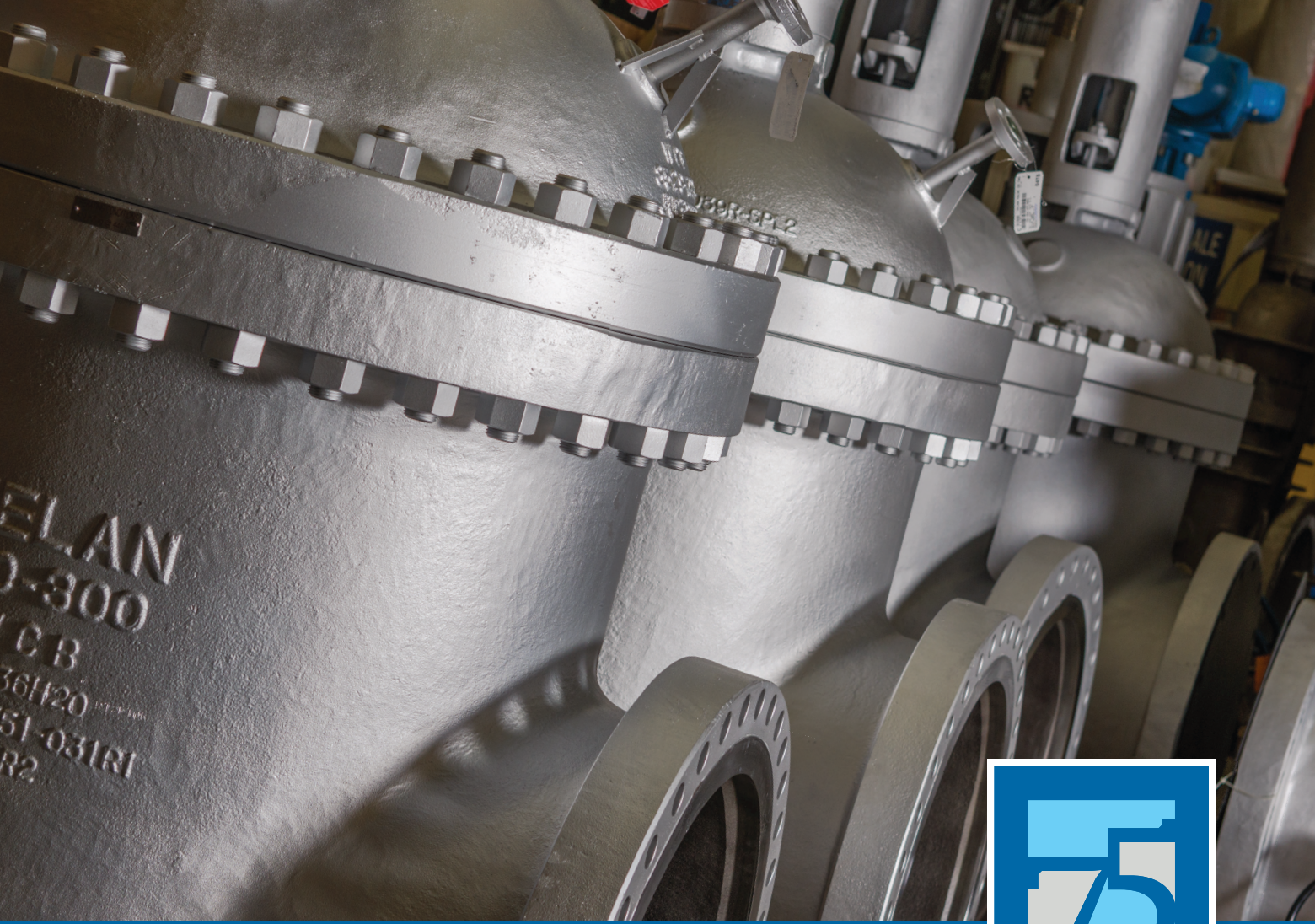
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# INDUSTRY NEWS

## First Shipment Departs LNG Canada Facility

Shell Canada Energy, an affiliate of Shell plc (“Shell”), announced that the first cargo of liquefied natural gas (LNG) has left the LNG Canada facility on the west coast of Canada. At 40%, Shell has the largest working interest in the LNG Canada joint venture. Located in Kitimat, British Columbia, the facility will export LNG from two processing units, or trains, with total capacity of 14 million tons per annum (mtpa).

“LNG Canada grows our leading integrated gas portfolio, providing a reliable supply of LNG to markets, most notably in Asia,” says Cederic Cremers, Shell’s President, Integrated Gas. “We expect that supplying LNG will be the biggest contribution Shell will make to the energy transition



A Shell LNG regasification plant in Gibraltar. Photo source: Fluor Corporation.

over the next decade, and projects like LNG Canada position our portfolio to achieve this.”

Shell’s LNG Outlook 2025 forecasts global demand for LNG is set to rise by around 60% by 2040, largely

driven by economic growth in Asia. LNG Canada’s strategic location on Canada’s Pacific Coast connects cost-competitive upstream gas from British Columbia to growing Asian demand.

## High-Temperature Incineration for PFAS Elimination

Veolia has published testing data on the incineration of PFAS compounds. The tests demonstrated that high temperature incineration is a proven and reliable disposal solution for high concentrations of targeted PFAS, destroying greater than 99% of targeted substances, including up to 99.99% of PFOS and PFHxS.

PFAS contamination is a critical challenge due to its widespread presence and persistent nature. This testing, conducted using the EPA’s most current guidance, advances the scientific understanding of PFAS disposal and gives cities and industries more options for management of these compounds.

The two-phased study was conducted at Veolia’s hazardous waste incinerator in Port Arthur, Texas, in July and October of 2024 by a third-party provider. The facility was chosen

based on its track record of managing PFAS-containing material, and its ability to reach a secondary combustion chamber temperature of 2,040°F and a residence time of 2.3 seconds.

The testing evaluated thermal treatment of AFFF fire fighting foam, PFAS-contaminated soil and spent carbon water treatment media in alignment with the EPA’s most current guidance for solids, liquids and stack air emissions.

In 41 of 45 samples, there were no detectable quantities of the target PFAS in any of the ash, slag or filter cake. In four ash samples, target PFAS levels close to the method detection limit were identified.

Very low levels of the target PFAS were detected in liquid residues; the target PFAS residuals were below the method detection minimum, as well as the Maximum Contaminant Levels

(MCLs) set by the EPA for drinking water limits.

In air emissions tests, the destruction and removal efficiency (DRE) was greater than 99% for the majority of target PFAS, and few to no PICs were detected during incineration, indicating highly effective destruction.

Veolia provides drinking water to more than 9 million people across the U.S. and has treated more than 24 billion gallons of water for PFAS at more than 30 sites, with dozens more under construction or in planning.

*Editor’s note: As fluoropolymers and other PFAS-related products are used in many flow control products, VMA is advocating for the industry to receive “Currently Unavoidable Use” status for these products. Learn more at [vma.org](https://vma.org).*

## Paper Mill Breaks Ground on Billion Dollar Expansion

Green Bay Packaging (GBP) is expanding its existing manufacturing facility in Morrilton, Arkansas, with an investment of more than \$1 billion. This expansion represents the largest capital investment project in the history of central Arkansas.

The multiyear project will significantly enhance the infrastructure of the mill and underscore the company's commitment to sustainable practices and operational efficiency. The project also includes the acquisition of approximately 300 acres of land for future investments and expansion, positioning the mill for the long term.

As part of a multiyear expansion, Green Bay Packaging will be enhancing the Morrilton facility's infrastructure and replacing key



Photo source: Green Bay Packaging

process components, including the recovery boiler and biomass boiler infrastructure. GBP will also install

an electric turbine generator to reduce Scope 1 and 2 greenhouse gas emissions.

## Baker Hughes to Acquire Continental Disc Corporation

Baker Hughes announced it has agreed to acquire Continental Disc Corporation (CDC), a provider of safety-critical pressure management solutions, from investment partnerships managed by Tincum Incorporated in an all-cash trans-

action for approximately \$540 million.

Headquartered in Liberty, Missouri, CDC designs and manufactures rupture discs, rupture disc holders, burst disc indicators, pressure- and vacuum-relief valves, flame and detonation arrestors and related safety products. These products, which are highly complementary to Baker Hughes' Industrial & Energy Technology's (IET) existing control

valve and high-pressure relief valve offerings, are deployed across a broad range of industries, including applications in the pharmaceutical, chemical, food and beverage, oil and gas and aerospace markets.

The acquisition is expected to close in the fourth quarter of 2025, subject to completion of all customary conditions and required regulatory approvals.

## DNOW to Acquire MRC Global in All-Stock Transaction

DNOW Inc. and MRC Global Inc. have entered into a definitive agreement under which DNOW will acquire MRC Global in an all-stock merger valued at approximately \$1.5 billion USD, including MRC's net debt.

Once complete, the combined company will operate under the DNOW name, with its headquarters maintained in Houston. It will span over 350 service and distribution locations across more than 20 countries. Leadership will remain with DNOW's CEO, David Cherechinsky, and MRC will have two representatives on the expanded 10-member board.

### **DNOW + MRC Global**

DNOW and MRC Global to Combine in All-Stock Transaction Creating a Premier Energy and Industrial Solutions Provider

The transaction is expected to close in the fourth quarter of 2025, pending approval from both companies' shareholders and completion of customary regulatory reviews.

## Chart Industries, Flowserve Corp. to Combine in All-Stock Merger of Equals

Chart Industries, Inc. and Flowserve Corporation have entered into a definitive agreement to combine in an all-stock merger of equals. The combined company is expected to have an enterprise value of approximately \$19 billion based on the exchange ratio and the closing share prices for Chart and Flowserve as of June 3, 2025.

With an installed base of more than 5.5 million assets in more than 50 countries, the combined company will address the full customer life-cycle from process design through aftermarket support. The combined company generated net revenue of approximately \$8.8 billion as of the end of Q1 2025, drawn from diverse, high-growth, attractive end markets, including approximately \$3.7 billion in aftermarket services revenue, representing approximately 42% of combined revenue.

The combination brings together Chart's expertise in process technologies across compression, thermal,



Source: Flowserve investor presentation

and Flowserve's capabilities in flow management. Combining digital platforms that underpin this full suite of solutions will enable further oppor-

tunities to differentiate solutions, offering a comprehensive digital overlay, including monitoring and predictive capabilities.

## Parker Hannifin to Purchase Curtis Instruments from Rehlko

Rehlko, a global player in energy resilience, announced that it has reached a definitive agreement to transition ownership of its Curtis Instruments business to Parker Hannifin Corporation, the motion and control technologies company, for approximately \$1 billion in cash. The transaction, which is expected to close by the end of 2025, reflects Rehlko's strategic focus on strengthening its core enterprise capabilities and commitment to delivering industry-leading energy resilience solutions for its customers.

"Rehlko is proud of the legacy and performance of Curtis as a high-performing, innovation-driven business," says Brian Melka, President and Chief Executive Officer of Rehlko. "Parker is an exceptional company and we are confident Curtis will thrive from



Source: Getty Images

Parker's increased scale, focus and investment."

The move positions both Rehlko and Curtis to pursue independent growth strategies, focused on accelerating innovation and expanding customer impact. Rehlko was acquired by Platinum Equity in 2024.

Until the transaction closes, Curtis will continue to operate as part of Rehlko, with both companies focused on delivering the same high-quality products, services and support that have defined their market-leading positions for over six decades.

## PSG Acquires IPP Pump Products GMBH

PSG, an operating company of Dover Corporation, announced that it has acquired ipp Pump Products GmbH (“ipp”), a specialized manufacturer of sanitary pump technologies, including hygienic lobe, progressive cavity and other processing equipment.

Headquartered in Bersenbrück, Germany, ipp Pump Products GmbH was founded in 2005. The company’s product portfolio is engineered for gentle, contactless fluid handling and optimized for CIP/SIP cleaning processes.

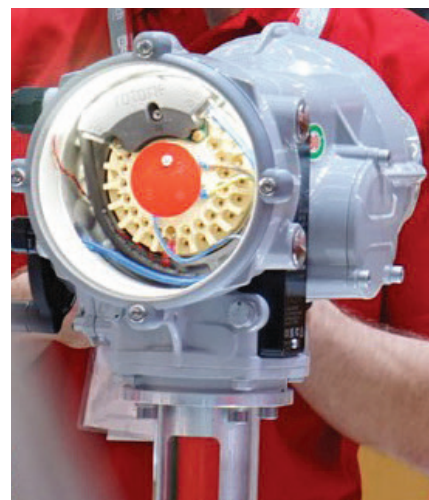
Constructed from premium materials like stainless steel and Hastelloy, ipp’s products help customers achieve optimal process performance in the most challenging hygienic applications.

## Rotork Joins Rockwell Automation’s Tech Partner Program

Rotork, a global flow control and intelligent actuation solutions provider, announced its official entry into the Rockwell Automation Technology Partner Program. This collaboration marks a significant step in expanding Rotork’s presence within the industrial automation landscape.

As part of the partnership, Rotork’s IQ3 Pro electric actuator with EtherNet/IP connectivity will be featured in Rockwell Automation’s Technology Partner product reference catalog and system design tools. This integration will make it easier for engineers, system integrators and end users to specify Rotork’s advanced actuation solutions in a wide range of industrial applications.

The partnership spans North America, EMEA and APAC, aligning with Rotork’s global footprint and enabling closer alignment with



Source: Rotork

Rockwell’s regional teams and customer base.

While the IQ3 Pro is the first product to be listed, Rotork anticipates expanding its presence in the Rockwell partner network as additional products in its portfolio become Ethernet-compatible.

## U.S. DOE Vouchers Awarded for Advancing Nuclear

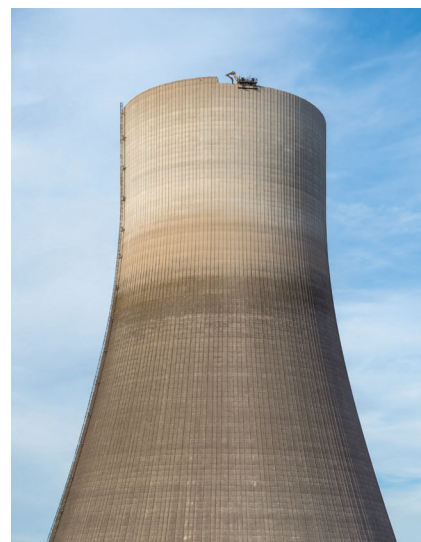
The U.S. Department of Energy (DOE) announced that three companies will receive GAIN (Gateway for Accelerated Innovation in Nuclear) vouchers to accelerate research on advanced fuels, materials and sensors. The vouchers provide companies with access to extensive research facilities and expertise across DOE’s national laboratory complex to advance promising projects that can provide more reliable, secure and affordable nuclear energy.

AiMiLight Sensors and Intelligent Systems Inc. (Pittsburgh, PA) will work with Pacific Northwest National Laboratory to test a prototype of the company’s new “smart” cable, designed to track temperature and radiation exposure in real-time and could assist nuclear power plants in transitioning to condition-based maintenance of electrical cables in harsh environments.

Hayward Tyler, Inc. (Colchester, VT) will collaborate with Argonne National Laboratory to test several new materials for use in sodium-cooled fast reactor pumps to find cost-effective alternatives for cobalt alloys, looking for alternatives to reduce U.S. dependence on China-sourced cobalt and strengthen U.S. supply chains.

Standard Nuclear Inc. (Oak Ridge, TN) will partner with Oak Ridge National Laboratory to calibrate its alternative approach to assess the carbon and oxygen content in ceramic-coated TRISO fuel kernels to reduce the cost and inefficiencies associated with current destructive testing methods.

GAIN voucher recipients do not receive direct financial awards. Vouchers provide funding to DOE laboratories to help businesses overcome critical technological and commercialization challenges. All awardees are responsible for a minimum 20%



Source: Getty Images

cost share, which could be an in-kind contribution.

This marks the second round of GAIN vouchers awarded for fiscal year 2025. Visit the GAIN website for more information on upcoming award rounds: [gain.inl.gov](https://gain.inl.gov).



# The American Petroleum Institute

A key organization supporting the flow control industry.

BY: HEATHER GAYNOR  
EDITOR-IN-CHIEF

Founded in 1919 as a standards-setting organization, the American Petroleum Institute (API) plays a pivotal role in the U.S. energy sector. With nearly 600 members, API acts as a national trade association representing oil and natural gas companies, but also as a key standards-setting body for critical components like valves, actuators, regulators and other flow control products. For manufacturers and end users alike, API's influence touches nearly every facet of production, safety and reliability.

API's membership is broad, encompassing a diverse range of companies including major energy producers, midstream pipeline operators, downstream refiners, engineering and construction firms, OEMs and suppliers of critical components. Valve, actuator and control manufacturers often participate directly in API committees and working groups to ensure their products align with the latest industry demands and safety expectations.

API standards are developed under API's National Standards Institute accredited process to ensure that the standards are technically sound and rigorous and that their third-party accreditation is easily understood and acceptable not only at the state and federal level, but increasingly globally.

API has developed more than 800 standards and recommended practices that help drive consistency, safety and interoperability across the energy value chain. These standards define materials, dimensions, performance criteria, testing procedures and qualification protocols that ensure valves and actuators meet the rigorous requirements of oil and gas service. A recent report found that API standards are used voluntarily by industry in more than 140 countries.

For the industrial valve industry, API standards that are common include API 599 (plug valves), API 603 (gate valves), API 608 (ball valves) and API 609 (butterfly valves). API 598 pertains to the testing and inspection of a variety of valve types. Others, like API 615, pertain to a specific application. There are other standards pertaining to the industrial valve industry — some that are appli-

cation specific or related to a certain type of system, and others that are developed for a particular type of valve.

Beyond standards, API's offers certification programs lend credibility and assurance. The **API Monogram Program** is a voluntary licensing program that ensures consistent manufacturing to API specifications. Licensed manufacturers may use the API Monogram registered mark on equipment that meets the requirements to its API Spec Q1, an industry-leading quality management standard that meets most of the ISO 9001 requirements as well as additional requirements specific to the oil and gas market.

API also serves as a key voice in policy and regulatory discussions. Through advocacy and public engagement, API works to shape balanced regulations that promote both energy development and environmental protection. The organization's technical expertise often informs decisions made by OSHA, the Department of Transportation and other regulatory bodies. Members of API are committed to 13 core elements of API Energy Excellence that were created to unify a cross-industry management system approach to drive operational improvement across the oil and gas industry.

In an industry where failure is not an option, API's work helps create a common language and set expectations between manufacturers, specifiers and end users. For companies involved in producing or deploying flow control equipment, understanding and aligning with API's standards is not just beneficial — it's essential for staying competitive and compliant in today's energy marketplace. For more information, visit API's website at [api.org](http://api.org).

API was formed in 1919 as a standards-setting organization and has developed more than 800 standards to enhance operational and environmental safety, efficiency and sustainability.



American  
Petroleum  
Institute



## Looking Back, Planning Forward

As we reach the midpoint of the year, many of us find a natural moment to pause — whether it's through a summer getaway or simply enjoying longer evenings with friends and family. For others, the summer months may bring a rare opportunity to focus on work and reflect while colleagues are away.

Regardless of how you're spending the season, mid-year offers a valuable opportunity to assess progress and adjust course. Looking back at a dynamic first half of 2025, one thing is clear: change continues to be the only constant. But with that change has come *some* much-needed clarity.

We now have a better understanding of the policy directions and regulatory shifts shaping our industry — ranging from trade and tax to environmental policy, a manufacturing-first agenda from the current administration and the growing patchwork of PFAS regulations at the state level. For many of our members, these developments have required adjustments to supply chain strategies, workforce planning and customer engagement.

At VMA, we've also embraced this evolving landscape. Throughout the first six months of the year, VMA engaged with policymakers to ensure the interests of our members are represented. Further details on these efforts can be found in the VMA News section.

Equally important has been our continued commitment to education and community. The first half of 2025 saw strong participation at in-person events such as the Valve Forum: Conference & Exhibits, the Hydrogen + Energy Valve Summit, and the Valve Repair Seminar. We also hosted a series of member-exclusive webinars and delivered timely updates through our eNewsletters. These activities were all designed to share knowledge, discuss trends and issues, and provide regular benchmarking opportunities.

With the path ahead becoming clearer, now is the time to begin charting a new course — one shaped by a new policy, market and global paradigm. The second half of 2025 offers the opportunity not just to react, but to plan, adapt and lead.

VMA is here to support you, and hope to see you at two upcoming members-only events designed to help members make informed, strategic decisions:

- The Market Outlook Workshop (virtual), September 9–11, 2025, features economic and market forecasts from leading industry analysts. This virtual format enables broader team participation and provides access to presentations during the year.
- The Annual Meeting, October 13–15, 2025, in Naples, Florida, brings together executives to explore the high-level trends shaping our industry — from evolving supply chain strategies and automation to technology's growing influence on energy and infrastructure, as well as economic and workforce headwinds.

As we move into the second half of the year, I encourage you to reflect on what's been accomplished, realign your strategy if needed with this new paradigm, and take bold steps toward the future. Let's move forward together!

Heather Rhoderick, CAE  
President

VMA is dedicated to driving growth and innovation of the U.S. and Canadian valve industry globally. Through collaboration, education and advocacy, we work to create an environment where manufacturers, distributors and service providers of valves, actuators and controls can thrive. The VMA News section of Valve Magazine highlights key initiatives, industry developments and opportunities we're championing. To learn more or explore membership with VMA or VRC, contact VMA President Heather Rhoderick at [hrhoderick@vma.org](mailto:hrhoderick@vma.org).

## Registration Now Open: 87th Annual Meeting

The Annual Meeting is for VMA and VRC members to gather with other top executives from across the industrial valve and flow control industry. This is our premier, members-only event focused on strategic insights, policy impacts and the trends shaping our industry.

This year, the event takes place October 13–15, 2025, in Naples, Florida. With topics including AI, supply chain, energy transition, economic outlooks, U.S. policy on trade, tariff and regulations and end-use market segment trends, this year's agenda is built for leaders navigating a rapidly evolving landscape.

Networking activities, a robust spouse/guest program and a gala membership awards and dinner round out the event. Group discounts are available for companies sending multiple attendees. Members can register and find out more at [vmaevents.org/annual](https://vmaevents.org/annual).



## Who Inspires You?

VMA is accepting nominations for our Membership Awards, and invites all members to submit nominations! VMA recognizes those individuals who have made significant contributions to VMA and the industry each year with our Person of the Year and Service Awards. These awards will be presented at the Gala Dinner and Awards Ceremony, Wednesday, October 15, 2025, in Naples, Florida (in conjunction with the Annual Meeting).

VMA's Person of the Year Award is our highest honor and recognizes an individual who embodies leadership, mentorship and a passion for moving our industry forward. The VMA Service Award honors

those who go above and beyond to support our mission — through committee leadership, technical expertise, insightful writing or consistent engagement. Nominations must be received by **August 15, 2025** at [vma.org/awards](https://vma.org/awards).



## Strategic Plan Updates Begin

The Board of Directors is updating the VMA strategic plan and all members are invited to provide input. Member insights will directly shape the programs, resources and priorities that best serve you, our members, and the broader valve manufacturing industry. Members who haven't received a survey to complete or who would like more information should contact Heather Rhoderick at [hrhoderick@vma.org](mailto:hrhoderick@vma.org).



Market Outlook  
Workshop:  
Virtual  
**September 9-11, 2025**

Annual Meeting  
**October 13-15, 2025**  
Naples, FL

\* VMA/VRC Members Only

Valve Forum:  
Conference & Exhibits  
**April 13-15, 2026**  
The Woodlands, TX

Call for Abstract Submissions:  
**Closes October 31, 2025**

Valve Repair Seminar  
**June 9-10, 2026**  
Pasadena, TX  
VMA and VRC members  
network during cocktail  
hour.



## 2025 VMA Scholarship Winners Announced

VMA is proud to present the VMA “William Sandler” Scholarship awards to two outstanding students who are pursuing studies in STEM fields related to our industry, and whose parents or guardians work for VMA or VRC member companies.

**Autumn Rudisell:** Autumn is attending the University of Cincinnati, where she is working toward a bachelor’s degree in mechanical engineering. Her father is employed at Indelac Controls, Inc.

**Nolan Thiel:** Nolan is attending Penn State University, where he is working toward a bachelor’s degree in mechanical or electrical engineering. His father is employed by AUMA Actuators, Inc.

VMA and VRC members can find information about the 2026 scholarship at [vma.org/sandlerscholar](https://vma.org/sandlerscholar).



## Shape the Future of Our Industry

VMA is seeking dedicated leaders from our member companies to serve on the **VMA Board of Directors** for the 2026–2029 term. This is a meaningful opportunity to help guide the strategic direction of the association and make a lasting impact on the valve and flow control industry. Those interested in serving must submit their information at [vma.org/committees](https://vma.org/committees) by August 15, 2025.

## Dates and New Location for the 2026 Valve Forum Conference and Exhibits Announced; Call for Abstracts Open

The 2026 Valve Forum: Conference & Exhibits will take place April 13–15 in The Woodlands, Texas, north of Houston. This premier industry event is open to all industry professionals, with special registration discounts available for VMA and VRC member companies.

Monday, April 13, will kick off with a full day of programming dedicated to VMA’s Valve Basics training — ideal for those new to the industry or looking to refresh their foundational knowledge. That afternoon, the Valve Forum officially opens with a general session, followed by a networking reception with exhibitors. Attendees will also have the opportunity to participate in an optional local facility tour earlier in the day.

The conference will continue with a robust schedule of technical, manufacturing, repair and business-focused sessions, along with live product demonstrations, hands-on learning experiences and plenty of networking opportunities throughout. Whether you’re looking to stay ahead of



industry trends, grow your professional network or bring new insights back to your organization, the 2026 Valve Forum delivers unmatched value.



## Call for Abstracts Now Open!

Are you interested in presenting at the 2026 Valve Forum? Join a renowned list of industry speakers — submit your abstract for consideration by October 31, 2025, by visiting [vmaevents.org/ValveForum](https://vmaevents.org/ValveForum) or use the QR code to access the Call for Abstracts:

## Valve Repair Seminar Success – 2026 Valve Repair Dates Announced

The 2025 Valve Repair Seminar, held in June at the San Jacinto College Center for Petrochemical, Energy & Technology (CPET) in Pasadena, Texas, brought together valve repair professionals from across the industry for two days of focused education and high-impact networking. The program featured an impressive lineup of speakers, including representatives from the National Board, MSS (Manufacturers Standardization Society), and API (American Petroleum Institute), who shared critical updates on code changes, industry standards and regulatory developments.

Additionally, the seminar offered application-based sessions covering key topics such as welding, field repair

techniques, inspection procedures and maintenance best practices. Highlights included guided tours of United Valve and CPET's state-of-the-art labs, a well-attended networking reception with exhibitors and engaging roundtable discussions exploring workforce challenges, AI integration and tariff impacts. With its strong focus on professional development and peer networking, the 2025 seminar affirmed its reputation as a must-attend event for the valve repair community.

Planning is underway for next year's Valve Repair Seminar, being held again at San Jacinto College Center for Petrochemical Energy and Technology, June 9-10, 2026.

For more information, visit [vmaevents.org](http://vmaevents.org).



## VMA Advances Member Issues on Taxes, Tariffs and PFAS Regulation

VMA continues to lead on several key policy fronts that directly impact its members and the broader flow control sector. In recent months, VMA has ramped up its engagement with lawmakers and regulatory agencies, providing targeted advocacy and education on tax reform, tariff impacts and the growing regulatory framework surrounding PFAS substances. These efforts reflect our commitment to ensuring a positive business operating environment safeguarding the competitiveness and sustainability of the valve manufacturing industry for our members.

On the legislative front, VMA has supported the inclusion of several pro-manufacturing provisions in the so-called "One Big Beautiful Bill." These include restoring immediate R&D expensing for domestic research and the 21% corporate tax rate and full expensing of capital equipment purchases. The bill also expands 529 savings plans to include postsecondary training and credentialing, such as certifications for welding and other manufacturing trades.

In late June, VMA joined over 300 manufacturing organizations in a unified letter to Congress urging swift passage of this tax package. The bill was then passed by congress on July 3, 2025, and signed by the President on July 4, 2025. **VMA will hold a webinar for its members August 27, 2025, to explain more details of the bill.**

VMA continues to voice concerns regarding an outright ban of all PFAS substances, and specifically with policy that treats all PFAS substances in the same manner. VMA supports the need to have our industry's products noted as a "currently unavoidable use" of PFAS. VMA submitted formal comments to Minnesota's record reporting proposed rule in spring. We continue to work with other partners to educate federal policy makers on the needed for any PFAS definition to exclude fluoropolymers, which are essential to industrial applications but have not been shown to pose risks to human health or the environment.

Tariff policy remains a dynamic and pressing issue. VMA continues to host a series of webinars to help members stay current on the evolving landscape. Recent updates include a temporary pause in reciprocal tariffs from July 9 to August 1, and new tariff actions targeting imports from the EU and Mexico. A presidential proclamation issued on June 4, 2025, also doubled Section 232 tariffs on steel and aluminum products – from 25% to 50% – with no exemption for goods in transit. This policy change could have significant cost implications for our industry, which relies heavily on these materials. **VMA will hold a webinar on August 11, 2025, for its members to review and provide information on the latest information and tariff developments.**

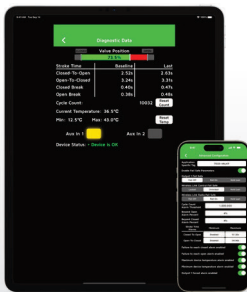
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FORWARD

FEATURED ARTICLE

# The Critical Role of Cooling for Data Centers

Valves, actuators, controls and pumps are the unsung heroes of managing the function of data centers, specifically when it comes to all the types of cooling systems.

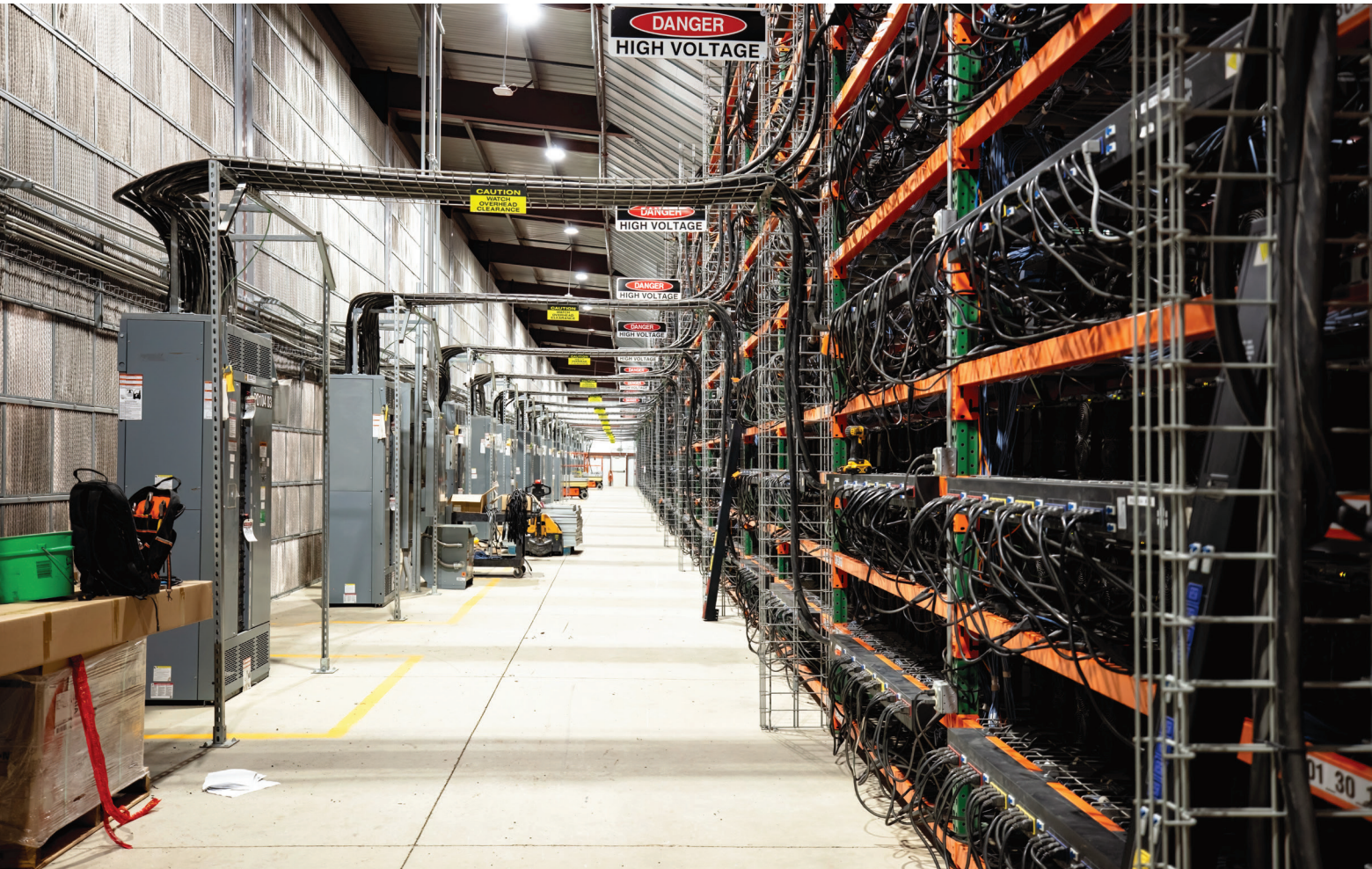
BY: HEATHER GAYNOR  
EDITOR

In today's hyperconnected world, the digital infrastructure that supports everything from streaming services and financial transactions, to industrial automation and artificial intelligence is anchored by a rapidly expanding network of data centers. And while we hear about all the cybersecurity threats lurking around every online corner, there are other physical threats to running these data centers, and one of the biggest is heat. With hundreds and often thousands of servers in one facility, the amount of heat they produce is significant and must be managed. Efficient cooling technologies are evolving all the time and the role that valves, actuators and controls play is crucial to their success.

## Growth of data centers

Global data center demand is increasing at unprecedented rates, and the cooling systems designed to manage the heat generated hasn't always kept up with demand, but that is starting to shift. The International Energy Agency estimates that, in 2022, data centers consumed an estimated

Miles of wires, pipes and tubing and hundreds of valves, actuators and controls are used to power the cooling systems for data centers.



460-terawatt hours (TWh) of electricity, making up nearly 2% of global electricity demand. In North America, data centers are being built at hyper speed, growing in size and complexity.

As artificial intelligence continues to grow in usage both in consumer and business applications, systems are more intensive than ever before and designing effective thermal management when building them is critical. Even small inefficiencies can have a significant impact, not just on operation but on operating costs, as well as carbon emissions. So owners of these massive data centers are always looking for ways to optimize their systems while decreasing their overall spending. Cooling is an area that can have a major impact.

### Types of data center cooling technologies

There is not a one-size-fits-all solution for cooling data centers. The location of the site, facility size, climate, energy costs and workload of processors all contribute to deciding which cooling technology or technologies to employ.

Immersive cooling is used in some data centers, so the integrity of the controls is critical to avoid catastrophic equipment failure.



### Air cooling

The most traditional and still commonly used systems are air cooled. These systems typically use computer room air conditioners (CRAC) or computer room air handlers (CRAH) to circulate chilled air around the server racks. CRACs are devices that monitor and maintain the temperature, humidity and air distribution. They are more efficient and more controllable than traditional air conditioning systems. Humidity control is very important as too little humidity can cause static electricity buildup that could damage the electronics. Too much humidity can create water vapor or condensation.

CRAC units are often set up on perforated, raised floor sections that form “cold aisles” to pump the cool air through the racks. Heat is then blown through the rear side of the racks and forms “hot aisles” before the air is returned to the CRAC intake to be recooled and redistributed. These systems run on refrigerant and require a compressor and a pump system and a series of valves to consistently circulate both the air in the room and the refrigerant in the system.

CRAH units use chilled water and control valves to circulate the air over cooling coils that are filled with chilled water. The warm air is returned through the CRAH unit and continuously recycled in the system. These systems do not require compressors and consume less energy than many CRAC units, so are often selected for these properties. Butterfly and ball valves are used for shutoff and control valves regulate the water flow throughout the chilled water system. Actuators are often used to dynamically adjust flow rates based on conditions to optimize cooling while minimizing energy consumption.

In both types of systems, room controls that measure and monitor temperature and humidity can also be supplemented with robots that move through the data centers collecting measurements from a variety of points throughout the data center.

### Liquid cooling

In high-density data centers, air cooling can't always maintain the required temperatures. Liquid cooling is often used to absorb heat directly from the servers. The two main types of liquid cooling used frequently are direct-to-chip and rear door heat exchangers.

Direct-to-chip cooling circulates coolant through cold plates installed within the server racks and attached to high-heat components. Small diameter tubing is often

used to carry the coolant, and must be of the highest integrity to ensure there is no leakage.

Rear-door heat exchangers (RDHx) are installed on the rear of the server racks. They are often used with air cooling systems. These systems require a chilled water system that sends water to a coolant distribution unit (CDU). Air cooling systems are used to push the heat from the server rack into the RDHx where it then goes through the chilled water system, and is constantly circulated.

Passive heat exchangers don't have any moving parts, only the heat exchanger with water circulating through it that is directly mounted to the server racks. Active systems ▶

have fans mounted to the back of the RDHx that pulls heat from the server racks into the exchanger directly.

RDHx units tend to perform well at warmer chilled water setpoints so they can be more energy efficient than CRAC units. They are also less complicated in their design so require less maintenance than CRAC or CRAH units overall.

Liquid cooling systems require a variety of valves including globe valves and control valves, often proportional control valves that are paired with smart controllers to work dynamically. Actuators are often used to ensure that the cooling system circuits open or close safely during unplanned power outages. Solenoid valves are also used for quick on/off responsiveness during emergencies or in backup systems.

### Immersion cooling

The latest and most innovative cooling systems are immersion cooling systems, where servers are submerged in nonconductive dielectric fluids and heat transfer goes directly from the components into the fluid. This is highly efficient and is very useful for heavy computing applications such as artificial intelligence servers that require much more computing power. In single-phase systems, the fluid is pumped through heat exchangers as a liquid. In two-phase systems, the fluid comes to a boil from absorbing heat then condenses and is recirculated.

Because electronics are submerged in a fluid, these fluids need to be of very high purity, and must remain uncontaminated and completely controlled and contained. Diaphragm valves are often used to control the fluid, as well as ball valves that are compact and can be reliably operated and shutoff. Magnetic drive actuators are often used to prevent contamination as the actuator mechanism can be isolated from the fluid.

### The brains behind it all: controls

Mechanical components and systems cool and circulate the fluids and cooling air in the system, but automation and precision controls are required to keep systems operating. Building management systems, programmable logic controllers and a variety of other control systems are used to monitor temperature and flow via sensors that manage real-time data monitoring. Valves and actuators are controlled to optimize temperature, flow and energy efficiency goals. All of these systems must also have redundancies and alert systems to indicate failures, and system readings outside set parameters for temperature, humidity, etc. Many data centers are built today using AI and computational fluid dynamics (CFD) systems to predict the future needs for cooling, flow, energy requirements and more.

In addition to the valves and actuators for each system, temperature and pressure measurement devices such as transducers provide constant feedback. Variable frequency drives are used to control coolant flow rates for actual

demand in the pumps that are behind all of these systems, whether air or liquid.

### Other considerations for design

The demand for new data centers is only increasing, and the density of these centers is growing exponentially. Some estimates are that cooling expenses of data centers alone accounts for up to 40 percent of the site's total energy usage. A recent webinar presented by Black & Veatch reported that the movement to high-density data centers is driven by several trends including:

- The cost of land with access to power, infrastructure for fiber and cabling and access to water. The building of single-story data centers is being replaced by multiple story buildings to accommodate more server racks.
- The increasing demand for computational power and the ability of individual computers to process more data than ever in a smaller footprint.
- Smaller footprint data centers, due to higher density, will require even more cooling and power to support their operations, and is changing how data centers and cooling systems are designed.

- Traditional server racks were designed in the range of 5 kW to 15 kW required to run the servers. High-density, higher powered racks today often require 100-150 kW, with leading edge designs going as high as 1 MW of power required per rack. This requires larger feeder systems for power distribution and makes space requirements more challenging to fit the systems into the smaller footprints. Black

and Veatch is looking to utilize superconductors to reduce the size of feeders. Traditionally, a 400-amp feed in conduit required 10-12 six-inch conduits. With a superconductor this can be done in one six-inch pipe, says Luke Platte of Black & Veatch.

- This large energy need is part of the drive for companies to explore small modular nuclear reactors to run off-grid and power individual data systems. Amazon, Google and Meta are just a few of the tech companies who have recently announced they are exploring SMRs to both power their own growing energy demands independently from the public utility grid and help them meet internal carbon-reduction targets.

**Systems need to be adaptive for future needs.**

### What's needed next

As all these factors converge, cooling systems will need to be more adaptive and continually more efficient and effective. Digital twins are being employed, along with CFD, to better estimate and plan for the needs of future data centers. Cooling systems are essential to support these data centers and valve, actuator, controls and pump manufacturers are critical suppliers for their operation. Ensuring performance and reliability of products will be key to winning new business in this ever-expanding market. X

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FEATURED ARTICLE

# Valves for Thermal Energy Storage Systems

Durability, reliability and proper sizing are just a few considerations when selecting valves for building systems.

BY: Bill Moore, *Eastern Regional Manager*  
CLA-VAL COMPANY

Thermal valves installed in a university TES system.  
All Photos Source: Cla-Val

Thermal energy storage (TES) systems are growing in demand due to their ability to provide cost savings, expanded cooling capacity, resiliency and sustainability for commercial and industrial facilities. In a nutshell, TES systems store thermal energy (chilled or hot water) for later use, which can be beneficial in managing energy supply and demand by storing excess energy produced during periods of low demand for use during peak times.

### Applications for TES systems

TES systems are used in centralized campuses, large hospitals and military installations to meet increased cooling loads without investing in additional chillers, cooling towers and pumps. Another area of increased demand for TES is large data centers, which require cooling systems to manage the significant heat generated by their IT equipment. At the time this article is being written, there are more than 5,300 data centers in the U.S., and the market is projected to grow from \$26.67 billion USD in 2023 to \$55.83 billion USD by 2028, with a compound annual growth rate of nearly 16%.

All this demand for TES has put pressure on water utilities and private infrastructure to supply these facilities with

large amounts of water. Control valves are used in water production, transmission and storage facilities. But proper selection and configuration of valves that control flow and pressure are critical in the design of a TES system, ensuring the valves will manage the system under all types of loads.

Due to the volume and size of these systems, automatic control valves provide many advantages over actuated ball or butterfly valves.

**An increased demand for TES is for data centers.**

### Greater range and precision of modulating control

Globe-style automatic control valves have greater range-ability for flow and pressure applications. Due to their linear design, automatic control valves excel at modulating flow and maintaining

tight control, providing infinite positioning capabilities. In contrast, ball and butterfly valves have a more limited control range. ▶

Valves in a commercial TES system.





Valves encased in foam for a TES system.

**Improved resistance to cavitation**

Cavitation can be an issue in some TES systems, causing valve damage, noise and reduced efficiency. Automatic control valves are less susceptible to cavitation and can be supplied or retrofitted with anti-cavitation trim if needed.

**Simpler and more cost-effective maintenance**

Automatic control valves have fewer moving parts and are generally less complex than actuated ball or butterfly valves. This may make them cheaper and easier to maintain over the long term, requiring fewer frequent overhauls or repairs.

**Versatility to perform multiple functions**

Many automatic control valves can be configured to perform additional functions beyond just flow control, such as pressure regulation, metering and more.

**Reliable backup functionality**

Automatic control valves often incorporate backup hydraulic functionality, ensuring continuous operation, including during power or control system failures.

**Customization and upgradeability**

Automatic control valves can be easily modified in the field to add new features or capabilities, without requiring a full valve replacement.

**Durability and reliability**

TES systems operate continuously, so the selected valves must be durable enough to withstand extended use without frequent maintenance or replacement. Features such as drip-tight closure and field-retrofittable upgrades can help ensure long-term performance.

**Software integration**

Consider valves that integrate with advanced sizing software. These software programs can model and compare the control capabilities of different valve types in a specific TES application, helping engineers make informed decisions about the most suitable valve solution.

It is also worth considering software that can create 3D drawings that include all building information and specs for implementation into the design. Many of these tools can be added to traditional CAD and architectural software and offer parametric models that update across the design when changes are made, and can include mechanical, electrical and plumbing on one schematic.

**TES systems are energy efficient**

TES systems contribute to the decarbonization of energy systems, which is one of the many reasons industries and utilities are embracing this new wave as it is yet another tool for transitioning to more sustainable energy practices. According to Allied Market Research, the global thermal energy storage market size was valued at \$20.8 billion USD in 2020 and is projected to reach \$51.3 billion USD by 2030, growing at a CAGR of 8.5% from 2021 to 2030.

Mechanical, electrical and plumbing engineers should collaborate with valve manufacturers to harness the full potential of these TES systems. This partnership can help with selecting appropriate valve types tailored to the system's specific conditions, including the correct size and configuration to meet flow demands and improve the system's reliability and efficient performance. ❗

**ABOUT THE AUTHOR**

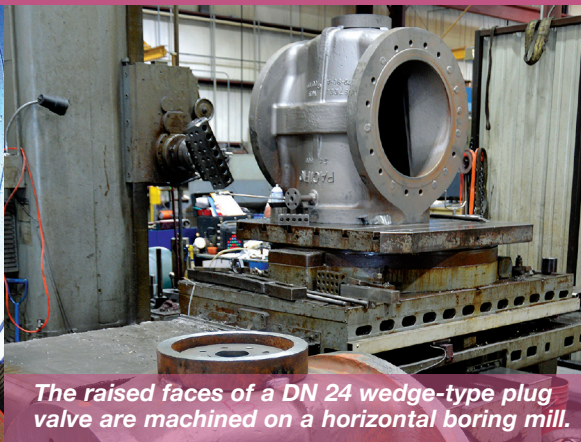
Bill Moore is the Eastern Regional Manager at Cla-Val Company. He has been with Cla-Val for over 30 years and has an in-depth knowledge of thermal energy storage systems and works with clients to find the right valve for the right application.



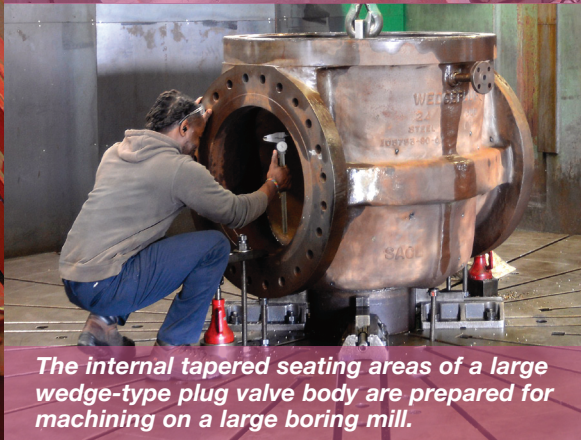
# Rising-Rotating Plug Valve Repair & Service



*The seating areas of a DN 30, wedge-type plug valve are weld-repaired, prior to machining and grinding.*



*The raised faces of a DN 24 wedge-type plug valve are machined on a horizontal boring mill.*



*The internal tapered seating areas of a large wedge-type plug valve body are prepared for machining on a large boring mill.*

United Valve is fully equipped to handle repairs and modifications on all types and brands of rising-rotating metallic plug valves. These valves are mainstays of Coker-valve block service as well as many other critical fluid control applications, such as overhead vapor lines and ethylene cracking units. We offer in-shop or field-service repair on these valves and their associated actuators.

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Weld repairs are often required on these plug-type metallic valves. The United Valve welding department is led by our in-house welding engineer and features both manual and mechanical welding processes. All of our 200+ welding procedures are created and qualified in accordance with ASME Section IX, as well as approved by many, even stricter end-user specifications.



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FEATURED ARTICLE

# Going Beyond Torque

What seem to be minor details in flange assembly can have a significant consequence.

BY: CARLOS D. GIRÃO AND ANGELICA PAJKOVIC  
COMPANY: TEADIT

In industrial facilities where pressure-boundary integrity is essential, seemingly minor details in flange assembly can have significant consequences. A gasketed flange joint that is improperly assembled may appear to perform adequately during initial startup, only to leak under normal operating conditions. These leaks are rarely due to the use of flawed materials. More often, they result from inconsistent assembly practices and a lack of understanding of gasket stress behavior.

The American Society of Mechanical Engineers (ASME) addressed this long-standing challenge through the development of PCC-1: Pressure Boundary Bolted Flange Joint Assembly.<sup>1</sup> This has since become the industry benchmark for best practices in bolted joint assembly. Within this document, Appendix O plays a central role by providing guidance for determining appropriate assembly bolt stress to ensure that gasketed joints are properly tightened and capable of maintaining sealing stress during long-term operation.

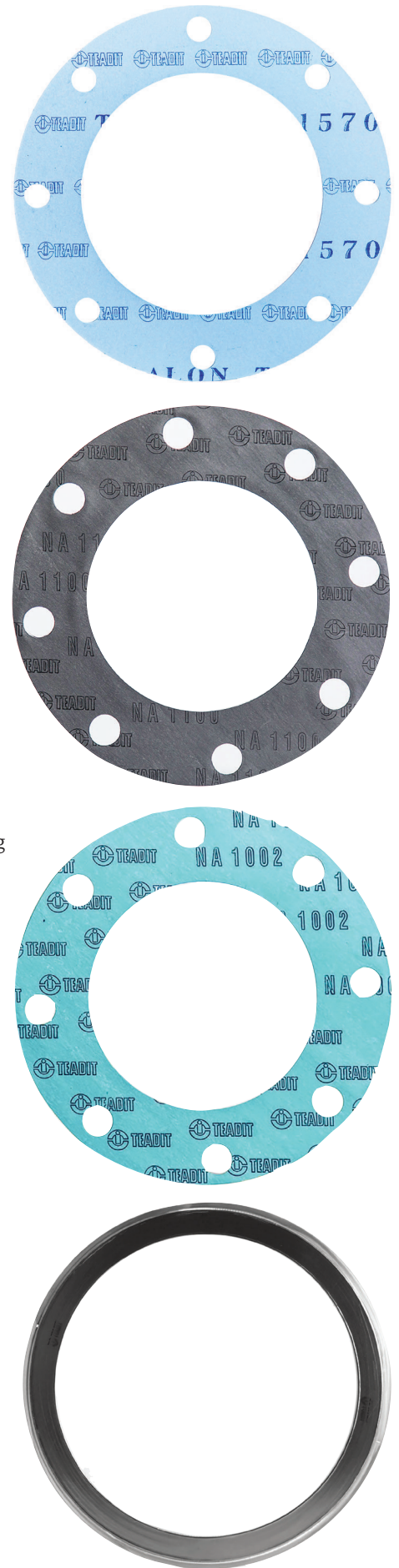
Over the years, manufacturers and research institutions have conducted extensive gasket testing, resulting in a growing body of published performance data. Standards such as EN 13555 have provided a formalized methodology for characterizing gasket properties, and several public databases now make this information accessible.<sup>2</sup> A practical understanding of how to translate this data into PCC-1 Appendix O gasket parameters helps engineers and maintenance teams to make more reliable and data-informed sealing decisions.

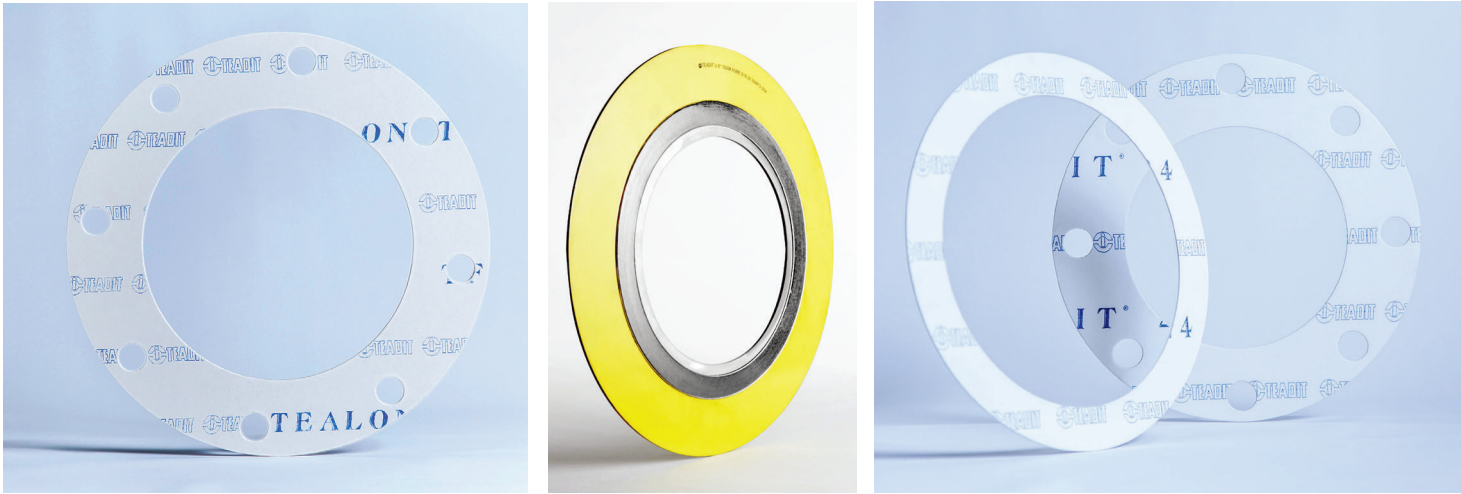
## ASME PCC-1 and the evolution toward load-based assembly

Historically, bolted flange joints have been assembled using torque-based methods, and this continues to be the most common approach in the field. Many legacy procedures rely on standard torque tables or experience, often without directly accounting for the actual stress applied to the gasket. While torque is convenient to apply and measure, it is only an indirect way of controlling what truly matters for sealability: the gasket stress. Factors such as thread condition, lubrication, bolt length, flange alignment and operator technique can all cause the same torque value to produce very different gasket loads. As a result, simply tightening to a specified torque does not always lead to reliable or consistent sealing performance.

ASME PCC-1 does not reject torque-based assembly. Instead, it highlights the limitations of torque as a proxy for bolt load and encourages practitioners to focus on the gasket stress that is ultimately responsible for sealing performance. PCC-1 provides tools and guidance on torque calculations, tightening sequences and stress targets allowing teams to use torque to achieve consistent gasket stress. In this way, torque becomes a means to an end, rather than the end goal itself. More reliable outcomes are achieved when assembly procedures are designed to control gasket stress, rather than relying solely on torque.

Shown are a number of examples of the types of gaskets tested. From top to bottom: restructured PTFE with microspheres as filler; compressed fiber with aramid filler; compressed fiber with carbon filler; and, a serrated metal gasket. Source (all images: TEADIT)





Other gasket types tested included products similar to these from Tedit, left to right: Restructured PTFE with barite as filler; spiral wound gasket; expanded PTFE.

Appendix O builds on this foundation by introducing specific gasket stress limits for different materials and designs. These values help engineers and assemblers ensure that joints are installed within safe and effective stress ranges, improving long-term sealing performance (Fig. 1).

These values serve as a guide for assembling joints with a high degree of repeatability and reliability, which are crucial factors in reducing emissions, minimizing rework and extending the time between planned outages.

### The influence of Appendix O on modern assembly practices

The methodology outlined in Appendix O addresses several practical challenges faced by maintenance and reliability professionals: the gasket is only part of the picture. The long-term performance of a gasketed joint depends on whether sufficient load remains on the gasket after it undergoes relaxation and experiences changes due to temperature and internal pressure.

Appendix O guides users toward selecting installation stresses that are high enough to ensure that post-relaxation stress remains above the  $Sg_{min-O}$  threshold. In this sense,

$Sg_{min-S}$  and  $Sg_{min-O}$  are not isolated values, but rather part of a relationship that must be understood and balanced during assembly planning.

For example, a gasket installed with a seating stress of 40 MPa may relax to 25 MPa after exposure to elevated temperature and internal pressure. If the  $Sg_{min-O}$  for that gasket type is 20 MPa, the joint will likely remain tight. If it falls below that threshold, leakage becomes more probable. Appendix O helps practitioners confidently plan for these stress transitions.

### Global considerations: EN 13555

While PCC-1 Appendix O defines a framework for determining appropriate gasket parameters, it does not define specific leak rate limits or tightness classes. In contrast, several European standards provide detailed methodologies for evaluating sealing performance and leakage behavior. Notably:

- EN 13555 describes how to determine key gasket parameters such as  $P_{QR}$ ,  $Q_{min(L)}$ ,  $QS_{min(L)}$  and  $QS_{max}$  through laboratory testing. These values are linked to defined tightness classes, also defined in the standard.
- VDI 2290 offers general guidance on acceptable leak rates in operational systems and is often used as a practical reference rather than a stringent performance standard. For example, a leak rate of  $10^{-2}$  mg/(s·m) is commonly cited for flanged joints in operation.

Recent technical work has examined the compatibility between the EN 13555 and VDI 2290 and PCC-1 Appendix O, and studies have shown<sup>3</sup> that EN 13555 test data can be used to determine Appendix O values.

For example, EN 13555 defines:

- $QS_{max}$  as “the maximum surface pressure that may be imposed on the gasket, at the indicated temperature, without collapse or crash,” which, by definition, is equivalent to  $Sg_{max}$ .
- $Q_{min(L)}$  as “the minimum gasket surface pressure on assembly required at ambient temperature in order to seat the gasket into the flange facing roughness and close the internal leakage channels so that the tightness class is to the required level L for the internal test pressure,” which is similar to  $Sg_{min-S}$ , but PCC-1 does not define a tightness class. In the ▶

Figure 1: Key parameters include:

|              |  |
|--------------|--|
| $Sg_{max}$   | Maximum permissible gasket stress. This value is the maximum compressive stress at the assembly temperature, based on the full gasket area, which the gasket can withstand without permanent damage (excessive leakage or lack of elastic recovery) to the gasket sealing element. |
| $Sg_{min-S}$ | Minimum gasket seating stress. This is the minimum stress required at assembly to ensure initial seal between the gasket and the flange faces.   |
| $Sg_{min-O}$ | Minimum gasket operating stress. This is the minimum stress that must remain on the gasket after offloading of the gasket by operational loads to ensure that leakage does not occur.  |
| $\Phi_g$     | Gasket relaxation fraction. This describes the proportion of the initial load that remains after gasket offload.   |

absence of a definition, VDI 2290 limit of  $10^{-2}$  mg/(s•m) for flanged joints is taken in consideration.

- $QS_{min,L}$ , “as the minimum level of surface stress required for leakage rate class L after off-loading,” which is similar to  $Sg_{min-o}$  definition but also lacks the leakage class. Again, VDI 2290 is also considered.
- $P_{QR}$  “as the ratio of the residual and initial gasket stress.” Both definitions have the same meaning, so it is possible to get the  $\Phi g$  directly from EN 13555 data for the design temperature.

The alignment between the standards allows end users, gasket manufacturers and engineers to integrate PCC-1-based training and procedures with internationally accepted performance data.

**Validating the stress framework: experimental findings**

To validate the applicability of EN 13555 data to PCC-1 Appendix O, a structured test protocol was developed, proposed and applied to a range of gasket types commonly used in industry. These included expanded and restructured PTFE gaskets, compressed fiber gaskets, spiral wound gaskets (with graphite filler), and finally, serrated metal gaskets with graphite facing.

For each gasket, a full EN 13555 leakage test was performed. The resulting curves were used to determine the minimum stress required to achieve a leak rate of  $10^2$  mg/(s•m), or  $Q_{min,0.01}$ . This value was then adjusted to account for relaxation and internal pressure, using the gasket’s stress retention value ( $\Phi g$ ) and a simplified formula derived from

Appendix O. The result was a calculated minimum assembly stress ( $Sg_{min-s}$ ), along with a corresponding minimum operating stress ( $Sg_{min-o}$ ) identified from the unloading curve.

To validate these values in practice, gaskets were installed in test flanges using the calculated  $Sg_{min-s}$ , then pressurized to 40 bar of methane. Leak rates were measured at both the initial assembly stress and again after reducing the gasket load to  $Sg_{min-o}$ , simulating long-term operating conditions after relaxation.

The tests consistently showed that gaskets assembled using this approach, maintained tightness throughout the experiment. Even after unloading to  $Sg_{min-o}$ , leakage remained within acceptable limits, confirming that the EN 13555 derived gasket parameters provided a reliable foundation for Appendix O implementation.

These results validated the accuracy of the proposed calculation method and reinforced the core concept of Appendix O: long-term sealing performance depends not just on how a joint is assembled, but on ensuring that residual gasket stress remains sufficient to maintain a seal under real-world conditions.

**Practical implications for maintenance and reliability teams**

The use of PCC-1 Appendix O and related standards has practical applications beyond engineering calculations. Maintenance teams and assemblers benefit from understanding the ‘why’ behind each tightening pattern or torque value. When personnel understand that seating stress must account for relaxation, or that different gasket materials

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respond differently to load, they are better equipped to avoid costly errors during turnarounds and startup procedures.

Adopting a load-focused approach also supports organizational goals in areas such as:

- Achieving emissions compliance by minimizing fugitive emissions from flanged joint;
- Improving reliability by reducing joint failures and rework;
- Optimizing asset lifecycle planning by allowing longer time between gasket replacement; and,
- Enhancing the safety culture by helping teams identify and address the root causes of joint leakage.

While Appendix O provides the framework, it is the training, communication and validation that are essential to turning that framework into consistent, effective daily practice.

### Conclusion

ASME PCC-1 and its Appendix O, have provided the industrial community with a rigorous and practical approach to flange joint assembly. By focusing on gasket stress rather than torque, and by incorporating concepts such as gasket relaxation and minimum operating stress, Appendix O enables more reliable and repeatable assembly practices.

When integrated with internationally accepted testing standards such as EN 13555, the guidance from Appendix O becomes even more powerful. It allows for a harmonized approach to gasket selection, assembly stress determination and joint validation. These are essential for modern plants seeking to reduce leaks, improve safety and meet

tightening environmental regulations.

Whether used during shutdown planning, new equipment installation or emissions mitigation efforts, Appendix O provides an essential reference point for those involved in the specification, design and assembly of gasketed bolted flange joints.▶

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CASE STUDY:

# From Safety Silos to Strategic Insights: SIS Management Transformed

Phillips 66 charts a clear path for downstream and processing operations turning decades of data into actionable, digital insights for safety, operations and uptime.

BY GREG RANKIN

When it comes to digital transformation, refining and processing operators face unique challenges. Unlike other industries that are already leveraging digital twins to improve design, enable predictive maintenance and boost operational efficiency, the refining and processing sectors often struggle with data management.

Many facilities have accumulated vast quantities of data over decades, some dating back over half a century. This data is often scattered across departments, locked in outdated formats and managed by tools from different generations. Such fragmentation makes digital transformation complex, as updating one document can render others outdated, creating uncertainty about which version is accurate.

“Everyone is looking to digitalization, but in refining, it is not that simple,” says Nagappan Muthiah, P.E, CFSE, Phillips 66 safety instrumented systems lead for industrial control systems.

Muthiah and his team at Phillips 66 were tasked with leading the digital transformation of the company’s Safety Instrumented Systems (SIS). Their mission: identify the best way to consolidate decades of dispersed and inconsistent safety data into a smarter, more practical system. This innovative solution aims to eliminate data silos, deliver enterprise-wide visibility and bring greater clarity to safety lifecycle management.

## The reality of digitalization in refining

Headquartered in Houston, Phillips 66 operates nine refineries and initially set out to pursue full lifecycle digitalization when it began its digital journey over five years ago. This would allow it to replicate its entire safety system digitally from front-end design through to commissioning. In theory, the process would deliver enormous savings in both time and money: design one unit, press a button and replicate it across sites.

“As much as it was intellectually satisfying to conceptualize the digitization of the entire process, including front-end design to operation and maintenance,” Muthiah says, “we quickly realized that the ROI just wasn’t there.”

The true opportunity wasn’t in digitizing front-end design data but in focusing on operations, maintenance and safety performance data of the existing assets.

Phillips 66 made a strategic decision to reorient its digitalization efforts around SIS during the operations and maintenance (O&M) phase — where proactive decisions directly impact reliability, uptime and safety.

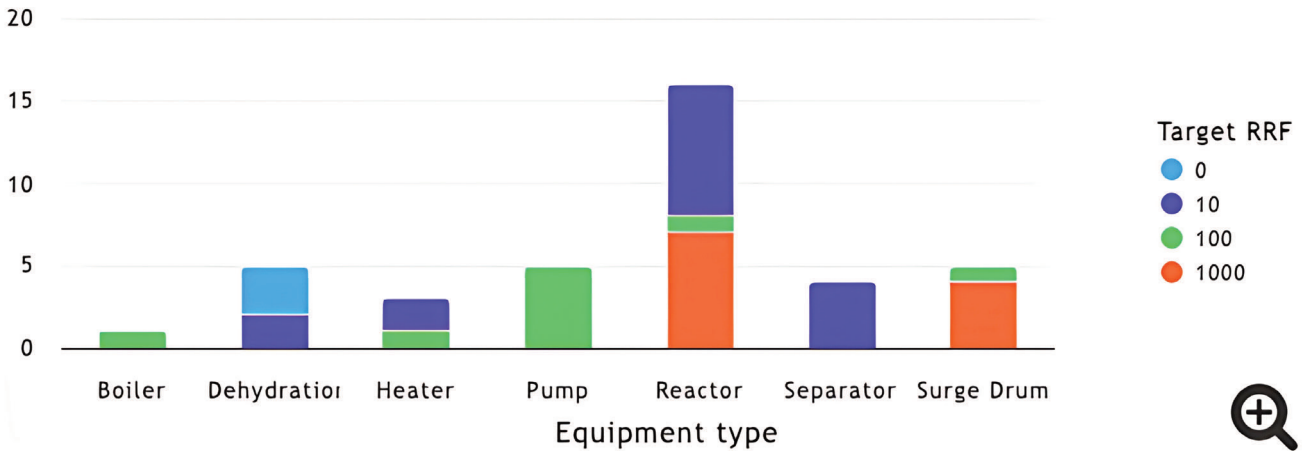
This approach aligned with guidance from the American Petroleum Institute’s (API) Recommended Practice 754, which classifies safety metrics into four tiers. While Tier 1 and Tier 2 reflect incidents that have already occurred, Tier 3 metrics act as leading indicators, revealing that a safety protection system was activated to prevent a potential event.

“Before we started utilizing our SIL system (safety integrity level), our safety data lived in siloed digital formats,” Muthiah explains. “You could read it, but tracking, comparing or integrating this safety design basis was much harder.”

## From documentation to real-time decision support

Phillips 66’s safety lifecycle tool, SIL Solver Enterprise, was

## Functions by Equipment Type and RRF



Phillips 66’s innovative solution eliminates data silos, delivers enterprise-wide visibility, and brings greater clarity to SIS management.

developed by Dr. Angela Summers, a licensed professional engineer with over 30 years of experience in SIS and a key contributor to industry standards from ISA, IEC and others. Originally created to calculate the Probability of Failure on Demand (PFD) and Spurious Trip Rate (STR) for process facility equipment, the software has evolved into a fully integrated safety management platform. It supports the entire SIS process — from design and documentation to compliance and governance — enabling digital transformation,

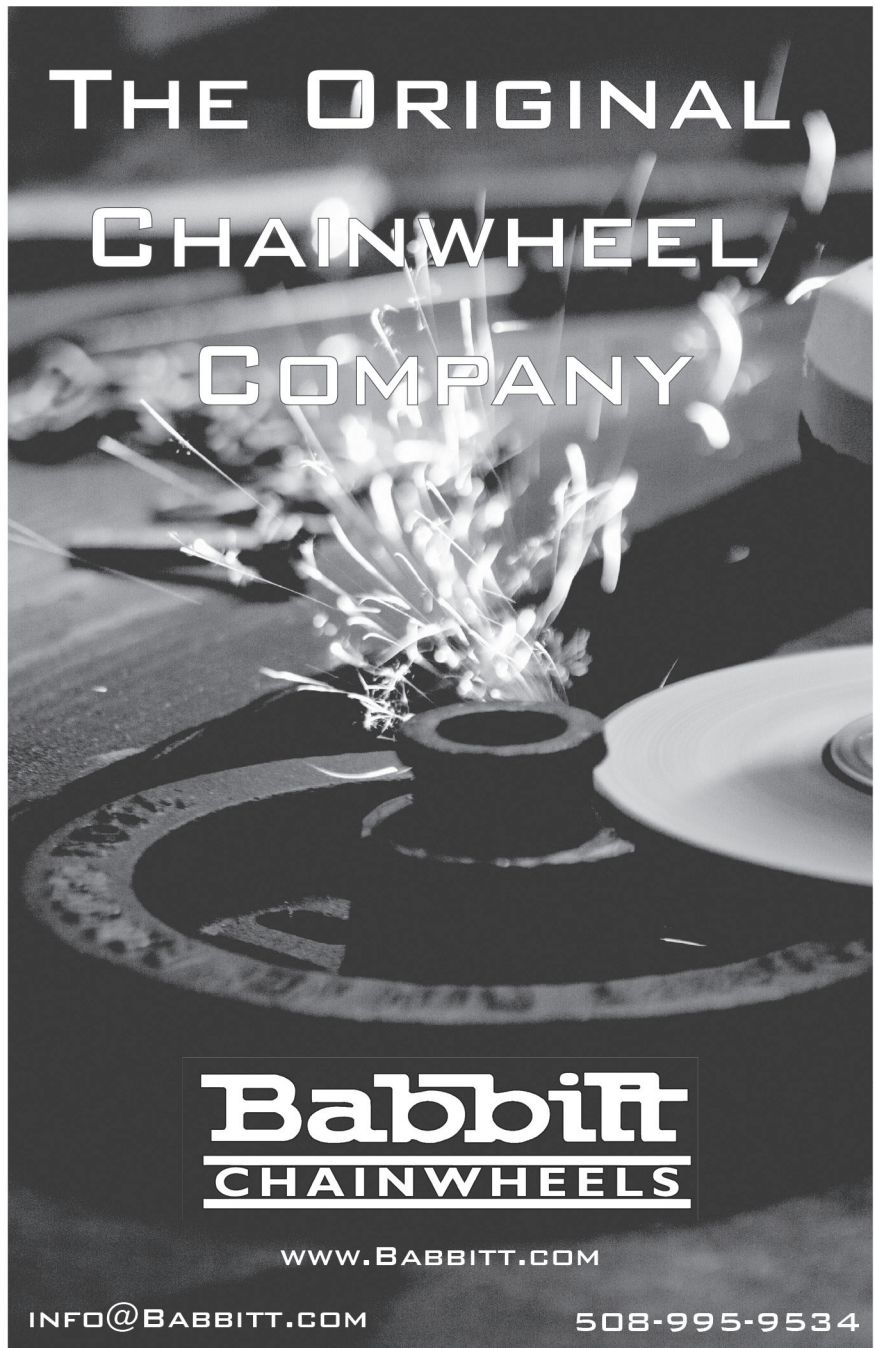
eliminating data silos and providing consistent visibility across the enterprise.

The secure, cloud-based architecture from SIS-TECH allowed Phillips 66 to centralize all SIS data across its refining assets. Rather than managing static reports in disconnected systems, teams now work within a dynamic environment where safety data can be filtered, analyzed and compared across units and facilities. Updates made in one area are automatically reflected across all related documenta-

Phillips 66’s safety lifecycle tool, SIL Solver Enterprise, was developed by SIS-TECH to support the entire SIS process—from design and documentation to compliance and governance.

| System ID                             | System Name                                | Haz Reg | PRS | SRS | Procedures | Tag Data | Access |      |
|---------------------------------------|--|---------|-----|-----|------------|----------|--------|------|
| + <a href="#">BIG_FUNC51</a> ...      | Fully populated                            | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Back Flow Cases</a> ... | Splitter Column SIS                        | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Demo System</a> ...     | Used to show various features              | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Examples</a> ...        | See Scope for what the examples cover      | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Heater</a> ...          | Demo Pass Flow                             | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Playing Around</a> ...  | Demo Pass Flow                             | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Pump Protect</a> ...    | Pump Protection Circuit                    | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Reactor Area</a> ...    | Reactor Area SIS                           | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Reboiler_BMS</a> ...    | Splitter Reboiler Burner Management System | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Surge Drum</a> ...      | Surge Drum                                 | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |
| + <a href="#">Valve Subsystem</a> ... | 5 Cases                                    | ●       | ●   | ●   | ●          | ●        | ?      | ✍️ 🔒 |

The SIL-Solver report interface quickly shows users where projects stand green indicates completed work, yellow shows incomplete tasks, and grey represents work that has not started.



tion, ensuring accuracy and alignment from field operations to corporate safety audits.

It was a paradigm shift — going from exchanging documents to exchanging data,” Muthiah says. “Suddenly, we could slice, dice and act on our safety insights.”

The system enables Phillips 66 to compare SIL ratings across similar systems, standardize processes and ask deeper operational questions: Why does one refinery require more SIL 2 functions than another? Is the risk profile accurate or are assumptions misaligned? What about outlier data?

With its SIS data structured and centralized, Phillips 66 is now uncovering patterns that were previously hidden.

**Strategic alignment with industry direction**

The ongoing efforts to access, analyze and visualize SIS data in aggregate are helping Phillips 66 become increasingly proactive in its safety management. As this work progresses, their teams are beginning to identify systemic issues and risk clusters, moving beyond merely addressing isolated failures.

“When you zoom out and leverage relevant data, you move beyond addressing isolated issues and start resolving the root causes within the entire system,” Muthiah adds.

Phillips 66’s SIS digital transformation aligns with the *Industry 4.0 Maturity Index* developed by the National Academy of Science and

Engineering (acatech) in Germany. The framework outlines six stages of digital maturity:

- **Stage 1: Computerization:** Digitization of analog systems.
- **Stage 2: Connectivity:** Systems and data are connected across departments, enabling communication.
- **Stage 3: Visibility:** Real-time insights into what's happening.
- **Stage 4: Transparency:** Root-cause analysis explains why things are happening.
- **Stage 5: Predictability:** Anticipating outcomes of future issues or performance.
- **Stage 6: Adaptability:** Autonomous response to changing conditions.

After several years of focused effort and with the right tools now in place, Phillips 66 sees itself firmly in Stage 2 and advancing toward Stage 3. At that level, the system will enable the comparison of “evergreen” static safety design data, which reflects how systems should operate, with real-time operational data from the field, to generate Tier 3 Metrics aligned with API-752. The next step, Stage 4, is where Muthiah believes real efficiencies will begin to emerge.

“We believe Stage 4 will be a sweet spot, where digitally mapped data helps us make decisions not just based on theoretical analysis, but on real-world analytics that further improve our safety and reliability,” Muthiah adds.

### From data-driven safety to operational excellence

For Phillips 66, future goals include extending insights from SIS into equipment protection systems (EPS), where greater digital transparency can enhance both safety and plant efficiency. As operational data continues to mature, the company expects to make even more impactful, real-time decisions.

“The next step would be to expand the applications to include asset protection and production loss,” Muthiah concludes. “If a piece of equipment is tripping, there’s a safety aspect, but also a commercial one. Your unit is down, you’re not making money. By looking at the metrics, we expect to improve uptime.”

Rather than attempting a sweeping overhaul, Phillips 66 took a targeted, outcome-driven approach to digital transformation. In doing so, the company transitioned from fragmented, document-heavy SIS management to

a streamlined, data-centric platform. The results: greater efficiency, compliance validation and enterprise-wide visibility. The company’s journey offers a practical model for how legacy-heavy industries can evolve with clarity, purpose and measurable impact.

“We’re not trying to digitalize for digitalization’s sake,” Muthiah explains. “We’re focused on what improves safety and reliability — period.”

### ABOUT THE AUTHORS

Greg Rankin is a freelance writer with more than 20 years of experience writing about the oil and gas industry, petrochemicals and refining.



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# What's the Chatter About Check Valves?

BY: Noah Miller, Applications/Engineered Sales Manager  
COMPANY: CHECK-ALL VALVE

Have you ever heard a check valve chatter? Having been on numerous job sites and spoken with maintenance personnel at many different corporations over the years, it seems to be a common occurrence. When asked if they have heard check valves chattering (typically a clink-clink-clink type sound happening rapidly) they have all heard that sound at one time or another.

If you are hearing this sound from your check valves continually, your check valve (and/or spring if it's spring-loaded) is oversized for your application. Essentially, there is not enough flow to fully open the particular check valve part number currently installed in the system.

In the case of a swing or double-door (butterfly) type check valve, often your only option is to reduce valve size (as compared to line size) to try to create more flow velocity to fully open the check valve.

For a piston/poppet or ball-type check valve, they are typically spring-loaded. There can be two options with this type of check valve (depending on the manufacturer/valve series):

- Reduce valve size to increase pressure drop to try to get the check valve fully open (just like a swing or double door check).
- Reduce the spring cracking pressure so that less pressure drop is needed to fully open the check valve.

Your next question may be, "Well, how can I ensure that the check valve I'm selecting for my in-line checking application will be fully open (no potential for valve chatter)?" Great question, and the good news is there are answers!

$$V = 0.408 \frac{Q}{D_2}$$

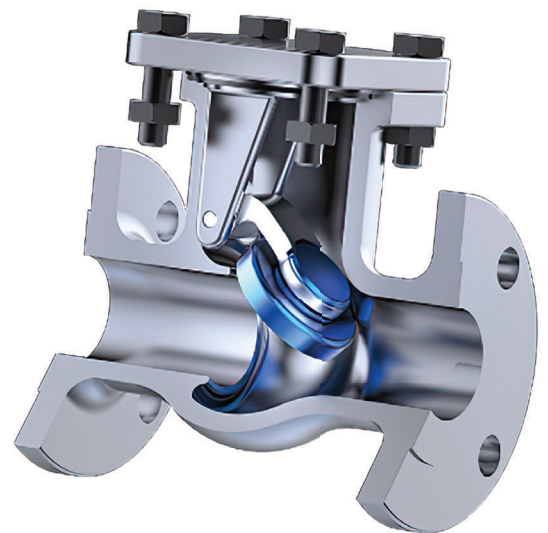
Where:

V = Water velocity inside the pipe (ft/second)

Q = Flow rate of water inside pipe (gpm)

D = Pipe inside diameter (in)

Caption: (L to R): Threaded bronze swing check valve; flanged stainless swing check valve; flanged carbon butterfly check valve; flanged bronze spring-loaded ball check valve; stainless flange insert spring-loaded piston check valve.  
Photos Source: VMA Valve Basics Course.



## Flow Formulas (Non-Choked Turbulent Flow Only)

### I. LIQUIDS

$$V = C_v \sqrt{\frac{dP}{G}}$$

$$dP = \left( \frac{V}{C_v} \right)^2 G$$

$$C_v = \frac{V}{\sqrt{\frac{dP}{G}}}$$

Where:

V = Liquid flow (gpm)

dP = Pressure drop (psi)

G = Specific gravity of liquid (water = 1.0)

C<sub>v</sub> = Valve coefficient

### II. GASES

$$Q = 1360 C_v \sqrt{\frac{dP}{GT}} \sqrt{\frac{P_1 + P_2}{2}}$$

$$dP = P_1 - \sqrt{P_1^2 - 2GT \left( \frac{Q}{1360 C_v} \right)^2}$$

$$C_v = \frac{Q}{1360 \sqrt{\frac{dP}{GT}} \sqrt{\frac{P_1 + P_2}{2}}}$$

Where

Q = Gas flow (scfh)

dP = Pressure drop (psi)<sup>1</sup>

T = Absolute temperature of flowing medium (degrees Rankine = °F + 460)

P<sub>1</sub> = Inlet pressure (psia)

P<sub>2</sub> = Outlet pressure (psia)

C<sub>v</sub> = Valve coefficient

G = Specific gravity of gas (air = 1.0)

### III. SATURATED STEAM

$$W = 3 C_v \sqrt{dP} \sqrt{\frac{P_1 + P_2}{2}}$$

$$dP = P_1 - \sqrt{P_1^2 - 2 \left( \frac{W}{3C_v} \right)^2}$$

$$C_v = \frac{W}{3 \sqrt{dP} \sqrt{\frac{P_1 + P_2}{2}}}$$

Where:

W = Saturated steam flow (lbs per hour)

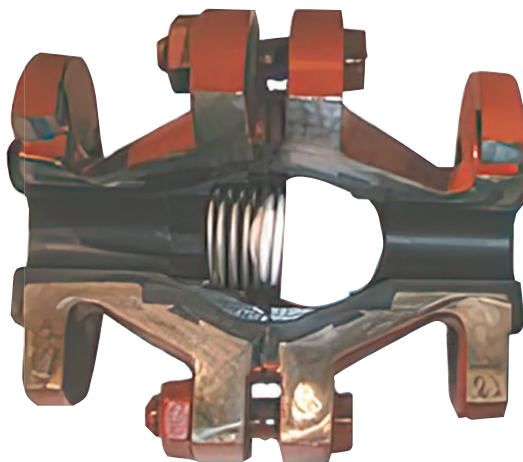
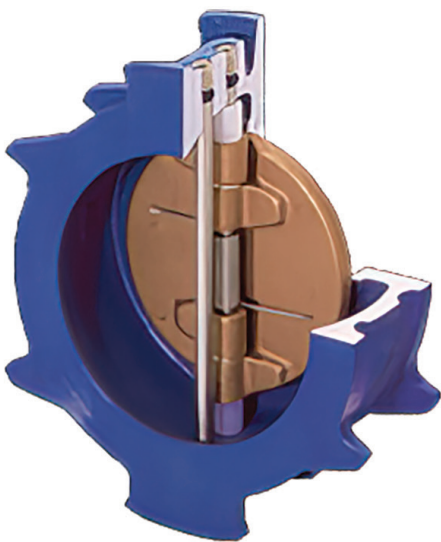
dP = Pressure drop (psi)<sup>1</sup>

P<sub>1</sub> = Inlet pressure (psia)

P<sub>2</sub> = Outlet pressure (psia)

C<sub>v</sub> = Valve coefficient

1- For calculation purposes, dP should never exceed ½ the inlet pressure, P<sub>1</sub>.



For a swing or double-door type check valve, there is a minimum flow velocity requirement for whichever manufacturer, series and size of check valve you are looking at. It is always best to reach out to the manufacturer to see what the minimum velocity requirement is for the check valve that you are looking at. If you are not reaching that required minimum flow velocity, then your check valve is partially open. Any partially open check valve has the potential to chatter. Any check valve that chatters will likely wear prematurely (sometimes severely). Additionally, the actual pressure drop through the check valve will be higher as a partially open valve has a lower Cv value than it does when fully open.

For a piston/poppet or ball-type check valve, there would be a minimum pressure drop requirement to fully open a given check valve. This can vary by manufacturer, series and size. For most manufacturers, the minimum calculated pressure drop requirement is around 2 to 5 times the spring cracking pressure. Anything less than the required minimum pressure drop would mean the equation is inaccurate (since you are inputting a fully open check valve  $C_v$ ), the check valve is partially open, and there is potential for check valve chatter. As previously stated, any partially open check valve can chatter. Any check valve that chatters will likely wear prematurely (sometimes severely).

In general, you want to size the check valve (and the spring if it has one) for the application, not necessarily

the line size. Check valves only operate off the flow, pressure, specific gravity and temperature of the media in the system. There is no external actuation on a check valve like there is on a control valve. More specifically, there is no manual, electronic, pneumatic or hydraulic actuation on a check valve like there is on a control valve.

With a control valve, you can ensure that it is fully open regardless of what's going on with the flow in the system since it's actuated. With a check valve, it's totally dependent on the flow conditions as to whether or not enough velocity or pressure drop is created to fully open it. On a normal in-line checking application, you want your check valves to be fully open to eliminate the potential for valve chatter and to help maximize check valve life.

There are other types of applications like noncode pressure relief, vacuum relief, injection, back pressure regulation and holding static liquid head pressure where you need to look at sizing a check valve differently for those types of services. Check with your manufacturer for the proper guidelines on those specific application types.

## Conclusion

To summarize the key points, keep the following in mind for an in-line checking application:

- Any partially open check valve can chatter.
- If a check valve chatters, it will likely wear prematurely (sometimes severely).
- Size the check valve (and spring if it has one) for the application, not necessarily the line size.
- Swing and double-door (butterfly) check valves will require a minimum flow velocity to be able to fully open.
- Piston/poppet and ball check valves will require a minimum calculated pressure drop to be able to be fully open.
- Check valves that are not meeting the minimum flow velocity or minimum required pressure drop will also not have an accurate calculated pressure drop, as the valve is not fully open, so the full Cv value is not available.
- Always reach out to your manufacturer for questions on check valves, including sizing. 📞



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# LATEST LAUNCHES



## Groth Corporation's 88E and 88F Valve Released

Groth Corporation, a global manufacturer of pressure relief and flame arresting solutions, announces the Models 88E (left) and 88F (right) Pressure/Vacuum Relief Valve & Flame Arresters Combinations. Designed to meet and exceed the most demanding industry standards, these dual-function valves combine sealing performance with flow capacity and flame protection.

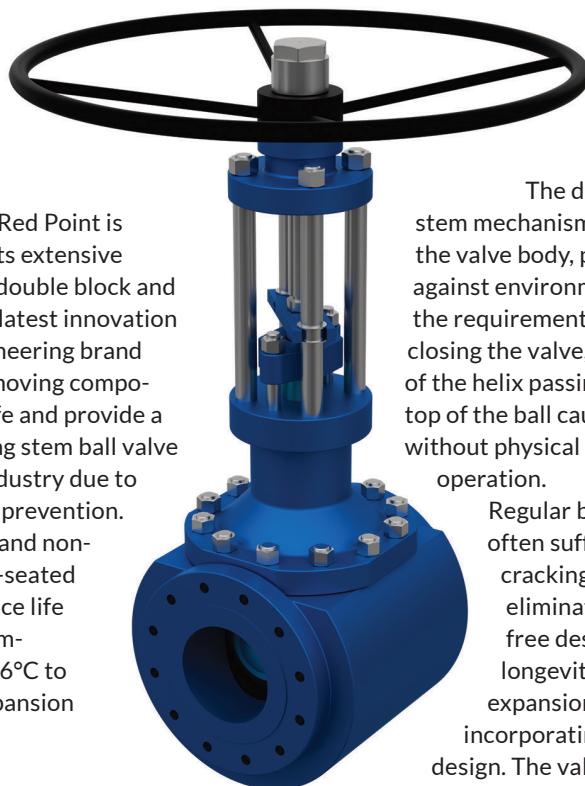
Engineered for versatility and reliability, Groth Models 88E and 88F serve a critical role in protecting storage tanks from overpressure and vacuum conditions while simultaneously preventing flame propagation. These dual-function valves are certified to the latest standards, including ATEX (EN ISO 16852:2016) and PED, and exceed API-2000 leak requirements — ensuring both safety and regulatory compliance. [grothcorp.com](http://grothcorp.com)

## Rising Stem Ball Valve Added to Trillium's Red Point Line

Trillium Flow Technologies' legacy valve brand, Red Point, is known for its customized valve solutions tailored to customer specifications, rapid delivery times and engineering flexibility.

As an innovator in flow control, Red Point is adding a rising stem ball valve to its extensive production catalog of ball, check, double block and bleed, gate and globe valves. This latest innovation from the Netherlands-based engineering brand is designed to reduce friction on moving components, extend maximum service life and provide a low-maintenance design. The rising stem ball valve is widely used in the oil and gas industry due to its robust design and reliable leak prevention.

The valve's friction-free sealing and non-contact ball movement and single-seated design offer longer potential service life for applications with operating temperatures of -320°F to 840°F (-196°C to 450°C). The impact of thermal expansion is minimized by the valve's design configuration.



Red Point's newest model is suitable for dirty service and offers a uniquely designed bottom trunnion to prevent solid particle ingress into the valve.

The distinct quarter-turn helix-shaped stem mechanism design is fully enclosed within the valve body, providing additional protection against environmental factors and eliminating the requirement for frequent lubrication. When closing the valve, the downward linear movement of the helix passing through the roller bars on the top of the ball causes the ball to rotate 90 degrees without physical contact, ensuring friction-free operation.

Regular ball and pin assembly designs often suffer from potential welding-related cracking issues. The new RSBV design eliminates this by employing a weld-free design, enhancing its reliability and longevity. Weld cracking and thermal expansion concerns were addressed by incorporating a non-shrink fitted/welded seat design. The valve also has an outside screw and yoke design. [trilliumflow.com](http://trilliumflow.com)

## New Bolted Bonnet Valve from Emerson

Emerson has announced its Fisher GX Bolted Bonnet Globe Valve and actuator system, designed specifically for controlling the flow of critical process fluids in applications in the downstream oil and gas, chemical and petrochemical industries, is being launched initially for the European market. The actuator can be serviced or replaced without exposing the valve internals or process media to the atmosphere, improving safety and reducing downtime.

Standard bonnets are designed so that the bolts securing the actuator yoke also hold the bonnet in place on top of the valve. Therefore, the actuator cannot be replaced or serviced without removing the bonnet and exposing the valve internals. Actuator repairs can be difficult in critical fluid applications as a result.

The Fisher GX Bolted Bonnet control valve addresses these difficulties associated with critical fluid applications by using a separate, high-strength locknut to secure the actuator's yoke to the bonnet. This allows service technicians to easily remove and maintain the actuator while keeping the bonnet in place.

The valve comes standard with a pneumatic actuator but is also compatible with electric actuators. It works with electric actuators from many different vendors, providing flexibility to meet electric actuation requirements.

The Fisher GX Bolted Bonnet control valve extends the existing GX product line, continuing to provide simple sizing with its automatic actuator selection and easy configurability. Its compact size also allows for simplified installation in space-constrained areas. [emerson.com](https://emerson.com)



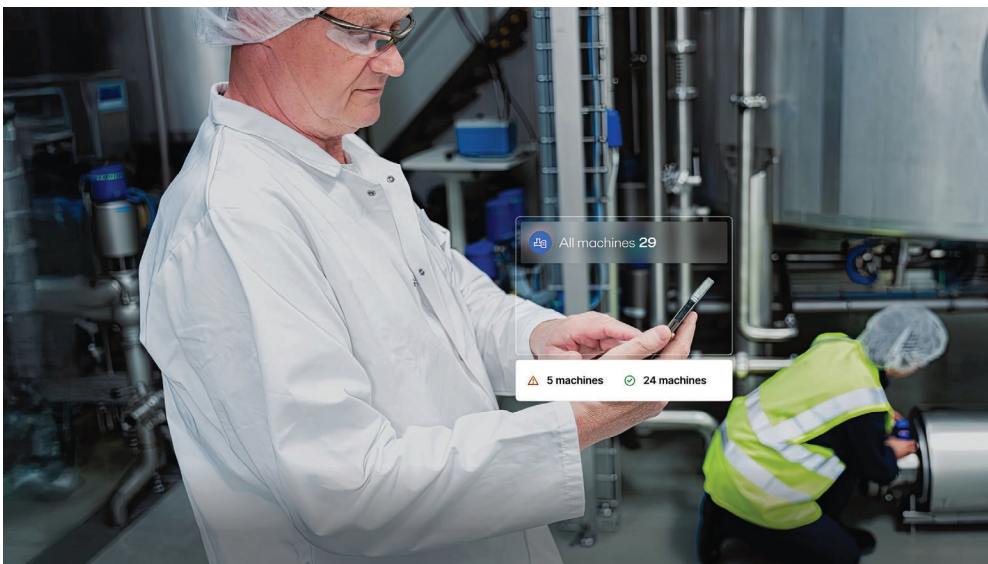
## Alfa Laval Launches AI-Based Condition Monitoring Solution

Alfa Laval has launched Clariot, a next-generation, AI-based condition monitoring solution built for hygienic process equipment to deliver accurate analysis and support. Clariot monitors equipment and processes, providing actionable insights that enhance uptime and optimize resource efficiency.

Clariot detects and identifies root causes of machine failures related to process, installation and mechanical con-

ditions for hygienic processes including monitoring pumps and other rotating equipment. The Clariot VX sensor is designed specifically for wet production environments and for handling multiple changeovers on the process lines.

Clariot consists of Clariot VX sensor, Clariot Connect gateway and analytics, seamlessly integrated into a complete digital handshake, meeting IEC 62443-3-3-SLI cybersecurity requirements. [alfalaval.com/clariot](https://alfalaval.com/clariot)



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**INDUSTRY**

# PROFILE

## Chris Jones



Source: Chris Jones

*Chris Jones is the Chair of the VRC Board of Directors. In his role as Director of Final Control Services for Midwest Valve Services, he leads the organization which includes five valve repair facilities throughout the upper Midwest and maintains more than 35 OEM authorized service relationships. He's been in the valve repair industry for 25 years, the past 15 with Midwest Valve, and has held a variety of roles including sales and sales management, business development, director and executive team leadership. He's a graduate of the University of Wisconsin – Madison.*

### What inspired you to pursue a career in the world of valves and actuators?

My father spent 45 years in the pump, mechanical seal, rotating equipment and valve repair business. Spending time with him at his office was my initial introduction to the industrial process world at a very young age. His dedication to helping customers solve problems, minimize downtime and improve equipment reliability became ingrained at an early age. I also learned the importance of quality and building things to last.

### Why did you decide to get involved with VMA?

Midwest Valve has been a long-time member of the VMA/VRC. I was provided with an opportunity to represent our organization at VMA/VRC meetings and maintain our highly valued, long-term OEM relationships we've had for over 40 years. From that point on, it's been important to me in helping promote quality, safety and the OEM supply chain message to our VMA/VRC members, end users and manufacturers. I've seen the consequences firsthand when companies cut corners and do not maintain as-designed engineering standards. The negative impact and potential loss can be significant to people and equipment. The VMA/VRC plays an important role in our line of work to help drive high standards, promote safety, exchange ideas and technology and advocate for the valve industry as a whole.

### Are there any exciting projects or initiatives you are working on that you'd like to highlight to our readers?

You know the old saying, "time is money?" Over the years, we've found ways to improve efficiency through our repair and documentation processes, which means quicker turnaround time. We have multiple initiatives underway that are focused on streamlining the repair process ranging from data and diagnostics to enhanced welding and machining methods. Customer shutdowns, turnarounds and outages (STOs) are getting shorter and we're aiming to help meet or exceed that industry demand.

### How do you stay abreast with changes in the valve/actuator industry?

Networking is key. We have a vast network of relationships across the industry including other repair companies, OEMs, suppliers, industry trade associations and most importantly end users — our customers. Participating in the VMA/VRC has helped evolve those relationships. I've also participated on a couple of advisory boards over the past seven years that help me stay connected with peers across the valve industry. In addition, collaborating closely with our customers on maintaining their assets helps provide feedback to manufacturers. This information sharing assists with new product development, the creation of specialty tooling, better repair and test methods, improved asset reliability, troubleshooting industry process challenges and making a positive impact on the success and sustainability of our customers' operations. 📌

Read the full interview: [VALVE-MEDIA.com/articles/industry-profile-chris-jones](https://www.valve-media.com/articles/industry-profile-chris-jones)

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