

# VALVE



WINTER 2024

Regulators for Semiconductor  
Pilot-Operated SRVs  
Gate Valves for Waterworks  
VMA Chairman Interview

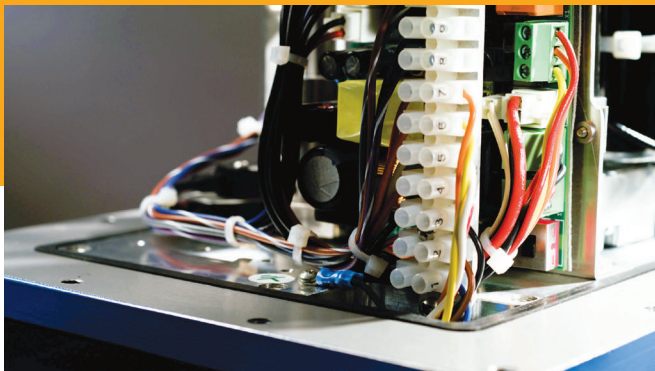
## Efficient Flow Control Products Help Meet Net Zero Goals

VOLUME 36 | NUMBER 1 | [VALVE-MEDIA.COM](http://VALVE-MEDIA.COM)

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## How the EPA's Emissions Rule May Impact Actuator Choices

**20** Efficient products can also help companies differentiate themselves to secure contracts.

BY TIM CHICOINE AND GOBIND KHIANI

**16**

### Advances in Regulator Technology Boost Semi Yields

Product innovations and supplier relationships are both critical to keeping fabs operating at peak.

BY JULIA VILLA

**24**

### Fundamental Operation of Pilot-Operated Safety Relief Valves

This installment of this series explores another type of pressure relief valves commonly used.

BY WAI LOON CHEONG

**28**

### Which Gate Valve is Best for Today's Waterworks Systems?

A look at the historical evolution of gate valve materials and designs to meet modern needs.

BY DEREK B. SCOTT & JOHN R. HELF

**38**

### Latest Launches

- ▶ Multivoltage Actuator
- ▶ Cryogenic Valve for FE
- ▶ Steam Trap Monitoring
- ▶ Explosion-Proof Quarter Turn Actuators
- ▶ Four-Piece Valve Assembly

### Departments and Columns

- 4** From the Editor
- 6** Industry News
- 10** Standards Spotlight
- 11** VMA News
  - Perspectives
  - Updates
  - Calendar
- 32** Q&A with VMA Chair Andy Duffy
- 34** Valve Basics: New Valve Modifications
- 36** VMA and VRC Member Roster
- 40** Industry Profile: Greg Johnson
- 40** Advertising Index

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FORWARD

## New Year, New-ish Magazine

Welcome to 2024 and an updated version of *Valve* Magazine! You may notice that we have incorporated several changes to this issue, from an updated logo to a refreshed design, and some new content areas — including this column!

I've been fortunate enough to be the editor of *Valve* since the Fall 2022 issue. I've spent my entire career in industrial editorial, marketing and communications roles, including with a global valve and fittings manufacturer where I interacted with professionals across industries and around the world.



While many in my life don't understand exactly what this industry is about, I have been known to simplify it by telling people not only is a bathroom faucet handle a valve, but so is a beer tap! Not quite what we cover in this magazine, but the same basic principles apply.

Valves have existed since ancient times, even if they looked different than they do today. Since humans figured out how to transport liquids and gases, valves have been crucial components in those systems. Our industry is ever-changing. It meets the needs of customer applications through updated designs, new materials and by finding new ways to manufacture the actual valves. While the basic technology may not have changed as quickly as other products, valve manufacturers continue to innovate with new designs and materials.

This magazine is published by the Valve Manufacturers Association (VMA), but the magazine, website and newsletters are here to educate the entire industry, specifically end users of industrial valves, actuators and controls. You'll find articles in this issue about semiconductor yield optimization through proper valve selection, and get up to speed on new regulations impacting actuators. Also featured is our second in a series on control valves, and our stalwart Valve Basics column, with an updated article on electric actuator controls. Finally, you'll find industry news, new product information and a regular section from VMA, along with a new column where we interview someone from the valve industry. Let me know if you want to be considered!

But we can't do it without you. Please send your press releases and news to [press@vma.org](mailto:press@vma.org), or send me an email with your article ideas and feedback. It takes a lot of content to publish not just this magazine but also our website and newsletters. Connect with me on LinkedIn so I can also follow what's happening in your businesses. We are here to serve you and rely on your expertise and ideas to do this. Thank you for being here, and I can't wait to continue growing this venerable brand and long-running magazine together.

Cheers!

**Heather Gaynor**, Editor-in-Chief  
[HGaynor@gardnerweb.com](mailto:HGaynor@gardnerweb.com)

# VALVE MAGAZINE

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# INDUSTRY NEWS

## Financing for Largest Clean Energy Project in U.S. Closes

Pattern Energy Group LP (Pattern Energy), a leader in renewable energy and transmission infrastructure, has closed an \$11 billion non-recourse financing and begun full construction of SunZia Transmission and SunZia Wind, which together is the largest clean energy infrastructure project in U.S. history.

SunZia Transmission is a 550-mile, 525 kV high-voltage direct current

(HVDC) transmission line between central New Mexico and south-central Arizona with the capacity to transport 3,000 MW of clean, reliable and affordable electricity across Western states. SunZia Transmission will deliver clean power generated by Pattern Energy's 3,515 MW SunZia Wind facility, the largest wind project in the Western Hemisphere,

which is being constructed across Torrance, Lincoln and San Miguel Counties in New Mexico.

SunZia Wind and Transmission will employ more than 2,000 workers on-site during construction, including heavy equipment operators, electricians, laborers and others.



## Heirloom Unveils America's First Commercial Direct Air Capture Facility



Heirloom Carbon Technologies unveiled a new facility that can capture up to 1,000 tons of carbon dioxide (CO<sub>2</sub>) per year, which will be stored in concrete to fulfill commercial removal purchases.

"This first commercial direct-air capture facility is the closest thing on Earth that we have to a time machine, because it can turn back the clock on climate change by

removing carbon dioxide that has already been emitted into our atmosphere," said Heirloom's CEO and co-founder, Shashank Samala. "The capacity of our technology to capture CO<sub>2</sub> from the air has gone from 1 kilogram of CO<sub>2</sub> to up to one million, or 1000 metric tons, in just over two years. We owe it to every climate-vulnerable citizen to continue to deploy our technology at the urgent pace required to reach billion-ton scale and beyond in time to stop the worst of climate change."

Limestone is used to pull CO<sub>2</sub> from the air. Using a renewable-energy-powered kiln, the limestone is heated to extract the CO<sub>2</sub>, leaving a mineral powder that absorbs more CO<sub>2</sub>. This powder is then spread onto vertically stacked trays where it acts like a sponge – pulling CO<sub>2</sub> from the air. Once saturated, the material is returned to the kiln, the CO<sub>2</sub> is extracted, and the process begins again. The captured CO<sub>2</sub> gas is then permanently stored safely underground or embedded in concrete.

The company's goal is to remove 1 billion tons of CO<sub>2</sub> from the atmosphere by 2035 – a figure which represents 20% of today's annual U.S. emissions and 10% of global carbon removal needed annually by 2050.

## IMI Critical to Collaborate with FAC in South America

IMI Critical Engineering has announced a new agent collaboration with FAC Engenharia to offer high quality and efficient flow control solutions for oil and gas customers and their partners in Brazil, as it works to strengthen its position in South America.

The collaboration means FAC Engenharia will sell products and services from IMI Critical Engineering brands, including IMI CCI, IMI Fluid Kinetics, IMI Orton and IMI STI, providing extensive on-site support.

## Harrington Acquires PumpMan

Harrington Process Solutions, a distributor of industrial products for corrosive and high-purity applications in the U.S., announced the acquisition of PumpMan, a provider of onsite maintenance, repair and replacement for all components in water and wastewater pumping systems.

Founded in 2016, PumpMan has grown quickly through a combination of organic growth and acquisitions, expanding to 11 locations across the United States.



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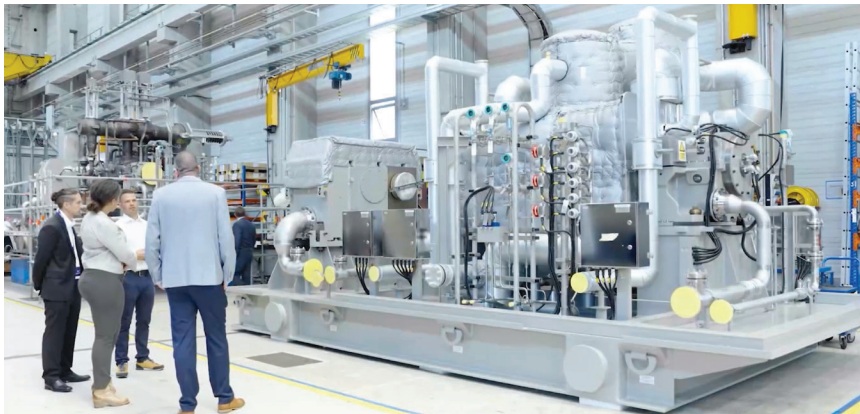
Photo Credit: Worldview Films

## First Power from Massachusetts Offshore Wind Project

Avangrid, Inc., a leading sustainable energy company and member of the Iberdrola Group, and Copenhagen Infrastructure Partners (CIP) announced that power from the Vineyard Wind project was delivered to the New England grid for the first time. As part of the initial commissioning process, at 11:52 PM on Tuesday, January 2, 2024, one turbine delivered approximately five megawatts of power, with additional testing expected to happen both on and offshore in the coming weeks. The project expects to have five turbines operating at full capacity early in 2024.

Power from the project interconnects to the New England grid in Barnstable, transmitted by underground cables that connect to a substation further inland on Cape Cod. Once completed, the project will consist of 62 wind turbines generating 806 Megawatts, enough to power more than 400,000 homes and businesses in Massachusetts.

## Siemens Energy Named Preferred Supplier for Advanced Fission Power Plant Deployments for Oklo



Oklo Inc., a fast fission, clean-power technology and nuclear-fuel recycling company, has signed a memorandum of understanding with Siemens Energy, designating them to potentially become Oklo's preferred supplier for rotating equipment of the power conversion system (conventional island) for the Aurora powerhouse. Siemens Energy could also provide consulting to support Oklo in design work of the conventional island.

"Fast fission reactors are a proven technology to produce heat and partnering with Siemens Energy takes steps to secure an efficient, reliable and scalable supply chain for converting that heat into power in our Aurora powerhouses," says Alex Renner, senior director of product at Oklo.

"The clean power generated by advanced nuclear is one of the key steps to reaching a net zero future," said Tobias Panse, senior vice president of industrial steam turbines and generators with Siemens Energy.

Siemens will also provide consulting to support the design and integration of the power conversion system.

## EPA Issues Final Rule on Methane Reduction

The U.S. Environmental Protection Agency (EPA) announced on December 2, 2023, a final rule designed to reduce methane and other harmful air pollutants from the oil and natural gas industry. The final action was announced at COP28 in Dubai, United Arab Emirates (UAE), advancing President Biden's historic climate agenda and day-one commitment to restore the United States' global leadership on climate change.

EPA's final rule should prevent an estimated 58 million tons of methane emissions from 2024 to 2038, the equivalent of 1.5 billion metric tons of carbon dioxide – nearly as much as all the carbon dioxide emitted by the power sector in 2021. In 2030 alone, the expected reductions are equivalent to 130 million metric tons of carbon dioxide – more than the annual emissions from 28 million gasoline cars.

Details are on the EPA website, and see the article on page 20 for alternatives to gas-powered actuators.

## Canada Launches \$1.5 Billion Critical Minerals Infrastructure Fund

Critical minerals are key enablers of clean technologies, like batteries, and clean energy sources (such as wind turbines and solar panels) which are essential to fighting climate change. Canada announced the launch of a Call for Proposals (CFP) of the Critical Minerals Infrastructure Fund (CMIF) to address key infrastructure gaps to enable sustainable critical minerals production and to connect resources to markets. With up to \$1.5 billion (\$1.09 billion USD) available over seven years, the fund will support clean energy and electrification initiatives as well as transportation and infrastructure projects.

This CFP will be the first of several under CMIF. Applicants can seek access to up to \$50 million per project for nongovernmental applicants and up to \$100 million per project for provincial and territorial governments investing in public projects. Information on funding opportunities and the applicant guide are now available online.

## Dow to Invest in World's First Net-Zero Integrated Ethylene Cracker in Alberta

Dow announced a final investment decision to build the world's first net zero Scope 1 and 2 emissions integrated ethylene cracker and derivatives facility in Alberta, Canada.

The \$6.5 billion project includes building a new ethylene cracker and increasing polyethylene capacity by 2 million MTA (metric tons per annum) as well as retrofitting the site's existing cracker to net-zero Scope 1 and 2 emissions. The investment is expected to deliver \$1 billion of EBITDA growth per year at full run rates over the economic cycle while decarbonizing 20% of Dow's global ethylene capacity.

The project builds on Dow's expertise in successfully implementing large projects, such as its TX-9 cracker in Freeport, Texas, which has delivered more than 15% return on invested capital since its 2017 start-up through best-in-class capital intensity, conversion cost and low emissions intensity.

Construction should begin in 2024, with capacity additions expected in phases, with the first in 2027, adding approximately 1,285 KTA (kilo tons per annum) of ethylene and polyethylene capacity, and the second phase starting up in 2029, adding approximately 600 KTA of capacity.

## People In the News

*Joseph P. Ford* was appointed engineering manager at **Conval**, a global manufacturer of severe service valves. Ford is a seasoned engineering leader with more than 30



years experience in all aspects of product lifecycle including R&D, project management, product design, configuration control and lean manufacturing. He has previously served in similar roles at Linde Advanced Materials Technologies, Circor and Baker Hughes, and holds a B.S. in mechanical engineering from Villanova University.

**Motion Industries, Inc.**, a distributor of maintenance, repair and operation replacement parts, and a provider of industrial technology solutions, named *Chris Cleland* to senior vice president of Strategy & Markets, effective immediately. He will lead Motion's strategy development for its business groups, plus the e-commerce and digital teams.




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## Hydrogen Valve Standard Coming from MSS

The growth of the hydrogen economy necessitates new standards for valves and products used in the storage and transport of these materials.

BY: GREG JOHNSON, *President, United Valve*  
MSS BOARD MEMBER & PAST PRESIDENT

Major changes to valve standards are usually predicated by a distinct specific need or major industry shift. A major standards growth spurt occurred in the 1990s with the accelerated need to banish asbestos coupled with the serious need to curtail fugitive emissions. This event would see numerous standards created and other standards updated due to the changes that were needed in materials and testing practices.

Today, with an increasing shift to alternative energy, there is again a need for new valve and piping standards, particularly for hydrogen applications. The effective use of hydrogen as a fuel requires economical transportation and storage of the energy-rich gas, which is made possible by either extremely high pressures and/or very low (cryogenic) temperatures.

To make hydrogen a useful fuel, it is necessary to make it denser for transport. One way to accomplish that goal is to compress the gas by increasing its pressure for movement through a high-pressure (1000-2000 psi) pipeline. When high volume transport is needed and pipelines are unavailable, hydrogen is most commonly transported and delivered as an extremely cold, cryogenic (-253°C) liquid in tank trucks and rail cars.

The compounding issue is the extremely small molecule size of hydrogen and its difficult containability. To address this need on the valve side, the Manufacturers Standardization Society (MSS) is currently working on a new standard to address this key part of hydrogen piping systems.

The hydrogen standard falls under the leadership of a new MSS Committee: Committee 410, "Severe and Special Service Valves." The scope of this group includes the creation of various application-related valve standards. The first document nearing completion covers an application that has needed standardization – valves in hydrofluoric acid (HF) service. HF acid is a very useful chemical in the refining industry, but it is very hazardous and highly corrosive, and standardization of valves in that service is

much desired by both end users and manufacturers. This document is in the ballot stage and may be finished for publication as early as spring.

One of the innovations that has made this new committee successful is a change in MSS participation policy. Previously, only manufacturers and a few other related subgroups could be members of MSS and have full participation rights. But MSS has created a new class of participants, subject matter experts (SME). This now allows a committee to broaden its work group scope to previously ineligible groups such as end users, engineering and construction (E&C) members, governmental agencies, educators and consultants. In the case of the HF and hydrogen valve standards work, this has shown to be invaluable.

As MSS celebrates 100 years of service to industry in 2024, the organization continues to be at the forefront of standards creation, be it revision of legacy standards or creating standards for the next wave of green energy applications. 🚀

The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc. is a non-profit technical association organized for development and improvement of industry, national and international codes and standards for Valves, Valve Actuators, Valve Modifications, Actuator Mounting Kits, Pipe or Tube Fittings, Flanges, Pipe or Tube Hangers and Supports, and Associated Seals, Springs, Spring Washers, and Fasteners. Since its establishment in 1924, MSS has been dedicated to developing voluntary standards for national and global application, in cooperation with other standardizing bodies and regulatory authorities.

MSS offers approximately 100 different Standard Practices. Learn more and order here: <https://msshq.org>.





# Happy New Year, and thanks for reading the refreshed *Valve Magazine*!

This magazine, and more broadly VMA, share a goal to educate the industry, so myself, along with editor Heather Gaynor and our *Valve* magazine Editorial Advisory Board, hope you like the new content and layout and find that it delivers useful and insightful information.

In addition to education, VMA also works to help identify trends and key issues facing our members, and provides the platform to address the issues. Never has this been more important as the future is more volatile and ever-changing than in recent memory – and I expect more of this in 2024. With an election year in the U.S., continued conflicts globally, reshoring or near shoring, increasing regulatory pressures and energy, environmental, societal and economic pressures – as well as new market opportunities and technical advancements – there is no shortage of concerns or opportunities that VMA can address.



***...VMA also works to help identify trends and key issues facing our members...***

This VMA News section provides a glimpse into some of the issues and topics that VMA's Committees address, but it doesn't replace being involved, working directly with peers, and gaining insights that help connect the dots on how all the external forces may impact your business. So, with the opportunity that lies ahead for the industry and VMA, I invite our members to get involved in VMA if you aren't already, I invite new companies to reach out and learn more about how your company may benefit from VMA membership, and I invite each of you to attend the Valve Forum, Hydrogen Summit or Valve Basics in person or on-demand programs to connect with each other, VMA and the industry.

Thank you, and I wish all our readers a strong and successful 2024! It will go faster than ever, and 2025 will be here too soon.

Heather Rhoderick, CAE  
President

## The Year in Review: 2023

VMA had a good year in 2023! A few highlights are listed below from our programs and activities areas. There was a

*This section of Valve will provide readers with a look into some of key issues and activities VMA is actively addressing. Members can contact VMA for more detailed information. To learn about becoming a VMA or VRC member, contact VMA President Heather Rhoderick at [hrhoderick@vma.org](mailto:hrhoderick@vma.org)*

strong focus on government affairs, especially on legislative and regulatory issues affecting our industry like PFAS, trade and tariffs, tax policy, Buy America Build America and supporting the workforce. Two “fly-ins” to Washington D.C. were held where we met with 20 Senate and House of Representative’s offices on Capitol Hill. VMA also filed comments on proposed EPA regulations related to PFAS in the environment, to explain the substantial implications of treating all PFAS materials in the same

manner. VMA also joined with other associations to promote new ways to obtain workforce training money and

to call for reinstatement on certain expensing items in the tax code. Globally, there were also a number of changes and alerts regarding various tariffs that we continue to keep members abreast of.

VMA realized high attendance at all of our events, and held the Market Outlook Workshop in person again for the first time since the pandemic. Additionally, the Valve Repair Council also held a workshop this summer for the first time since the pandemic. Participants enjoyed learning and being in person again. Education remains a key pillar of VMA, and in addition to in-person events, the Valve Basics program expanded in the on-demand format with both companies and individuals taking advantage of the program. A statement on sustainability that members can use in their communications with customers was created, and a membership “pulse survey” on business and economic trends was expanded and relaunched. VMA also made updates to both the VMA and Valve media brand and content areas to continue to be as relevant as possible, hired new staff and moved our offices to Alexandria, Virginia. A busy year!

A more complete look at 2023 will be provided in our Annual Report. It was a foundational year for the organization which will help us continue to deliver on our core priorities going forward.



**April 9, 2024**

**Inaugural Hydrogen Valve Summit**  
Houston, Texas

**April 9-11, 2024**

**The Valve Forum: Exhibits and Conference**  
Houston, Texas

**August 1-2, 2024**

**Market Outlook Workshop with The Hydraulic Institute\***  
Oakbrook, IL

**October 2-4, 2024**

**2024 VMA/VRC Annual Meeting\***  
Park City, Utah

\* VMA/VRC Members Only

## New Year, New Look



Working with various Committees, we are excited to introduce not only a refreshed look and feel to the Valve media products, but also to VMA! Our goals for the refresh were to ensure that the VMA and Valve logos and brand elements worked seamlessly with one another to help reinforce the relationship between the magazine and Association. Additionally, we wanted to provide a fresh update to the brands to expand their appeal to new audiences, without losing their recognition. If you haven't already, you'll start to see the new logo and other new designs for VMA over the next quarter. For those who have been involved with VMA for many years, you may notice the logo looks similar to one used years ago!

## Registration Open for Valve Forum and New Hydrogen Valve Summit

The entire industry is invited to attend two VMA events this spring: the the new Hydrogen Valve Summit, followed by the 2024 Valve Forum: Conference & Exhibits. VMA's Valve Forum is the premier gathering for the entire valve industry value chain, offering insights, business opportunities and the latest products.

The new Hydrogen Valve Summit, is a day dedicated to exploring hydrogen and carbon capture market opportunities. Sponsorship and exhibit opportunities are also available, providing a cost-effective place to showcase your latest innovations in valves and actuators, new services and equipment to valve manufacturers and end users.



TECHNICAL



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VALVE FUNDAMENTALS



## VMA Board of Directors Announced

VMA is pleased to announce the 2023-2024 Board of Directors, led by Chairman of the Board, Andy Duffy (Emerson). VMA's Board of Directors sets the strategic direction for the Association, and works to ensure that member value is being provided through all the association's services and activities. VMA thanks all these individuals for serving their industry and the VMA in this capacity.

The 2023-2024 Executive Committee is comprised of the following individuals:

**Chairman of the Board: Andy Duffy**  
Vice President, Sales, Emerson, Discrete Automation

**Incoming Board Chair and Finance Committee Chair: Kirk Wilson** – President, Flow Control, Flowserve Corporation

**Strategic Planning: Nathan Brunell**  
Product Line General Manager, Baker Hughes

**At-Large: Kevin McKown**  
Regional President, IMI Americas

**Immediate Past Chair: Matt Thiel**  
President, AUMA Actuators, Inc.

The following individuals were elected to the VMA's Board of Directors for their first three-year term:

Jordan Bast – President & CEO, Richards Industrials

Zachry Brown – President, Bray International, Inc.

Rachel Hollinger – Executive Vice President, DeZURIK

Scott Jackson – CEO and President, FloWorks

The following individuals were elected to VMA's Board of Directors in an ex-officio role for a two-year term:

Cory Jones – President, Setpoint IS

Kelly Lovell – Executive Vice President, United Valve

The following individuals remain on the VMA Board of Directors:

Alejandro (Alex) Alcalá – Crane Co.

Danilo Garcia – RF Valves

Seth Guterman – American Valve

Dave Loula – ITT Engineered Valves

Kevin J Tinsley – Valmet

Rob Velan – Velan

## 2024 Valve Repair Council Announced

The Valve Repair Council held its annual business meeting last fall, and had discussions around the ways the Council could increase education and networking to both its members and customers.

Expanding on the education and networking provided at the Valve Repair Workshop held this year, it was agreed to provide some educational sessions

this spring at the Valve Forum, and to hold another Valve Repair Workshop for repair companies in 2025. Additionally, the Board is discussing other programs and activities that would help the membership.



The following Board of Directors were also elected to serve the Council and its members:

Kim Beise – Chairman, Dowco Valve

Jody Dunn – Vice Chairman, Quality Valve

Greg Johnson – United Valve

Chris Jones – Midwest Valve Services

Richard Lewis – John H. Carter Company

Jack Roubik – Flotech Inc.

Cliff Smith – Valmet

Cory Jones – Setpoint IS

The VRC Board invites all Valve Repair Council to express any interest on working with the Board on new projects to reach out to any of the members, or to contact Heather Rhoderick at [hrhoderick@vma.org](mailto:hrhoderick@vma.org).



### VMA AND VRC MEMBERS

## Date and Location Announced for 2024 Annual Meeting

VMA and VRC members should save the date for the 86th VMA and VRC Annual Meeting, October 2-4, 2024, in Park City, Utah. This event promises to be a dynamic gathering of industry leaders, professionals and experts in various fields, and will provide a unique platform to help leaders wade through the external forces affecting the industry and the specific impact on their business. The scenic backdrop of Park City adds an extra layer of inspiration to this annual gathering. The future is moving faster and is more volatile than in recent memory – don't miss this opportunity to hear key information from experts and peers.



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**Emerson congratulates Andy Duffy**  
on being elected new 2023-24 Chairman of the  
Valve Manufacturer Association of America.



## Educating our Legislators on PFAS, Taxes and Workforce



In October, VMA took the conversation on the implications from an incredibly broad treatment of all PFAS materials direct to the nation's legislators on Capitol Hill. Meetings were held with 14 different Senate and Representative offices key to our industry. The focus of the day was to help explain and educate on why PFAS materials should be segmented, managed and regulated differently based on their hazards and risk, and on the benefits provided by low hazard PFAS materials commonly used in seals, linings, packings and more applications. With much of the current focus from both legislators and regulators in the U.S., Canada and Europe to treat all PFAS and materials using any type of PFAS in the same way, it is important to explain the huge impacts this could have on the modern way of life, and impacts on the environment, security, economy and much more. While the focus of the meetings was on PFAS, we also discussed some tax issues around the expensing of research and development activities and ways to support workforce training.

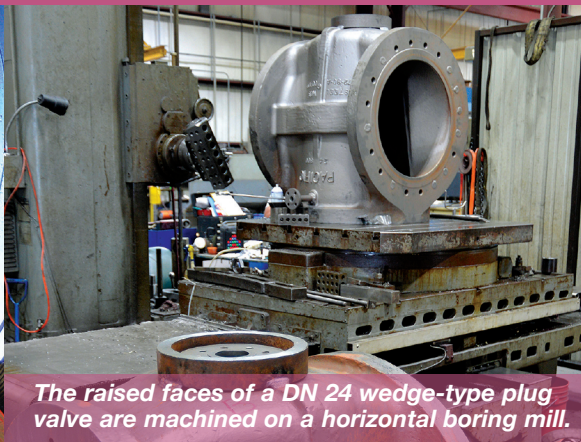
## PFAS Reporting Under TSCA Regulation

EPA's recent PFAS Reporting Under TSCA Section 8(a) (7) rule, announced on October 11, 2023, holds significance for industrial valve manufacturers, distributors and suppliers who import articles/products containing PFAS materials like PTFE or those who manufacture it. With a one-time reporting requirement, the rule includes information from 2011 onward and imposes a reporting deadline of either May or November 2025. All VMA/VRC members are invited to listen to a recent members-only webinar which provide insights into the potential implications and requirements of this rule for their companies. Additional information will also be available through the year on this.

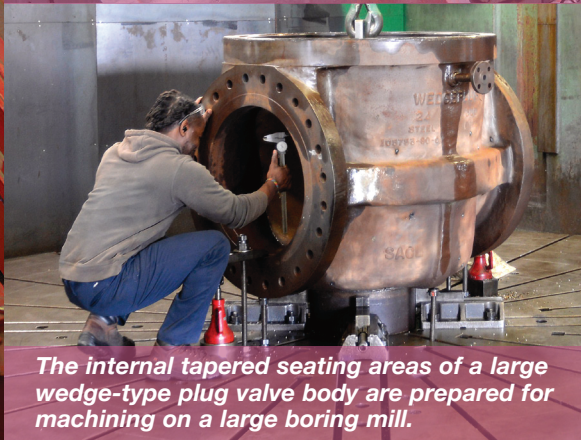
# Rising-Rotating Plug Valve Repair & Service



*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.

The largest boring mills in our machine tool inventory can machine plug valve tool components of any size or material, while our grinding machinery is capable of handling valves of up to NPS 24 for both internal and external grinding. The machining department features 20-ton cranes, while the adjacent assembly area is served by a 40-ton crane.

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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## REGULATORS

# Advances in Pressure Regulator Technology Help Boost Semiconductor Fabrication Yields

BY: JULIA VILLA, *Product Marketing Manager*  
COMPANY: EMERSON

In addition to product innovations, supplier relationships are key to keeping fabs operating at peak production levels.

Demand for virtually every kind of semiconductor chip continues to grow as digital technology is woven more deeply into every aspect of our modern world. That demand places unrelenting pressure on fabs to increase production yields, challenging manufacturers to find new technologies and solutions to boost productivity while simultaneously improving manufacturing quality. For the semiconductor industry, this can be a complex and costly challenge. When manufacturers have well-established, multibillion-dollar production systems and controls, it can be difficult to convince them to invest in integrating new production, automation and data analysis tools. However, there are incremental technologies becoming available, such

as innovative new gas delivery components, that offer ways to improve semiconductor efficiency and productivity, one pressure regulator at a time.

### **Upgrade key gas delivery system components to improve yield**

Updating or modifying any part of an established chip manufacturing process is challenging. First, it can be extremely expensive in terms of engineering and equipment costs. New system integration can also prove cumbersome and present costly disruptions to the larger operation. These challenges often lead manufacturers and their suppliers to examine smaller systems and components within the process to try to

(LEFT) Close up of silicon wafer during manufacturing in semiconductor plant. Photo Credit: iStock photo.

identify opportunities for yield improvement, and a system and component that are getting a lot of attention are the gas delivery system and the pressure regulator.

Because there are so many gas delivery systems involved in semiconductor manufacturing, the pressure regulators that control gas flow have taken center stage as a critical component in the battle for better yields. The more precise pressure and flow control and improved cycle times afforded by newer pressure regulator designs are helping manufacturers more tightly control gas delivery, which is directly tied to higher product quality and higher yield. In the bigger picture, these component-level improvements can also assist in reducing material waste and equipment wear and tear, all of which contribute to alleviating the semiconductor shortage that manufacturers are working so hard to resolve.

### Critical value of high-purity components in gas cabinet designs

To understand the positive impact a high-purity pressure regulator can have on a semiconductor manufacturing operation and its yield, consider a typical gas cabinet within the larger context of gas delivery systems. Gas lines start out 100% clean and free of impurities, so regulators that are introduced into the process must also be 100% clean. This means regulator suppliers must do their part during the manufacturing of high-purity regulators to ensure no impurities are introduced into the process once the regulator is installed. For example, some pressure control regulators are manufactured specifically for high-purity applications and are assembled in an ISO 4 clean room and vacuum bagged to protect cleanliness from the point of manufacturing through transport and installation into the system.

Cleanliness, however, is only part of the story of a pressure regulator's impact on yield. Equally important is the regulator's ability to deliver precise flow control. When the gas supply reaches the gas cabinet, the regulator is responsible for controlling the flow of the gases that are distributed to the valve manifold boxes that feed clean room tools. Once gases reach the clean room, flow precision is absolutely critical for delivering the high product quality that results in high yields, and any fluctuations in pressure or flow can compromise this quality.

Recognizing the critical role of regulators and their potential to impact yields, industry-leading suppliers have

focused their engineering expertise on advancing regulator technology to control flow more precisely. As a result, newer sensor-equipped pressure regulators are now available that enable manufacturers to capture, analyze and respond to regulator data automatically without operator intervention. Additionally, advances in the pressure regulator's internal design, such as reductions in volumes and modifications to the diaphragm, have improved cycle times by reducing the amount of time required to purge the regulator during changeover.

### Digital pressure regulators upgrade precision and control

Continuing with the gas cabinet example, a common scenario in this area of gas delivery is for personnel to check pressures by reading gauges inside the cabinet and manually recording the readings. This traditional approach introduces at least three opportunities for error into the manufacturing process. First, there is an opportunity for human error in recording the pressure data. Second, there is an inherent delay between when the operator records the data and when action is taken in response to the data. Lastly, it requires the operator to come in close proximity to the gas cabinet to read the pressure gauges, and in some cases the operator must open the cabinet

to make pressure adjustments. Each of these steps adds unnecessary risks into the process, which can be resolved by integrating modern pressure regulator technology.

For example, small changes in pressure over time may go unnoticed when data is captured manually, and minor fluctuations are often not identified and corrected until after they have negatively impacted chip quality and reduced yield. Comparatively,

digitized pressure regulators can be directed to respond to minute pressure deviations and to automatically make corrections without operator intervention. This removes the time delay associated with traditional troubleshooting and manual control, and it prevents out-of-spec conditions from persisting to the point where they impact quality and yield. Applying automation to pressure regulators in this way also minimizes operator safety risks by reducing or eliminating the need for them to come in contact with the gas cabinet.

Incremental digitization of components like pressure regulators and subsequent digitalization of the larger gas delivery systems can present a variety of new opportunities for process improvement and safety in the future. In addition to truly optimizing yields, manufacturers will also be able to ▶

*As pressure regulators become "smarter," more precise and more responsive, manufacturers have improved the ability to monitor and control processes in real time.*

instantly identify and correct root causes of processing issues, make processes inherently safer by distancing operators from dangerous gasses and equipment and extend equipment life through better preventive maintenance. Semiconductor

manufacturing of the future will also allow facility managers to plan downtime using predictive maintenance tools informed by real-time performance data.

### Advances in pressure regulator mechanical features

While digitization of pressure regulators is an important part of high-precision gas delivery, as illustrated by the gas cabinet example, there have been other equally important innovations in the mechanical features of regulators that are also helping to control contamination.

For instance, new regulator designs include springless and threadless models with lower internal volumes and fewer media contact points to minimize particle accumulation and contamination. Regulators may also feature a tied diaphragm design that creates a positive seal in the event of internal leakage at the outlet. And leak integrity within the regulator body has been improved with newer metal-on-metal diaphragm-to-body seals. These updated mechanical features allow pressure regulators to deliver safer and more reliable performance and contamination control in many types of ultrahigh-purity gas delivery

systems, including bulk specialty gas systems, gas cabinets, valve manifold boxes and other tool hookup and pressure control systems. The standardized part numbers also make selection easier for distributors and end users.

### Key criteria for selecting component suppliers

For manufacturers who need to replace failing pressure regulators within their gas delivery systems or who wish to update their regulators to these newer designs, partnering with a knowledgeable supplier that has semiconductor manufacturing expertise and experience is critical to success.

First, find a supplier that has ISO-rated clean rooms to

ensure that the regulators you purchase have been manufactured in an ultra-clean environment using an ultra-clean manufacturing process. Also, make sure your supplier has a readily available supply of products that meet industry standards and that have a reputation for performance and reliability. This will expedite access to repair and replacement parts, which is essential for avoiding prolonged downtime.

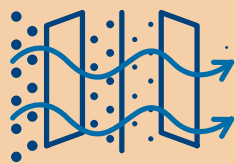
Next, local support from a supplier can prove invaluable, as it allows the supplier to become familiar with a manufacturing operation, and it enables the manufacturer to become familiar with the supplier's product families. This aspect of the manufacturer-supplier relationship is beneficial for both parties, enabling them to work in harmony to quickly resolve short-term issues as well as focus on longer term process improvement goals. Engaging a supplier in manufacturing challenges and goals can also lead to advances in control technologies that are beneficial for the manufacturer as well as for the industry at large.

Lastly, attention to supply chain disruptions and raw material shortages should also play a role in choosing a supplier. Those who are knowledgeable about raw material resources and supply dynamics and who proactively prepare and plan for disruptions may offer a higher level of supply security.

### Every component counts

Innovations in pressure regulators are just one example of how a broad range of components are being modernized to meet the digitalization needs of today's manufacturers. By fully digitalizing the entire manufacturing process, with components such as pressure regulators becoming "smarter," more precise and more responsive, manufacturers have significantly improved ability to monitor and control processes in real time. They can respond to issues faster, before they slow down production or impact quality — a crucial need for semiconductor manufacturers to sustain their yields and meet unprecedented demand.

As industries continue to invest in digital transformation, small changes with improved, digital pressure regulators can create big improvements, creating momentum that moves manufacturing forward. This approach is a more manageable way to reap the benefits in quality, safety and yield that new component-level technologies offer. ❗



## High-Purity Manufacturing

Unlike many industrial valve and regulator applications, semiconductor manufacturing takes place in an ultra-high purity environment. Air quality, humidity, temperature, air flow and other environmental factors are tightly controlled to minimize any contaminants entering the rooms, and personnel wear specialty clothing and often enter labs through airlocks. ISO standards range from ISO 1 to ISO 9 for clean rooms, with ISO 1 (10 particle per cubic meter of air) being the cleanest. How clean is that? Most operating rooms are only required to meet ISO 4 — or 10,000 particles per cubic meter of air 0.1 microns or larger — for infection control.

— H. Gaynor

### ABOUT THE AUTHOR

Julia Villa is a product marketing manager at Emerson. She has over five years of experience in the industry, managing products from concept to completion. She received a Bachelor of Science in chemical engineering from Tecnológico de Monterrey and later earned a master's degree in marketing from EGADE Business School.



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The **Hydrogen Valve Summit**, taking place the day before the Valve Forum, aims to provide attendees with an understanding of the hydrogen and carbon capture markets for the valve industry. Attendees can attend either event or both, with a discounted rate for attending both.

Registration and more information is available online at [VMA.org/ValveForum](https://VMA.org/ValveForum)



"The guest interaction was outstanding, and the presenters made themselves available for discussion." — 2023 Valve Forum Attendee



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## ACTUATORS

# How the EPA's Emissions Rule May Impact Actuator Choices

The move toward net zero emissions by 2050 was just released during the COP28 meeting in Dubai.

**TIM CHICOINE** WedgeRock Engineered Solutions  
**GOBIND N KHIANI** GAPV Inc.

Climate-related disclosures are becoming an essential and expected element of corporate communications, and all signs point to these disclosures becoming mandatory. Investors, communities and stakeholders are pressuring companies of all sizes to act on the environmental and social aspects of their performance. Focusing on environment, social and governance (ESG) efforts could be a differentiator when it comes to securing new contracts or customers for oilfield services. The recent surge of focus on ESG matters by investors and other affected stakeholders has only been intensified by current public health, economic and societal crises.

Essentially, ESG is meant to be a way by which companies can be assessed or ranked for a wide variety of factors that measure the nonfinancial, social impacts of their investments and operations. At the same time, ESG is being used to provide socially conscious investors with a range of business and investment opportunities.

Some of the ESG target highlights that can shape the industry are:

- New targets to reduce methane and greenhouse gas (GHG) emissions intensity from its operations by 30-50% by 2030, and net zero by 2050.
- Advancing the commitment towards new technology along with diversity, equity and inclusion.
- Expanding safety programs to include advances in targets for health and safety.

Along with the new ESG requirements, many gas utility, transmission and midstream and gathering companies, and gas utilities are being required to install rupture mitigation valves (automatic control valves or remote-control valves) to meet Pipeline and Hazardous Material Safety Administration's (PHMSA) "Final Valve Rule." In addition, the Environmental Protection Agency (EPA), under the direction of President Biden, is proposing changes to the Clean Air Act, 40 CFR 60. First proposed in the Federal Register on November 15, 2021, and after a year of comments, the EPA released an update that was printed in the Federal Register on December 6, 2022. The final changes were released on December 2, 2023, in conjunction with COP 28 in Dubai. The EPA is implementing "New Source Performance Standards" (NSPS, also known as NSPS OOOOb) for greenhouse gas and volatile organic compound emissions from the oil and gas industry. NSPS OOOOb will be backdated to December 6, 2022, the date the supplemental proposal was released. The EPA is also implementing new emission guidelines (also known as EG OOOOc) for the states to follow in establishing standards to reduce greenhouse gas emissions. One area the EPA is targeting is the reduction of methane and volatile organic compounds (VOCs) by disallowing the use of natural gas-driven controllers at new, reconstructed and modified sources of emissions. This proposed rule was sent to the Office of Management and Budget (OMB) at the White House on September 28, 2023. The OMB should have this finalized and printed in the Federal Register by late 2023 or early 2024. Once enacted, owner/operators of oil and gas facilities will have 12 months to comply with NSPS OOOOb. The states will have two years to submit their Emission Guidelines to the EPA for approval and then owner/operators will have three years to comply with that state's emission regulations.

With thousands of gas-powered actuators currently operating in the field, valve operation in the gas industry can be a major source of greenhouse gas emissions. Until recently, there were few viable alternatives available to meet performance requirements within the existing pipeline infrastructure. Historically, pipeline valves are operated using standard efficiency gear operators, remote controlled actuators or automatic controlled actuators as determined by the application, valve torque, available operating media and preference of end users. In the case of larger diameter ball valves, even when these valves are operated infrequently, "convenience actuators" are often installed for the health and safety of personnel.

These convenience actuators are installed at substantial installation cost and maintenance. Driven by "human factor specifications," this approach is taken to keep operations personnel from turning handwheels hundreds of rotations to open or close a valve, as is the case with standard efficiency gear operators. These convenience actuators are often low-pressure pneumatic (with regulators and relief valves), gas/hydraulic oil (also referred to as gas over oil) and direct gas actuators. Unless instrument air is available in the case of low-pressure pneumatic actuators, the

above listed actuators require the use of natural gas from the pipeline to operate. During operation of pipeline-gas assisted actuators, natural gas exhausts to the atmosphere. While once considered acceptable, this methane venting is now considered fugitive emissions of greenhouse gases.

Quantitative and verifiable reduction of greenhouse gases is a prime environmental initiative in corporate ESG sustainability and is rapidly gaining clarity and traction. This new focus is driving the design of new solutions using high-performance manual and electric alternatives to gas-powered valve actuators. These next generation actuator packages are key to achieving aggressive and responsible ESG goals by reducing Scope 1 and Scope 2 greenhouse gas emissions

New products on the market, such as high-efficiency worm, planetary and spring return gears, are finding a place in energy and industrial applications. A high efficiency gear is loosely classified as any gear that is greater than 50% efficient. Standard-efficiency worm gears, most prominent in valve actuation, are typically 35% or less efficient by design, as this makes the gear set inherently self-locking, meaning torque driven from the valve stem through the output of the gear will be transmitted through the gear train to the input (back driven). To overcome back-

driving/non-self-locking gear trains, an anti-back drive device must be employed in many applications to make these advanced actuators suitable and compliant. With the proper design, the use of high-efficiency gears provide valve actuation that can reduce power consumption or work by more than 300% in many applications while eliminating the venting of greenhouse gases.

High-efficiency worm and planetary gears can significantly reduce the work required to operate valves over standard efficiency worm gears. The benefit for the customer is easier manual operation compared to that of a standard efficiency gear. An additional benefit is decreased operation time in manually intensive operations such as pig launching and receiving.

High-efficiency gears can also be coupled with electric actuators to reduce operating times over conventional gears and power consumption by as much as 70%. But remember, the cleanest energy is that which is not consumed. The use of high-efficiency gears, especially planetary gears, are being used to significantly reduce power consumption while still meeting performance requirements; a sample calculation of the power consumption for a standard-efficiency worm gear compared to a high-efficiency planetary gear utilizing 16-, 20-, and 24-in. 900# ANSI valves is shown at right. The same electric actuator was used in all cases to illustrate the differences.

The graphs on p. 22 show power consumption per cycle, over a 10-year period and over a 30-year period. As one can see from these calculations, power consumption is often reduced by more than 50%. This reduced power consumption of this sample project results in a lower carbon foot-

**The cleanest energy is that which is not consumed.**

### 16" 900# Valve

	STANDARD EFF. WORM	HIGH EFF. PLANETARY
Ratio	227.5	95
MA	84.6	86.7
Efficiency	37.20%	91.30%
Required input ft.-lbs.	84	82
Rim pull 30" HW	54	52
Turns	60	24
<b>240v/1ph/60hz Actuator</b>		
Act. RPM	150	150
Time in seconds	23	9.5
Locked rotor/Start current (A)	72	72
Nominal current (A)	8.7	8.7
<b>Power Consumption (kW/HR)</b>		
At start current	0.1	0.042
At nominal current	0.012	0.005
Cycles per day	0.1	0.04
1 year	37	15
10 year	365	153
20 year	731	305
30 year	1,096	458
40 year	1,461	610

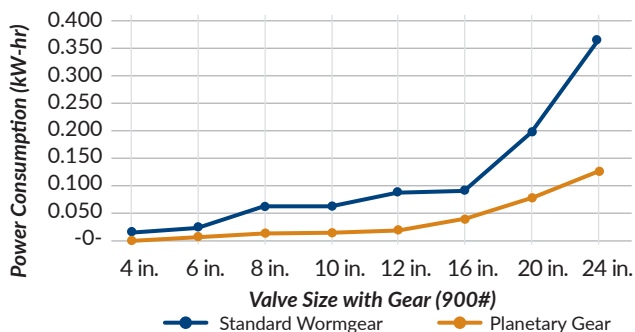
### 20" 900# Valve

	STANDARD EFF. WORM	HIGH EFF. PLANETARY
Ratio	455	180
MA	164.4	164.3
Efficiency	36.10%	91.30%
Required input ft.-lbs.	85	85
Rim pull 30" HW	54	54
Turns	114	45
<b>240V/1PH/60HZ Actuator</b>		
Act. RPM	150	150
Time in seconds	46	18
Locked rotor/Start current (A)	72	72
Nominal current (A)	8.7	8.7
<b>Power Consumption (kW/HR)</b>		
At start current	0.2	0.079
At nominal current	0.024	0.01
Cycles per day	0.2	0.08
1 year	73	29
10 year	731	289
20 year	1,461	578
30 year	2,192	867
40 year	2,923	1,156

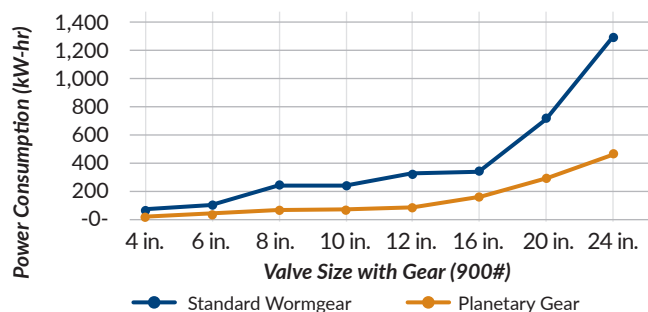
### 24" 900# Valve

	STANDARD EFF. WORM	HIGH EFF. PLANETARY
Ratio	819	285
MA	302.9	260
Efficiency	37%	91.30%
Required input ft.-lbs.	72	84
Rim pull 30" HW	46	54
Turns	205	71
<b>240V/1PH/60HZ Actuator</b>		
Act. RPM	150	150
Time in seconds	82	28.5
Locked rotor/Start current (A)	72	72
Nominal current (A)	8.7	8.7
<b>Power Consumption (kW/HR)</b>		
At start current	0.36	0.125
At nominal current	0.044	0.015
Cycles per day	0.36	0.13
1 year	132	46
10 year	1,315	458
20 year	2,631	915
30 year	3,946	1,373
40 year	5,261	1,831

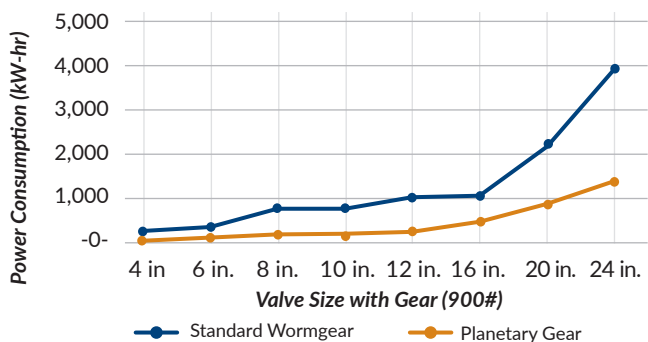
### Power Consumption Per Gearbox - Kw-Hr



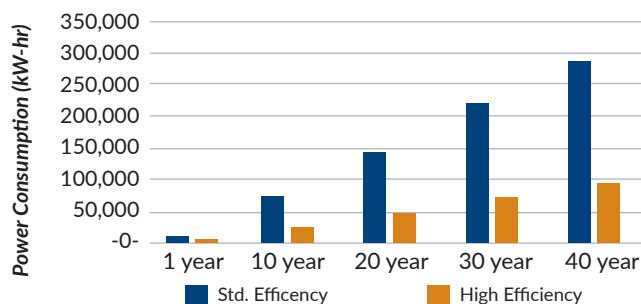
### Power Consumption Per Gearbox - 10 Year Period



### Power Consumption Per Gearbox - 30 Year Period



### Carbon Footprint



print if conventional power generated using fossil fuel is required. This is shown in the chart to the left.

Not only does high-efficiency planetary gear technology help reduce the scope 2 GHG emissions compared to a standard-efficiency worm gear but, in many cases, the reduced power consumption allows for the use of a DC motor in conjunction with a renewable energy source such as a solar panel and an uninterrupted power supply. This enables the creation of an “off the grid” solution. This can be especially beneficial in remote areas where a zero-emission solution can be provided, eliminating any scope 1 and 2 emissions, while dramatically reducing the infrastructure cost of bringing power to those remote areas.

Another new technology that is gaining traction is the development of mechanical spring-return or failsafe gears. Spring-return gears can be used in a multitude of configurations to fulfill different operating conditions that historically required the use of hydraulic fluid and/or pipeline power gas. These engineered gears can be used in manual applications, manual-reset automatic control applications, manual-reset remote control applications, and when coupled with a motor operator, spring-return gears can be used for remote fail-safe ESD applications. Current spring-return gears out in the market are built using a high-efficiency planetary gear platform.

Spring-return gears can be operated manually using a lever and spring combination in one direction and the handwheel for the other. This is an emission-free solution to a convenience gas-over-oil actuator that uses a lever-operated solenoid valve to open and close the valve or a self-contained hydraulic spring-return actuator. The operator would use the lever to stroke the valve in the “fail direction” by manually actuating the trigger release mechanism that holds the spring. This setup would require the operator to stroke the valve back to its “ready” position using the handwheel. The benefit to the employee operating the valve in a manual fail-safe application is reduced operation time and workload of the planetary gear to compress the spring versus a standard gear or hydraulic pump. The benefit for the organization is less physical work and stress for the employee compared to a commercial gear, while at the same time reducing the organization’s methane emissions to zero for each valve stroke.

### Manual reset spring return gear

Spring-return gears can be used as manual reset, standalone emergency shut-down devices. These can be designed to operate utilizing line pressure from a high- or low-pressure pilot or pressure switch in an automatic control strategy, or by receiving an electric signal from the operator’s control room in a remote-control strategy. In either of these configurations, the gear would be set up to go to a “fail position” when the signal was received — the spring would be released allowing the valve to travel to its fail position. The valve would again need to be manually reset to the “ready” position by operating the gear using the handwheel. This allows for quick operation in the case of an upset condition while keeping an operator in the control room from reset-



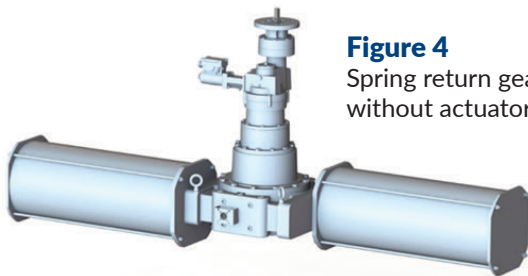
**Figure 1**  
High-efficiency  
worm gear.



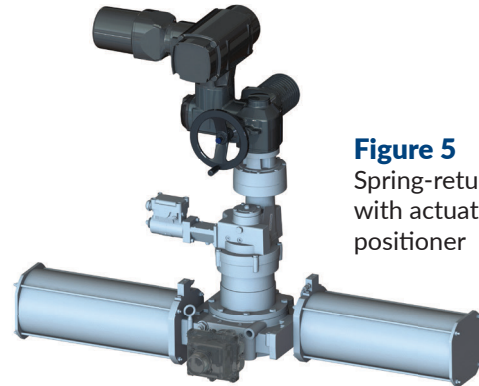
**Figure 2**  
High-efficiency planetary gear



**Figure 3**  
Manual reset spring return gear



**Figure 4**  
Spring return gear  
without actuator



**Figure 5**  
Spring-return gear  
with actuator and  
positioner

ting a valve to its ready position without someone first going to the site to identify what caused the upset condition, a common industry application.

Spring-return gears can also be coupled with an electric actuator to provide an all-electric, mechanical fail-safe actuator. Since no gas power is required for this type of setup, valve operation is inherently emission free. Spring return gears are independent of the motor operator and therefore can be used with almost any multiturn electric actuator manufacturer, allowing the end-user to maintain conformity of products in their facility or pipeline, helping with spare part reduction and operator training/qualification.

In an electric fail-safe application, not only does the customer get the benefit of an emission-free mechanical fail-safe device, but they also get the benefit of reduced power consumption, reduced operating times and reduced infrastructure costs. By using the mechanical advantage of the planetary gear, the output torque required by the actuator is reduced allowing for a smaller motor that utilizes less power.

In short, electromechanical/manual-mechanical alternatives to gas-powered actuators can help achieve environmental objectives, manage longer term asset costs and provide operational safety in the following ways:

- Eliminate exhaust emissions
- Reduce leak paths of tubing and fittings
- Eliminate valve creep in ESD valves due to temperature change and piston leak
- Reduce maintenance over the life of the asset
- Reduce the amount of work required to manually open or close a valve

- Reduce power consumption of electric actuators
- Assist in meeting performance requirements such as speed of operation

Every company and individual has a direct and vital role to play in delivering a shared energy future that is more suitable, just and ultimately sustainable. This requires continued collaboration with stakeholders, challenging the status quo and pushing the boundaries on innovative thinking by providing change in society. ❗

#### ABOUT THE AUTHORS

**Tim Chicoine** is the Director of Sales, Americas for WedgeRock Engineered Solutions, and Principal of Riverhawk Industrial Sales Inc. He has over 30 years' experience in the valve and actuator industry. His focus is on methane mitigation in valve operations for the oil and gas industry.



**Gobind N Khiani** is a distinguished alumnus of the University of Calgary. Along with a Fellowship, he has been on the Board of Directors for Energy Sustainability Training for Young Engineers and Geoscientists and Canadian Prairie Group of Chartered Engineers since 2019, and also serves as chairman of the end-user group at API 609 and vice chairman of Standards Council of Canada, and is past chair of the CBEC of APEGA.

## SAFETY RELIEF VALVES

# Fundamental Operation of Pilot-Operated Safety Relief Valves

In this second of a series, we explore another type of pressure relief valves used in common applications.

BY: WAI LOON CHEONG, *Training Leader*

COMPANY: BAKER HUGHES

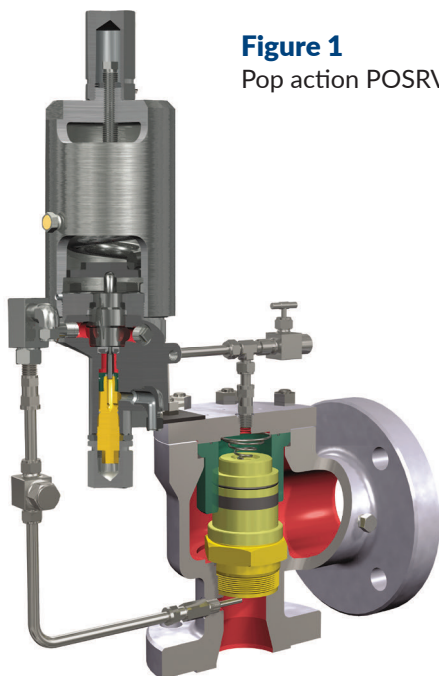
All images courtesy of Baker Hughes

In this second installment of the series, we will discuss another type of pressure relief valve (PRV) called a pilot-operated safety relief valve (POSRV). In the Fall 2023 issue, we covered the fundamental operation of spring-loaded safety relief valves in detail and some of their common applications.

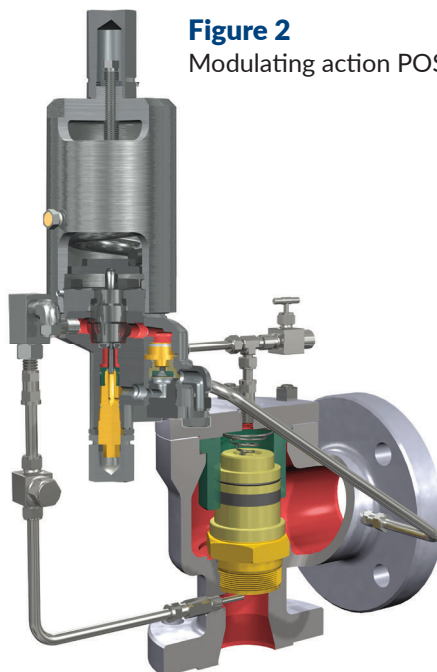
A pilot-operated safety relief valve is a pressure relief

valve in which the major relieving device (main valve) is combined with and is controlled by a self-actuated auxiliary pressure relief valve called a pilot valve. Pilot-operated safety relief valves can be flowing or non-flowing, and come in two pilot types – pop action and modulating action. See Figures 1 and 2 for illustrations of these pilot types.

**Figure 1**  
Pop action POSRV



**Figure 2**  
Modulating action POSRV



## Operational Basics of Pilot-Operated Safety Relief Valves

The pilot valve operates by sensing system pressure and using this pressure to control the closing force on the main valve disc. Increasing inlet valve pressure results in increased closing force until the pilot valve opens. Pressure is relieved at a designated set point as process media is allowed to discharge through the main valve.

### Pop Action POSRV

Use of the pop pilot configuration will result in a main valve disc “pop” action from the seated position to 100% open. When the overpressure condition is relieved, the main valve disc will reseat due to the increased media pressure directed through the pilot valve to the top of the valve disc (dome).

As shown in Figure 3, system pressure from the main valve inlet is fed to the dome area by the pilot through interconnected tubing. This equalizes the pressure on the top of the disc with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the disc is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.

Figure 4 shows that as inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to atmospheric pressure.

The main valve disc is allowed to lift off the seat as the fluid force overcomes the now removed pressure load above the main valve disc. The valve discharges to relieve system pressure.

When the discharging main valve reduces the inlet pressure to the preset blowdown pressure of the pilot,

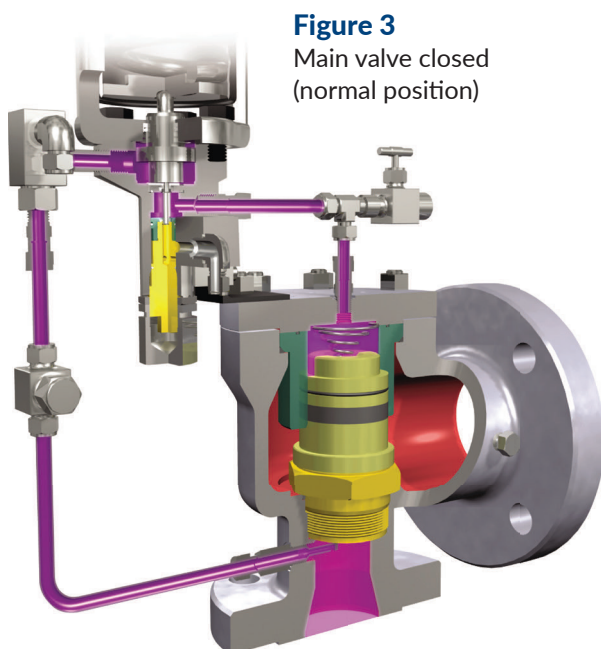
the pilot piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve disc. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the disc closes the main valve.

### Modulating Action POSRV

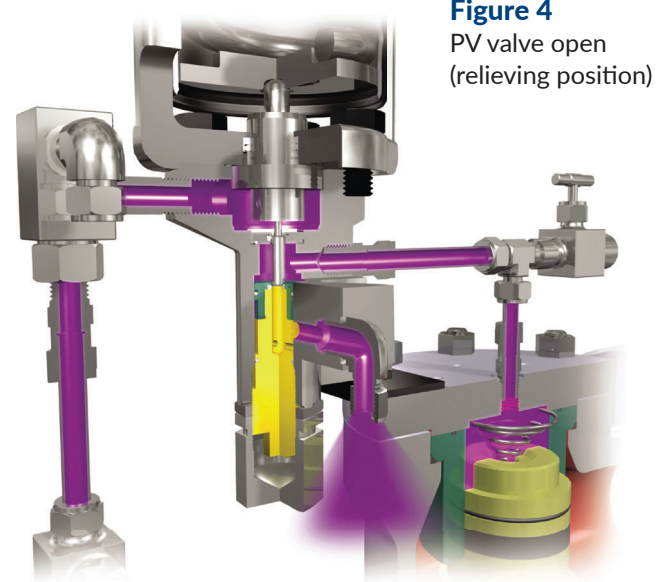
The modulating pilot operation is very similar to the pop pilot operation with the added ability to hold a percentage of system pressure above the main valve disc, producing a modulating action. Increasing the system pressure results in reduced closing force due to venting through the pilot valve. Pressure relief begins at a designated set point as process media is discharged through the main valve. However, the actual lift of the main valve disc is based on the specific system overpressure condition instead of “popping” instantaneously to the 100 percent open position. This “modulating” action results in improved operating efficiencies through reduced media loss and lower emissions.

Figure 6 illustrates how system pressure from the main valve inlet is fed to the dome area by the pilot through interconnected tubing. This equalizes the pressure on the top of the disc with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the disc is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.

Figure 7 shows that, as inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to the bottom of the modulator piston. The modulator piston has a differen-



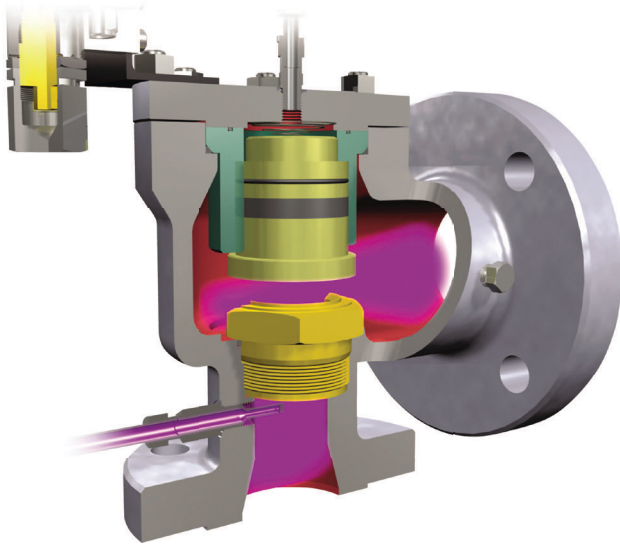
**Figure 3**  
Main valve closed  
(normal position)



**Figure 4**  
PV valve open  
(relieving position)

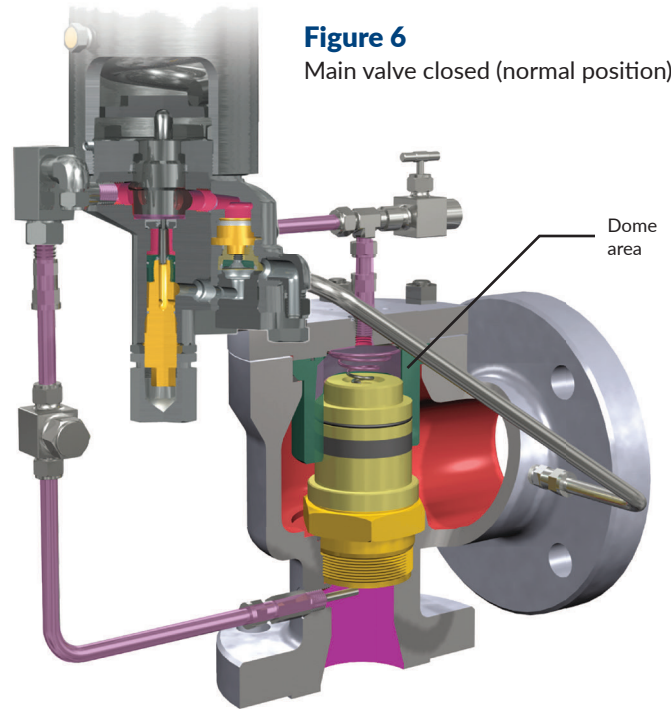
**Figure 5**

Discharge through main valve



**Figure 6**

Main valve closed (normal position)



tial area with the smaller area being on top. The top of this piston is always subjected to the main valve inlet pressure. When the dome pressure is applied to the bottom of the modulator piston, there is a net upward force. This is due to both pressures being equal (at this point), and the lower area is larger than the upper area. The modulator relieves pressure from the dome to the atmosphere until force from the inlet pressure on top of the modulator piston is sufficient to move it to the closed position. A certain amount of pressure remains in the dome. This pressure is controlled

***There are some advantages of a pilot-operated SRV over a spring-loaded SRV but there are also limitations.***

by the differential area in the modulator. Since the dome pressure has not been dropped to atmospheric pressure, the main valve only partially opens at the set point. The modulator piston will remain closed until the main valve disc is forced into higher lift by increasing inlet pressure.

As this occurs, the modulator piston may relieve further pressure from the dome as necessary to achieve the required main disc lift within 10% overpressure.

As the inlet pressure increases further, the net upward force on the main valve increases, allowing the main valve to relieve more pressure. The disc obtains full lift (full capacity) within 10% of set pressure. (See Figure 8.)

When the discharging valve reduces the inlet pressure to the preset blowdown pressure of the pilot, the pilot

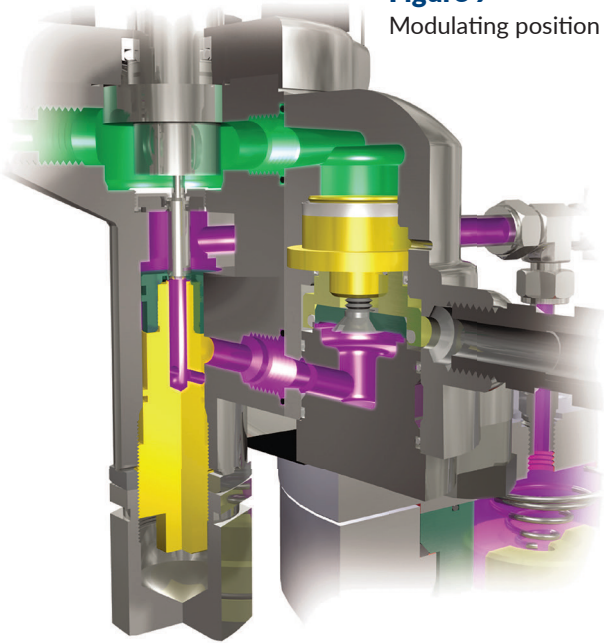
piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve disc. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the disc closes the main valve.

### Advantages of a Pilot-Operated SRV over a Spring-Loaded SRV

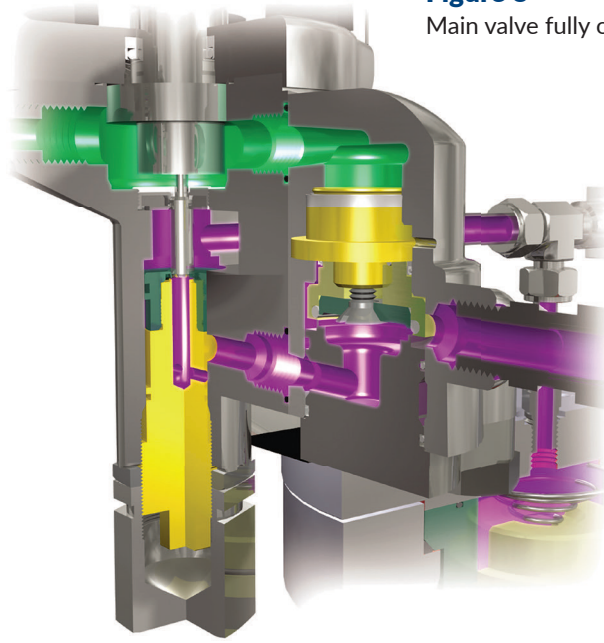
There are many advantages of a pilot-operated SRV over a spring-loaded SRV. Here are a few worth noting:

- Pilot-operated SRVs can achieve seat tightness up to 98% of set pressure for both the main valve and the pilot valve. This ensures zero leakage during normal operating conditions for even the most demanding high-pressure applications. Pilot-operated SRVs' greater seating force make them the ideal solution for higher operating pressure gaps as compared to spring-loaded SRVs. Operating closer to maximum allowable working pressure (MAWP) helps to keep the system running optimally.
- Full-bore pilot-operated SRVs offer much greater capacity compared to standard bore with comparable valve size. This unique offering allows operators to save on valve costs and associated piping investment thanks to reduced piping diameters.
- A modulating action pilot-operated SRV will allow flow for the required capacity of an overpressure event rather than the rated capacity of the valve. This allows users to take advantage of using the system-required flow rate in their line loss calculations rather than the valve-rated flow, thus reducing inlet line losses.
- The field test connection allows operators to function-

**Figure 7**  
Modulating position



**Figure 8**  
Main valve fully open



ally test their pilot-operated SRV while the pilot-operated SRV remains in service and continuously protects the system from an unexpected overpressure event.

- The dual pilot option allows users to reduce unplanned outage downtime servicing or replacing one off-line pilot while the other continues protecting their system. This allows service technicians to perform service and repair on a planned schedule.
- The unique design of a pilot-operated SRV connects it to the main valve through interconnected tubing, making it possible to mount different accessories. This includes manual blowdown valves, filters, backflow preventers, pressure differential switches, pilot valve testers, remote pilot mounting, dome assist pilots and others.

### Limitations of a Pilot-Operated SRV over a Spring-Loaded SRV

As we've seen, there are some advantages of a pilot-operated SRV over a spring-loaded SRV, but there are also some limitations to consider. Depending on the severity of the dirty service, different types of filters with varying capacities can be installed, and a dome assist option can be installed to isolate the dirty process media from crucial valve components such as the modulator, dome assembly, vent and inlet seals. However, for severe dirty service where clogging of the interconnecting tubing is possible, a pilot-operated SRV might not be the best fit.

A pilot-operated SRV operates by allowing time for system pressure from the main valve inlet to fill the dome area through interconnecting tubing. During plant start-up, when the system pressure has an extremely rapid

ramp rate, the dome area may not equalize with the same inlet pressure, resulting in insufficient closing force. Consequently, the system pressure from the main valve inlet will push the main valve disc to lift and start to leak. A spring or alternative pressure can be added in the main valve dome area to close the main valve disc while allowing time for system pressure to ramp. If these remedies are not feasible or economical, a spring-loaded SRV will be the better option in excessive pressure ramp rate applications.

### Common Industries and Applications

Pilot-operated SRVs are found in many industries just like spring-loaded SRVs. Common industries using these valves include power generation, refining/petrochemical, chemical, midstream oil and gas, upstream oil and gas and pulp and paper. Some unique applications for pilot-operated SRVs include high-pressure applications, reducing emissions in high operating pressure applications, offshore drilling, and production platforms in deep well applications, and any air/gas, liquid, steam, 2-phase, or multisequence applications.

In the next issue, look for the third article in this series on pressure relief valve basics: safety valves. ❏



#### ABOUT THE AUTHOR

Wai Loon Cheong is the valves training leader for Baker Hughes. He has more than 20 years experience, and has worked in a variety of roles at the company.

## GATE VALVES

# Which Gate Valve is Best for Today's Waterworks Systems?

A historical perspective may provide the answer.

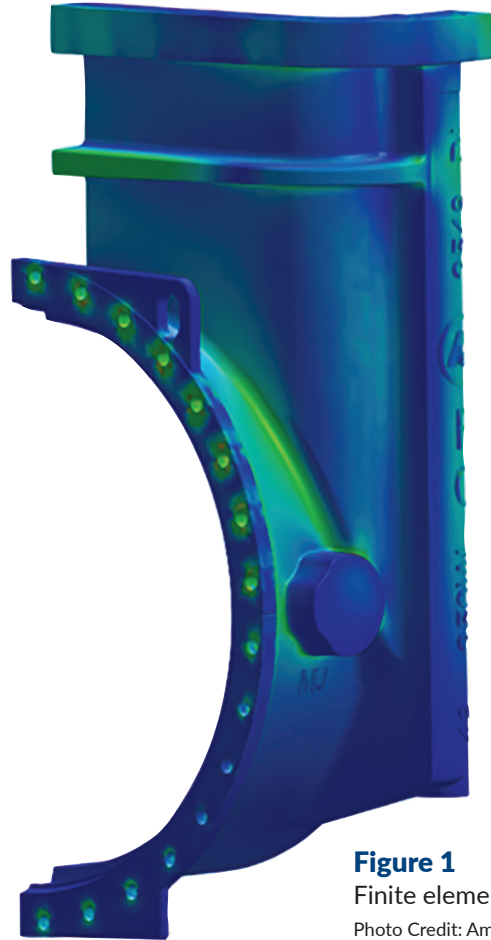
BY: DEREK B. SCOTT *Marketing And Technical Manager*

JOHN R. HELF *Product Engineer*

COMPANY: AMERICAN FLOW CONTROL

The gate valve is the most common valve used in a waterworks utility system. Gray cast iron metal-seated gate valves have been produced since the 1800s. They are governed by the ANSI/AWWA C500 standard titled *Metal-Seated Gate Valves for Water Supply Service*. The standard was developed in 1913 but did not receive the C500 designation until 1953. In 1980, as rubber molding and coating technologies advanced, the waterworks industry introduced the ANSI/AWWA C509 *Resilient-Seated Gate Valves for Water Supply Service* standard.

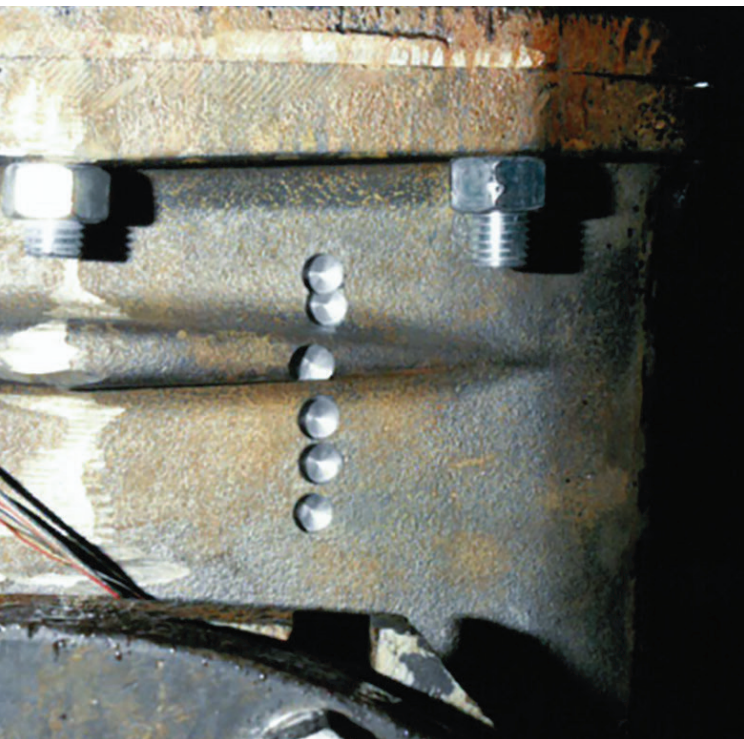
The C509 standard, unlike C500, has no allowance for leakage. It also requires more corrosion-resistant coatings. Responding to trends that saw the industry's migration from cast iron to ductile iron pipe and fittings, field trials were conducted on a reduced wall, ductile iron gate valve beginning in 1985. This advancement resulted in a new standard for resilient-seated gate valves being published in 1999. The standard was designated ANSI/AWWA C515 *Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service*. The standard leveraged the strength and durability of ductile iron by reducing the wall thickness of the valve. Today, most utilities specify C515 gate valves. Occasionally, however, specifications are published requiring C500 or C509 compliance even when the utility is using C515-compliant valves. These outdated specifications, or erro-



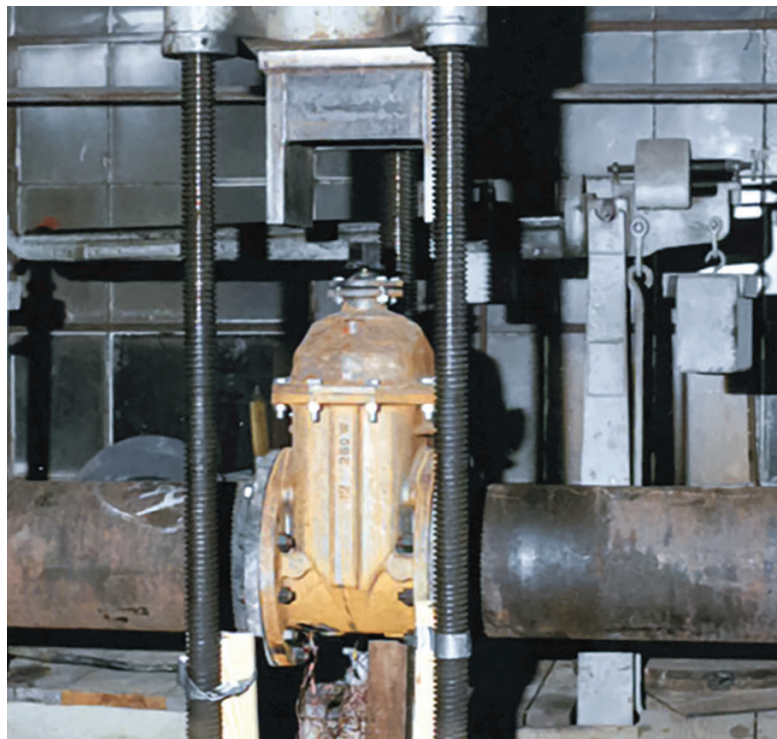
**Figure 1**  
Finite element analysis (FEA)  
Photo Credit: American Flow Control

neous references to older standards, result in confusion regarding which gate valves should be used. More problematic are specifications that require contradictory criteria from multiple standards, which can require a valve that may not exist. These problematic situations result in unintended interpretations of the requirements. To understand the source of the confusion, one must first look at how the standards have evolved and why.

The minimum wall thicknesses required in the C500 standard were largely based on industry experience, valve application and the standard gray iron casting methods used at the time. These limitations resulted in the published wall thicknesses being somewhat arbitrary. Also common to these valves is an allowable leakage that worsens with time, as well as higher operating torques that result from significant friction across the metal seats. The resilient-seated gate valve addresses these primary issues with a one-piece rubber-encapsulated wedge that is leak-tight and that allows for lower operating torques. Originating in Europe, the resilient-seated design was received with widespread acceptance and in 1980 resulted in the development of the C509 standard. The wall thicknesses published in the standard were carried over from the C500 standard, making the C509 wall thicknesses arbitrary as well.



**Figure 2** Simulated corrosion of the valve castings



**Figure 3** Beam load tests

After the introduction of the resilient-seated gate valve, the industry migration from gray cast iron to ductile cast iron continued in the development of the C515 standard. A comparison of these standards reveals only a few differences; they are virtually identical. Unlike C509, the newer C515 standard requires the use of ductile iron for the body and bonnet components. Because of the increased strength and elasticity of ductile iron, the allowable minimum wall thickness requirements are reduced, and the pressure rating has been increased. Different from the arbitrary wall thicknesses in C500 and C509, the wall thicknesses published in C515 were developed using finite element analysis (FEA), along with applied validation testing. Since being published, there has been a significant shift in demand toward ductile iron waterworks valves produced to the C515 standard. Another significant difference in the standard is an allowable 12.5% reduction in wall thickness accounting for casting deficiencies called out in the C500 and C509 standards. This reduction is not allowed in C515. A comparison of the allowable C500, C509 and C515 wall thicknesses appears in Table 1 and shows the differences to be very minimal. Table 1 thicknesses account for allowable tolerances.

After the ANSI/AWWA C515 standard was published in 1999, there were occasional questions about the potential effects of corrosion related to reduced wall thickness. Of particular concern was how material loss, if any, might impact the strength of a valve while under pressure. Companies must address this during the validation of

**Table 1:** Corrected Valve and Wall Thickness Comparison.

Size	Minimum Wall Thickness Adjusted for Allowable Minus Tolerances		
	AWWA C500 (inches)	AWWA C509* (inches)	AWWA C515 (inches)
4		0.35	0.31
6		0.38	0.32
8		0.44	0.34
10		0.55	0.36
12		0.60	0.38
14		0.66	0.45
16		0.74	0.50
18		0.82	0.56
20		0.85	0.56
24		0.95	0.62
30		1.22	1.06
36		1.35	1.31
42		1.38	1.42
48		1.51	1.44
54		1.93	1.44
60		2.14	1.68
66		2.35	1.88
72		2.56	1.94

**Table 2**  
Pressure-Related Fracture Due to Simulated Corrosion

Gate Valve Type	12-inch Gray Iron Valve	12-inch Ductile Iron Valve
Rated working pressure	200 psig	250 psig
Undrilled casting wall thickness (avg.)	0.70 inch	0.44 inch
Drilled casting wall thickness (avg.)	0.45 inch	0.19 inch
Pressure at failure	850 psig	1,200 psig
Method of failure	Fracture along drilled spots	Blown bonnet gasket

reduced wall designs with coatings. Of note, both C509 and C515 valve castings are typically coated with a fusion-bonded epoxy coating prior to assembly. This coating insulates the individual valve components and protects them against corrosion. Metal-seated C500 valves, upon which C509 wall thicknesses were based, were not coated in epoxy.

Experiments were conducted on the gray iron C509 valve and on a ductile iron C515 valve to determine what effect the reduced wall might have. To simulate advanced corrosion, several ½-inch diameter spots were drilled ¼-inch deep into known high-stress concentration areas, as determined using FEA (Figures 1 and 2). Gray iron and ductile iron are

known to exhibit similar corrosion properties. The drilled spots simulated worst-case scenarios of compromised wall thicknesses. Both valve models were pressurized until failure. The test was then repeated, and the results were tabulated in Table 2. Performance equal to, or better than, the C509 gray was considered validation of the C515 design.

Even with the castings heavily compromised to simulate corrosion, both

valves failed well above their rated pressure. The C509 bonnet failed at approximately 850 psig by cracking along a row of drilled locations near the flange. The ductile iron C515 valve did not fracture despite the wall thickness being less than half of the C509 valve.

Due to a temporary yielding of the bonnet, the gasket lost pressure at approximately 1,200 psig. This flexing is due to ductile iron’s ability to yield. During the test, the C515 castings experienced no permanent deformation.

***The evolution of these standards and the results of these simple but important validations dispel any notion that thicker is always better.***

The results of the test validate the wall thicknesses published in the C515 standard and demonstrate performance superior to that of the older gray iron design.

A test comparing the beam load strength of the valves was also conducted. Unrelated to corrosion, beam loads can develop from settling structures and soil, or pipe misalignment. In the test, a vertical load was applied to the top of a valve assembled between two ductile iron pipes and placed under pressure. The lower flange of the gray iron C509 valve failed at 78,000 pounds with a vertical displacement of less than an inch. The ductile iron C515 valve did not fail, despite 135,000 pounds of vertical load and approximately 2 inches of displacement. Instead, the piping system failed at the threaded flange location.

The evolution of these standards and the results of these simple but important validations dispel any notion that thicker is always better. Specifications are a critical component to the design of any project. Whatever valve is desired, it is important the specifier be aware of the latest technologies available and stay up to date on product development. The name behind the product is also an important consideration in valve selection. Following these practices will always be in the best interest of the engineer, owner and end user. ❗

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**Derek B. Scott** is the marketing and technical manager for American Flow Control. He holds a B.S. in mechanical engineering from the University of New Orleans and has nearly 40 years of experience in the water and wastewater industries. He is currently responsible for the division’s product engineering and marketing functions, and represents the company on several standards committees, including AWWA, MSS, ASCE, NSF and AWWA, and is chair of the ANSI/AWWA C515 Committee on Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.



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## AN INTERVIEW WITH...

# Andy Duffy



Duffy provides some insights into what opportunities and challenges he sees ahead for the valve industry, as well as the importance of elevating the industry's visibility. He succeeds Matt Thiel, who remains on the VMA Executive Committee, as VMA Chairman of the Board.

**Valve Magazine** Can you give us a little background on your education and how you became involved in the industry?

**Andy Duffy** My undergraduate degree is in Mechanical Engineering from Villanova (way back in 1983). I had a short stint in the printing industry and then instrumentation before joining ASCO, an Emerson company, in 1986. In 1988, I earned my MBA at Seton Hall. I was drawn to ASCO by the international opportunities. I was in the international department and then moved with my young family in tow to Australia as commercial director for that operation. In 1997, we moved to Singapore, where I ended up as GM for our fledgling operations in Asia.

My first experience with the North American valve industry began in 2002 when we moved back to headquarters in Florham Park, New Jersey. Marketing was my first role there, but by 2005, my position shifted to sales where I have been ever since. The valve industry is probably one of the most important for everyday life but least seen and understood by anyone outside of it.

**VM** Why did you want to get more involved with the VMA?

**AD** With all of my focus early in my career overseas, the VMA offered a great way to get immersed in the North American market and start building a network of peers and ultimately, great friends.

**VM** What do you see as the greatest opportunities in the industry? What about challenges?

**AD** The shift in focus around all process industries to sustainability and efficiency makes our industry and products that much more relevant today. We control so many different processes that we have to stay ahead of the trends and regulations. We have huge potential, if in addition to the basic control of the process, we can harness the data stored in our installed base and turn that into actionable insight for our customers. By doing that, we should be able to help them achieve their goals on sustainability and better efficiency.

Our challenges revolve around the ever-changing and broad regulatory environment. Companies not only have to deal with various government and legal requirements from the U.S. but also across the globe. We can take the lead as an industry group to influence and drive the regulations to make the world a better place.

In addition to regulations, our own industry's profile is largely unseen, yet vital to our lives. It is challenging to attract young talent, so we need to make the industry more visible and attractive to a broader group to ensure that we can continue to drive innovation.

**VM** Did the pandemic or other recent economic or global events bring on any shifts or changes to the industry you think may stay?

**AD** Probably the biggest change is a shift to some sort of hybrid work environment and with that, the diminished travel and face-to-face interaction with our customers and end users. We need to find better ways to communicate and stay in touch with our customers not only for current day-to-day things but to keep a pulse on forward trends to help with innovation.

**VM** How do you see VMA's role in advancing the valve industry?

**AD** Over the past few years, the board has worked to refresh our approach and provide more value to our members. We updated our strategic vision and focused on areas where we could come together and impact issues that were important to membership. The best and most recent example is our government affairs program. The continuing evolution of regulations around PFAS chemicals creates significant challenges for many of our member companies. Our group has really come together with technical resources to put together very critical position papers that have been presented to various government offices over several joint visits to Washington. In addition, the VMA staff leadership has worked with other industry associations to coordinate efforts and amplify the message.

**VM Any other pressing issues in the valve industry?**

**AD** I think that in addition to regulations like those above, the current geopolitical environment presents small- to medium-sized companies with a very difficult compliance picture. We can help as an industry group to educate and point them in the right direction.

And we've already talked about attracting good, diverse talent. By making the industry more visible, we can help our membership recruit and retain a growing workforce.

**VM How do you hope to focus your efforts as a leader of VMA?**

**AD** The work of the past several boards has moved us forward and positioned the association to be relevant and valuable to our members. We will keep on that track but also increase our efforts to recruit and retain our membership. We need to find a way to attract all of the relevant companies to join us and add to the voices driving the programs mentioned above.

**VM What advice would you give to someone joining VMA?**

**AD** Get involved! We have many committees in addition to what we have already covered, technical and education, to name some. The association is only as good as the members make it and that takes getting involved.

**VM On a more personal note, your challenging job must keep you busy. What do you do when you're not wearing your business hat?**

**AD** My wife Holly and I love to travel and experience new places and food. Cooking and wine are high on the list. Lately, that has included many trips between our two grandsons, one in Boston and one right near VMA headquarters in Alexandria. Being in New Jersey puts us halfway between the two!

Outside of that, we love to spend time on Cape Cod where I can golf and Holly can spend time on the beach. We always meet up at the beach bar to figure out what we are going to do for dinner.

**VM What advice would you have for those entering the valve industry — either as a recent graduate or a mid-career professional?**

**AD** The valve industry is one of the most diverse areas where you can work. We touch so many aspects of daily life that it truly represents a great way to get to touch so many different industries and see some much new technology and opportunity. There is never a dull moment when someone comes in and asks you about a new application. It's also not just technical, there are opportunities for all different backgrounds whether your interests are in marketing, sales, operations and even finance. 🚀

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# VALVE Basics

## New Valve Modifications

By: GREG JOHNSON, *President*  
COMPANY: UNITED VALVE

Valve modification can be defined as: adding value to standard or “commodity” valves by installing actuators, special trims, different end-connections, packing and gaskets and other accessories or upgrades not provided on the original product. These modifications are primarily for gate, globe, check and ball valves.

Back in the days of black and white television and cars with tailfins, end users usually had a storehouse full of valves commonly used in their plants. This was ideal for both the valve OEM and the distributor: everything was ordered in advance and the need for expedited-delivery, special valves was a random occurrence. However, belt-tightening measures by those end users lowered their inventories. Combined with the refinery and petrochemical construction boom of the 1970s, this created a situation where the supply capability of domestic manufacturers was exceeded for commodity and particularly for specialized valves.

### MODIFICATION BECOMES POPULAR

Up until this time, modification of new valves by third-party shops was only tacitly approved by a few OEMs. However, they soon began to see the advantages of authorizing quality valve service facilities to perform alterations on their products. With an official authorization program, the OEM could retain oversight of the after-market work performed on their products, plus reduce the number of bogus operations performed on their valves.

This led to a system whereby individual manufacturers audited the facilities performing the modification work and only authorized those companies with the capabilities and quality systems to perform the work correctly.

Today, the OEM authorization system for gate, globe, check and ball valve modification is very strong, and widely used and accepted by OEMs, distributors and end users. However, modification of pressure relief valves almost exclusively consists of OEM parts replacement by an OEM and a national board-certified facility. The modi-



fication of control valves is usually handled by an OEM's own service centers.

### MSS MODIFICATION STANDARDS

The Manufacturers Standardization Society (MSS) has accomplished a valuable service for the new valve modification industry by creating a series of standard practices detailing how many popular valve modifications should be performed. The first MSS valve modification document, MSS SP-141, Multi-turn and Check Valve Modifications, was published in 2011. Here is the scope of that document:

**1.1** This Standard Practice establishes minimum requirements for the modification of new gate, globe and check valves, which have been manufactured in accordance with recognized national standards and require modification to meet specific end-user requirements.

**1.2** The purpose of this Standard Practice is to ensure that the quality of workmanship and materials meet all applicable standards and codes.

SP-141 contains basic instructions, welding criteria and non-destructive testing requirements for many modifications, including trim changes, changing ends from raised-face to butt-weld ends, packing and gasket replacement, bypass installation and NACE International, MR01-03 compliance. The document also calls for OEM parts to be used if readily available.

The following is verbiage from one of the nondestructive evaluation procedures contained in SP-141: dye penetrant (PT) examination.

**10.2** Dye penetrant examination of valve body and bonnet

**10.2.1** Scope—The procedure details the requirements for dye penetrant (PT) examination of bodies and bonnets of assembled valves, as per MSS SP-93 or ASME (American Society of Mechanical Engineers) B16.34. This procedure requires the replacement of the original packing and gasket.

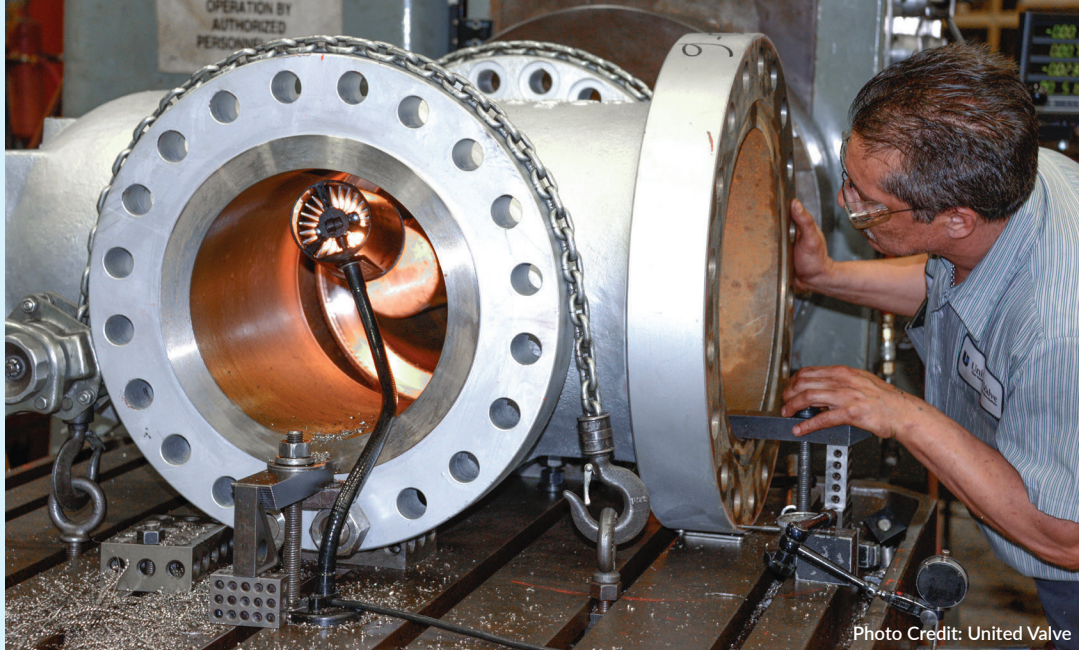


Photo Credit: United Valve

**10.2.2** Valves shall be disassembled in accordance with Sections 4.1 and 4.2.

**10.2.3** All paint is removed from valve body and bonnet, either by abrasive means (grit or shot blast) or with chemical paint stripper.

**10.2.4** All exterior areas as well as accessible interior areas of the body and bonnet are to be examined.

**10.2.5** PT inspection is to be performed by personnel certified to Level II, in accordance with ASNT (American Society For Nondestructive Testing) SNT-TC-1A. Level I personnel may perform the inspection under the guidance of an onsite Level II inspector.

**10.2.6** PT inspection shall follow the guidelines of MSS SP-93 or ASME B16.34, Appendix III. Acceptance criteria shall be in accordance with the respective test specification.

While the MSS standards are helpful, it is important to remember that this is new valve modification, which means that the original design standards must be maintained unless superseded by an owner/end user's specific request for variance. When performing modification work, it is imperative that an inventory of current valve design standards, such as ASME B16.34, American Petroleum Institute (API) 600 or API 594 be maintained. Additionally, a modifier is responsible for any necessary design calculations, such as those needed for substituting a stronger stem material for a weaker material (e.g., 410ss to 316ss). Bonnet extensions for cryogenic applications or extension tubes for buried pipeline service also require competent design work.

## OEM SUPPORT IS VITAL

Modification shops are a valuable source of valve quality feedback to the OEM. On the floor of a typical shop, thousands of valves are tested and inspected each year.

These secondary inspections can provide valuable data to the OEM if nonconformances are found.

The valve shop also serves as a second "final inspection point" for OEM products. Defects have been discovered by modification facilities that could have had dire consequences for the manufacturer had they failed in service.

## THE WARRANTY

Although some manufacturers have set up service centers to repair and modify their products, the majority of valve modification work is still performed by independent valve modification shops. These independent shops usually have an edge in service and order turnaround because they are not encumbered by a large OEM bureaucracy that rightly prefers mass production of new valves over specialized valves.

Valve modification facilities provide an important service to end users, distributors and OEMs. The OEM benefits by being able to concentrate on high production items, rather than late-ordered specials that often slow assembly lines down. The distributor benefits by spending less money stocking slow-moving special valves. The end user benefits by receiving critical, special valves on time and at a reasonable price, which lowers total cost of ownership. 📌

## ABOUT THE AUTHOR

**Greg Johnson** is president of United Valve. He is a member of the Valve Editorial Advisory Board, a founding member of the VMA Education and Training Committee and past president of MSS.



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# LATEST LAUNCHES



## Multivoltage Electric Actuator Launched

American actuator manufacturer, Indelac Controls Inc., released its ProVolt (PV) Series multiple voltage quarter-turn rotary electric actuator. The new actuator series offers the flexibility of universal voltage and optional battery backup feature. The ProVolt Series is UL Listed, built in a NEMA 4/4X/7 enclosure and allows users the capability of operating on any one of five voltage inputs with the flip of an internal switch. Input voltages include: 115vac, 230vac, 24vac, 24vdc or 12vdc.

Available with four torque output options from 400 in.-lbs. though 1500 in.-lbs., ProVolt actuators can be ordered as a standard open/close actuator or with modulating control options for precise valve and damper position control using 4-20mA, 0-10V or 1-5V external input signal. When equipped with the optional integrated battery backup, the ProVolt can be configured in the field to fail open (CCW) or fail close (CW) if power is lost, switching to battery power without operator intervention. [indelac.com](http://indelac.com)



## Cryogenic Valve Designed to Help Control Fugitive Emissions

Flowserve Corporation launched the Worcester cryogenic series of reduced-port, quarter-turn floating ball valves for liquefied natural gas (LNG), hydrogen and other

industrial gas and cryogenic applications.

Available in three-piece (CF44 series) and flanged (CF51/CF52 series) configurations, Worcester cryogenic valves feature a high-strength stem and provide exceptional fugitive emissions control from an improved live-loaded stem seal. They also incorporate a modular bolted bonnet design, which provides customers with cost-effective flexibility and enables them to reduce spare parts inventories. Total cost of ownership (TCO) is reduced as a result.

The redesigned bonnet configuration offers stem sealing for fugitive emissions compliance throughout the thermal ranges. Live loading ensures a long service life and continued compliance. The high-strength stem improves reliability, extends service life, and provides for increased maximum allowable stem torque (MAST) while complying with API 608 and ISO 17292.

The modular bolted design also simplifies maintenance compared to the previous conventional welded design. Customers also benefit from worldwide availability and competitive lead times now possible because Flowserve standardized the Worcester Cryogenic valve design, materials and construction. [flowserve.com](http://flowserve.com)



## New Steam Trap Monitoring Solution

IMI Critical Engineering has launched a steam trap monitoring solution to reduce losses and excess downtime in industrial applications

resulting from blocked or leaking steam traps.

The STM-10 steam trap monitoring solution comprises wireless compact sensors monitoring critical process conditions and software, which uses data from the sensors and smart algorithms to instantly confirm whether a steam trap is blocked or leaking.

The smart algorithms used within the STM-10 have been developed with IMI Critical Engineering's extensive experience in steam process and control.

Combined with proactive maintenance schedules, the STM-10 cuts energy costs and CO<sub>2</sub> emissions while reducing the risk of wet steam erosion damage.

The solution's compact design is easily installed to exposed pipes on either side of the steam trap. The associated asset monitoring cloud-based dashboard gives operators and maintenance staff the ability to instantly diagnose steam trap failures, allowing corrective actions to be initiated before problems begin to harm production yields.

It uses wireless long-range communications and thermal energy harvesting, making it a self-contained solution that can be installed by any member of the plant maintenance team. [imi-critical.com](http://imi-critical.com)



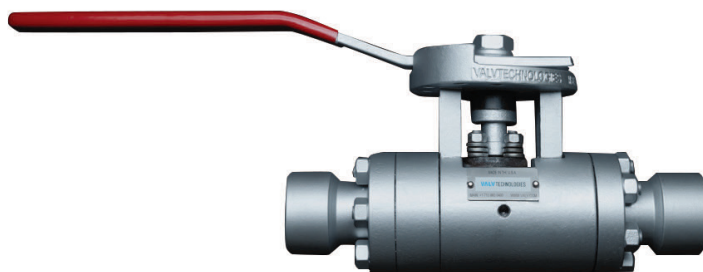
## Explosion-Proof Quarter Turn Actuators

The ProMation Engineering explosion-proof actuators are designed for use in hazardous locations and meet Class I and Class II Division 1 standards per UL 1203. The explosion-proof actuators share the same electronic and mechanical components as the ProMation standard location products.

The ProMation explosion proof actuators feature: a standard raised indicator allowing easy identification of actuator position; an anti-condensation heater; two auxiliary switches; ISO 5211 mounting; permanently lubricated locking gear train and a clutchless, manual handwheel. In addition to on/off control, they can have proportional control with 4–20 mA, 0–10, 2–10, and 1–5vdc input and feedback.

The actuators range in torque from 300 to 13,250 in./lbs and are available in 24vac, 24vdc, 120vac, and 230vac voltages. The output gearing and mounting patterns are the same as the standard product and therefore, fully compatible with valve, damper couplers and linkages that are used for nearly any industrial application. [promationei.com](http://promationei.com)

## New Four-Piece Assembly Valve



The V1-R metal-seated ball valve, an addition to the V Series from ValvTechnologies, provides customers a lower cost of ownership overall by making it easy to service and maintain by the customer. The new V1-R boasts a four-piece assembly design that simplifies removal, keeping end connections in line, allowing for maintenance without cutting or welding.

The new V1-R design includes integral seat, the company's patented RiTech hard coating, blowout-proof stem and live-loaded packing. The design and construction provides an extra safety margin crucial to maintaining productivity, giving customers increased security, less downtime and lower maintenance, and it's backed by the company's zero-leakage guarantee. [Valv.com](http://Valv.com)



## Did You Know...

- 1 It's been **a century** since MSS began developing standards for the valve and fittings industry!
- 2 Nearly **100 standards** are currently available from U.S. and global distributors.
- 3 All SPs are available in both **electronic** and **book format**.
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- 📄 **Revised SP-154-2023, Low Pressure Knife Gate Valves for Double Block and Bleed**

Click here for a complete list of MSS Standards or go to [MSSHQ.org/ActiveStandards](http://MSSHQ.org/ActiveStandards).

#### WHO WE ARE

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- 14 Emerson Automation Solutions**  
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- Inside Front Cover  
**Indelac Controls, Inc.**  
indelac.com
- 39 Manufacturers Standardization Society**  
msshq.com
- 1 Powell Valves**  
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- 15 United Valve**  
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- 19, 31 Valve Manufacturers Association**  
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**INDUSTRY**  
**PROFILE**

**Greg Johnson**



*The valve industry, like any other, is made up of a collection of individuals from different walks of life and experiences. Industrial valves have been around for thousands of years but are still a product that the overwhelming majority of people do not consider in their daily lives. At Valve, we decided to share stories from our readers and contributors about who they are, what draws them to their work in the industry, and what advice they may have for others who want to explore a career in valves themselves.*

If you've ever been to a VMA event or participated in other organizations including the American Petroleum Institute, Manufacturers Standardization Society, or even the International Standards Organization, you may have met Greg Johnson — a member of the valve world professionally since 1978, when he joined the business his father had started in 1961, United Valve. And while he's been active in this industry for more than 40 years, we don't see him slowing down any time soon.

When he was planning for his career, Greg wasn't interested in the family business, so he pursued a career in journalism and photojournalism. After a number of years, Greg eventually made his way to United Valve in 1978, and returned to school to study engineering in 1985. Once he was in the industry, he continued his constant search for knowledge and began to get involved in industry associations and organizations such as VMA and MSS. In fact, Greg has been a member of the API and the MSS for 30 years, which is how he says he stays abreast of changes in technology and across the valve industry. He's also a member of the Valve Editorial Advisory Board.

When it comes to emerging trends and technologies, Greg sees a couple of things on the horizon. "One of the biggest challenges for valve manufacturers and end users today is to deal with and respond to the fast-moving changes in the industry and the shift to alternative energy sources." Among these emerging trends, he's particularly excited about more uses of hydrogen as a fuel source, as well as carbon capture and sequestration. He is a part of a number of industry standards committees right now working on updates for hydrogen service.

With his background, Greg wanted to find a way to use his unique perspective and skills to give back, which is how we got more involved with the VMA. As part of the editorial advisory board, Greg regularly reviews technical content and is the first phone call or email if our editors have a technical question or want to verify or validate information. He's been instrumental in helping update and revise the Valve Basics content both for the magazine and for in-person and online training sessions, updating decades-old content and creating new content for the program regularly.

When asked what advice he'd give to someone new to the valve industry, Greg says: "Find a specific segment or the industry or niche area and learn all you can about that one segment first." Greg also says that the biggest piece of advice he got that stuck with him was this: "Do things the right way. Your reputation will always stay with you."

In his spare time, Greg finds lots of ways to keep busy. Currently, he is working to finalize a passion project that he's been tackling for several years. "I've been working on my history of the U.S. valve industry book for several years, and I'm down to the last 2-3 chapters." He's also a musician. "I've been a musician for decades, playing drums and harmonica. I'm also a model railroader and my wife and I love to travel!" 📍

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## Relevant

TP-410 contents include information on valves, pipes, pumps, fittings, critical elements of fluid handling, flow meters, control components and a chapter titled, "Sensible Heat Transfer".



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