

WHAT'S IN STORE FOR VMA IN 2021

VALVE

MAGAZINE | WINTER 2021
VOL. 33, NO. 1

The Booming Biopharmaceutical Market



• THE NUCLEAR
• POWER
• INDUSTRY
•

• KNOWLEDGE
• TRANSFER
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1950-2020

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The Strong and Growing Biopharmaceutical Market

The race to develop and distribute COVID-19 vaccinations has led to expanded business for companies that serve this niche market. Take a look inside this work—and other opportunities—within the biopharmaceutical industry.

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With five generations in today's workforce, it's more important than ever to ensure transfer of knowledge among employees. Discover three techniques to facilitate intergenerational learning.

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ISOLATION VALVES FOR HIGH-SOLIDS SEVERE SERVICE

Slurries with large concentrations of suspended solid particles can create challenges for piping systems and valves. Understanding slurries is imperative to proper valve selection and design.

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- » Triple Offset Valves
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VALVE Magazine (ISSN No. 1057-2813) is the official magazine of the Valve Manufacturers Association of America (VMA) and is published quarterly by VMA, located at 1625 K Street NW, Suite 325, Washington, DC 20006; 202.331.8105; Fax: 202.296.0378.

Advertising queries: 540.374.9100. Periodicals postage paid at Washington, DC, and at additional mailing offices.

POSTMASTER: Send address changes to **VALVE Magazine**, P.O. Box 1673 Williamsport, PA 17703-1673. Subscriptions are free to qualified readers in the United States and Canada; \$40 per year to unqualified readers in the United States and Canada; \$60 per year for all subscribers outside the United States and Canada.

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VMA VALVE MANUFACTURERS ASSOCIATION OF AMERICA
The voice of the flow control industry

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A Strong Industry Forges Ahead



Finally, one of the most difficult and challenging years in memory, 2020, is behind us. If only the start of this new year came with a reset button so all the problems and issues facing society, our country, our companies and each of us individually would magically disappear! Of course, that's not a likely scenario. Instead, we forge ahead, working toward a brighter future and knowing the essential valve industry is on the ready to provide solutions to many of the challenges we face.

On page 14, read about how the valve industry has played a key role to ensure the eagerly anticipated SARS-CoV-2 vaccine could be manufactured as quickly and safely as possible, moving the world one step closer to stopping the health pandemic.

On page 18, learn about how the valve industry has played a key role to ensure the eagerly anticipated SARS-CoV-2 vaccine could be manufactured as quickly and safely as possible, moving the world one step closer to stopping the health pandemic.

Creating more clean energy is more important than ever. On page 18, learn about nuclear energy's role helping to reduce overall carbon dioxide emissions, as well as gain an understanding of the nuclear industry's interesting history. Highly engineered valves and actuators, of course, have always been critical for the safe functioning of nuclear power generation.

Regardless of the industry, understanding what type of product to specify in important applications is key to meeting customer needs. You'll find two articles to help keep you up to speed on industry standards, one on severe service applications and another related to the water and wastewater market.

Another topic on everyone's minds is the loss of experienced employees to retirement. With that comes the growing need to step up the transfer of knowledge. An expert on the subject describes steps your company can take to keep the knowledge flowing among the various generations.

Lastly, don't miss the latest updates on what VMA is doing to help our members and industry. I hope you enjoy this issue, and I wish all our readers a happy, healthy and prosperous new year!

Heather
Heather Rhoderick, CAE
President



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NEW CONTRACTS

Emerson Selected to Modernize TVA Power Plant

The Tennessee Valley Authority (TVA) has selected Emerson to modernize and optimize its Magnolia power plant that delivers reliable, cleaner electricity to customers. The Magnolia project is part of TVA's five-year, \$110 million investment to install digital technologies across its power generating fleet.

The 980-megawatt Magnolia plant, in operation since 2003, uses combined cycle technology, generating up to 50% more electricity from natural gas while producing less emissions than other sources.

Emerson and TVA are using virtual technologies in place of face-to-face inter-



Emerson Selected to Modernize TVA Power Plant

action to keep the project moving forward during the COVID-19 pandemic.

Neles Adds Eight New Channel Partners in the Americas

Neles signed seven new distributor agreements and one agent agreement in South and Central America during the last three quarters of 2020. The new partners serve process industries, such as refineries, petrochemical, chemical, fertilizer, steel, bioenergy, food, power, pulp and paper,

water and wastewater. Some of them also provide service support for Neles valves and valve controls.

Mueller Awarded Contract for AMI Deployment in California City

Mueller Water Products announced the city of Newport Beach, CA, has selected Mueller to deploy 26,500 advanced metering infrastructure (AMI) water meters. The project will include the replacement or retrofitting of all current city water meters with the

Mi.Net AMI system.

The Mueller Network Operations Center will support the new AMI system and will monitor all network devices. This will allow the city to focus its time and resources on the delivery of water rather than network and information technology support.

Velan Receives Major Offshore Valve Contracts in Asia

Velan has been recently awarded important contracts for the supply of multiple packages of actuated and manual valves to MODEC Offshore Production Systems (Singapore) Pte. Ltd. These orders are added to those already acquired in the last 12 months for sales in excess of \$30 million.

The scope of supply

PEOPLE IN THE NEWS

EMERSON... has appointed **Akberet Boykin Farr** as vice president of diversity and social responsibility. Boykin Farr, who has managed the company's internal diversity and inclusion (D&I) programs since 2017, will continue to oversee the D&I function. She will also manage the Emerson Charitable Trust, coordinate the company's corporate social responsibility (CSR) reporting and serve as community liaison in St. Louis, Emerson's global headquarters. She takes over CSR duties from **Dave Rabe**, who retired in December after 36 years with Emerson; he most recently served as vice president of corporate social responsibility.



Boykin Farr

CURTISS-WRIGHT... as part of its succession plan, **Lynn M. Bamford**, previously president of the defense and power segments, has been named president and CEO and a member of the board of directors, following **David C. Adams'** retirement as CEO on Jan. 1, 2021. To ensure a smooth transition, Adams will continue as executive chairman of the board through May 2022, at which time Bamford will assume the dual role of chairman and CEO.

VELAN... has appointed **James Mannebach** as chairman of the board. The outgoing chairman, **Tom Velan**, will continue to serve as a director of the company. Mannebach, who joined the board in 2018, is the first independent chairman of the company. He has extensive experience in the valve and flow control industry having worked in senior leadership positions at Emerson Process Management, Roper Technologies and IMI.

Rob Velan has been appointed vice chairman of the board as the Velan family continues to move from the second-generation leadership to third-generation and independent leadership. Rob Velan has served on the board since 2013 and is the executive vice president of MRO and Aftermarket.

VALVTECHNOLOGIES... has appointed **Joseph "Joe" Miller** as industry director for the company's fossil power division. Based in Denver, Miller will have global leadership responsibility for ValvTechnologies' power industry group, with a focus on business growth and customer performance in the severe service marketplace. Miller previously was president of The Energy Corporation and also served as vice president of engineering for Calpine Corporation.

HUNT VALVE... announces that **Charles Ferrer** has been promoted to president & CEO. **Brad Sterner**, CEO since 2015, maintains the title of executive chairman and remains a member of the board of directors of Hunt Valve. Since joining Hunt Valve in early 2017, Ferrer has progressed to increasing levels of senior management responsibility. He joined Hunt Valve from GE Aviation and previously served in the U.S. Marine Corps as an F/A-18 pilot.

RICHARDS INDUSTRIALS... announced that **Tara Baker** has been promoted to the position of regional sales manager. She was previously a client consultant at Richards for the past seven years. Her role will be to build, develop and lead a team of sales representatives focused on driving growth for Richards' products lines.

consists of high and ultra-high-pressure forged valves whose compact design and special construction have significantly contributed to the improvement of the customer's process efficiency and will also improve and facilitate the daily operation of the customer's facilities. Deliveries are scheduled for end of 2020 to early/mid-2021 (Q1 to Q2 FY22).

Charbonneau Industries, Flowserve Supplying Philips 66

Philips 66 has awarded a contract to Charbonneau Industries, Inc (Ci) for additional mainline valves for their C2G Ethane Pipeline System. The system connects the growing Philips 66 storage complex at Clemens Caverns to a new JV petrochemical complex near Gregory, TX. Ci OEM Pipeline Platform Partner, Flowserve, will provide electric actuators for this project. Ci will continue to provide project management, V&A mount, set, extended testing, coating, logistics and storage as necessary for the Philips 66 project. JV partners ExxonMobil and SABIC are continuing to develop the complex, which is expected to go into service mid-2021.

ACQUISITIONS

Baker Hughes Signs Agreement to Acquire Compact Carbon Capture

Baker Hughes is acquiring Compact Carbon Capture (3C), a pioneering technology development company specializing in carbon capture solutions. The acquisition underpins Baker Hughes' strategic commitment to lead in

the energy transition by providing decarbonization solutions for carbon-intensive industries, including oil and gas, and broader industrial operations.

The advancement of carbon capture technology solutions is widely considered critical to delivering the additional CO2 emissions reduction needed to meet global 2050 climate targets. In the energy and industrial sectors, carbon capture technology is among the most viable decarbonization paths for retrofitting existing assets, as well as for greenfield projects. 3C's technology can address CO2 capture from different emission sources and can contribute significantly to the decarbonization of customers' operations.

FloWorks Purchases Oliver Equipment Company

Sunbelt Supply announces the acquisition of Oliver Equipment Company (OEC) by affiliate FloWorks International. Terms of the transaction were not disclosed.

Headquartered in Houston, OEC offers specialty products and services for demanding industrial applications through a network of five branches. Its highly technical sales force supports the maintenance, repair and operations activities for chemical,

petrochemical, power generation, refining and other infrastructure-focused end markets. OEC will continue to go to market under the OEC brand.

Emerson Acquires Progea Group

Emerson has completed the acquisition of the Progea Group, a provider of industrial internet of things (IIoT), plant analytics, human machine interface (HMI) and supervisory control and data acquisition (SCADA) technologies. Progea Group is headquartered in Modena, Italy, with approximately 55 employees.

The addition of Progea's capabilities will build on Emerson's embedded software and control portfolio for manufacturing, infrastructure and building automation applications.

AWARDS & HONORS

Highland Foundry Honored at Annual Pinnacle Awards

Highland Foundry won multiple Pinnacle Awards at the annual Manufacturing Safety Alliance of BC awards event in 2020.

Highland was recognized for both the Topaz and Sapphire awards, for successfully developing and implementing the health and safety management system, maintaining OSSE Certification and demonstrating leadership



JUNE

13-16 AWWA's ACE

San Diego
www.awwa.org/ace

23-24 Valve World Americas Expo

Houston
www.valveworldexpoamericas.com

AUGUST

VMA Market Outlook

Dates to be determined
www.vma.org/MarketOutlook

16-19 Offshore Technology Conference 2021

Houston
www.otcnet.org

SEPTEMBER

VMA Annual Meeting*

Dates/location to be determined
www.vma.org/AnnualMeeting

OCTOBER

16-20 WEF-TEC

Chicago
www.weftec.org

VMA Valve Basics Seminar & Exhibits

Dates to be determined
Pasadena, TX
www.vma.org/ValveBasics

VMA VIRTUAL EVENTS

A variety of educational programming, including webinars, are being finalized as we go to press. Please visit www.vma.org for additions to VMA's event schedule, and see the 2021 Events ad on inside back cover.

* Open to VMA/VRC members only. Visit www.VMA.org to learn if your company qualifies for membership.

VALVE

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commitment to safety through visible engagement as a member of the Executive Health and Safety Council of BC and signatory of the BC Safety Charter.

In addition to those awards, Highland was recognized as the winner of the 2020 Joint Health and Safety Committee Excellence Award.

VMA Members Named to Top Distributors' Lists

The Modern Distribution Management (MDM) Distributors Top 40 List, now in its eleventh year, is MDM's annual ranking of the top 150+ North American industrial, construction and commercial product distribution companies by revenue across 16 discrete product category sectors. MRC Global came in at #9 in this year's list.

Industrial Distribution unveiled its annual Big 50 List. VMA members who made the list are MRC Global (#7), NOW Inc. (#10) and Wolseley Industrial Group (#13).

DeZURIK Receives the Minnesota Governor's Safety Award

DeZURIK was recognized for excellence in workplace safety and health during the MN/SD Safety & Health Virtual Conference, Oct. 19-20, 2020. DeZURIK is one of 262 employers

to be honored through the awards program, coordinated by the Minnesota Safety Council. DeZURIK's award recognizes continuing improvement and/or a continuing outstanding record with incident rates that are 51% to 90% better than the industry average and a score between 75 and 90 on the safety program evaluation scale.

Baker Hughes Foundation Contributes \$50K to Emancipation Park Conservancy

The Baker Hughes Foundation announced a \$50,000 grant to support Emancipation Park Conservancy in Houston. The funds will support educational programs, park maintenance and safety equipment for the park. The grant is part of a broader commitment by Baker Hughes to participate in community programs, volunteerism and engagement with the organization.

This partnership with Emancipation Park Conservancy aligns with Baker Hughes Foundation's mission to promote education, environment and health and safety in the communities where it operates.

Emerson Honored in 2020 Flow Control Innovation Awards

Flow Control's annual Innovation Awards program recognizes the latest innovations and technology breakthroughs in the fluid and gas handling industry. Winners and honorees are determined through an open voting process by **Flow Control** readers. Emerson Automation Solutions received an honorable mention for its AVENTICS Series AF2 Flow Sensor.

Neles Wins Manufacturing Excellence Award

In 2020, the **Worcester Business Journal** Manufacturing Excellence Award winners "have found ways to not only survive the economic fallout from the coronavirus pandemic, but to provide new products and services to the particular needs the pandemic is creating."

Neles of Shrewsbury, MA, was awarded the Collaboration in Manufacturing Award thanks in part to their innovative Valve Technology Center.

Spirax Sarco Aiming for Carbon Neutrality by 2040

Spirax Sarco is one of over 40 UK companies that has committed to achieving carbon neutrality by 2040 and one of more than 20 companies that has committed to biodiversity net gain.

The full list of commitments made by group chief executive Nicholas Anderson, ahead of a Business Leaders Event organized by the Council for Sustainable Business and DEFRA, includes sourcing 50% of the company's electricity from renewable sources by 2030 and establishing a 2030 biodiversity net gain target.

NEW FACILITIES

Trillium Flow Technologies Moves Utah Facility to Fresno

Trillium Flow Technologies has announced the merger of their facility in Salt Lake City, UT, to Fresno, CA. The company currently employs 137 people in the city of Fresno and this merger is expected to generate more than 50 additional jobs in the next five years. VM



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- API 6FA

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- Helium or Methane

API RP591 Testing

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- Manufacturer evaluation
- Subcontractor evaluation

Cryogenic Testing

- All sizes and valve types
- Testing at -320°F, -150°F & -50°F

VMA: Moving Beyond 2020 and Toward a Brighter Future

The most challenging of years—2020—has finally come to an end. When it became clear in March 2020 that we were facing a pandemic, the association pivoted rapidly and adapted a variety of programs to fit the unprecedented situation. Now, plans for 2021 are well underway. Here's a look at what we've accomplished and what's in store this year.

Government Relations: As soon as the pandemic hit, VMA worked with its manufacturing partners to help ensure our members could continue to operate as essential businesses at national and state levels. A members-only webpage with timely and curated information was launched, webinars were held and letters were sent to our government explaining and advocating for our industry's needs during this time. This will continue in 2021, as we will provide information to our members on how government activities may affect the valve and flow control industry and represent our members on these issues. Focus areas include infrastructure, workforce, COVID-19 related issues such as liability protection and loans, and trade/tariff activities, among others.

Events, Education and Training: In 2020 VMA realized the largest attendance at its events ever—both in terms of the number of companies and individuals participating. While everyone missed the opportunity to meet in person and network face-to-face, the content, speakers, education and training provided virtually were still top-notch and timely. For 2021, VMA will continue to offer its education and training in a virtual format, with plans to start in-person mid-year.

Industry, Market and Economic Data: We saw an increase in 2020 in the number of members looking to VMA for information to help them understand the current environment and make business decisions. Members received an economic forecast prepared by the Institute for Trend Research (ITR) on a quarterly basis, and VMA



provided the membership with an internal monthly economic report and annual market forecast. This year, we also included additional surveys and information on COVID-19 and how our members were both impacted by and responded to the pandemic. In 2021, VMA will continue with this and offer a more robust internal report through a partnership with a recognized financial services firm.

Industry Information and

Knowledge: VALVE Magazine, through both the print and online version, reached nearly 50,000 readers in 2020—over half of which are end-users. VMA's flagship magazine continues to be a trusted source for all those in the industry and for those who use or specify valves and other flow control equipment. For 2021, VMA will continue to use VALVE Magazine as a prime way to help achieve one of our objectives of educating valve users and makers. A new approach to delivering the content in the magazine will be put in place for the spring issue and for the magazine's website. Users will have a robust way to access and find articles and will have access to more manufacturing

content, while advertisers will have new ways to reach their specific customers and prospects.

New Initiatives: A newly launched Career Center provides a way for our members to reach thousands of job seekers in manufacturing and engineering. VMA's revamped website is also on cusp of being launched, providing a much more user-friendly way for our members to access members-only information and for end-users and others to learn about the industry and VMA.

Strategic Plan: VMA began a strategic planning process in 2020, which will culminate in March 2021 with a new strategic plan. While 2020 resulted in some substantial changes in how VMA delivered on its objectives, it also allowed us to have important discussions on the priorities of the industry and our members, as well as what objectives VMA should move forward. VM

ISSUES ON VMA'S RADAR

As we move through 2021, the association will continue working to help our members address various issues affecting their businesses, including the following:

- **The impact of a new administration.** While the Democrats now control the Senate, the thin margin means they don't have a lot of legislative leverage. Issues likely to be addressed include tax and trade policy, clean energy and infrastructure. Trade and tariff activities will continue, and changes to environment regulations may also occur.
- **Workforce.** Addressing the lack of skilled people to work in today's manufacturing and industrial facilities continues to be a critical issue.
- **COVID-19.** With vaccine distribution underway, more optimistic predictions for business and the economy are emerging. But many issues—such as liability protection, loans, OSHA and Department of Labor changes—still loom large.
- **Standards.** Helping members keep apprised of new standards and working with organizations if needed.
- **Technology and manufacturing.** Changes will continue, especially around Industry 4.0 and other trends.
- **Industry statistics and end-use market forecasts.** Information and knowledge to help our members make business decisions.

Arie P. Bregman: 2020-21 Chairman of the VMA Board of Directors

At the conclusion of VMA's first Virtual Annual Meeting in September 2020, Arie Bregman, Vice President & General Manager of DFT Valves Inc., Exton, PA, was elevated to the top leadership role as Chairman of the VMA Board of Directors for 2020-21. We spoke with Arie about his career path, the challenges faced by our industry and his focus for the coming year. Here's what he had to say:

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

I got my BSME in mechanical engineering from Lowell Technological Institute and my master's degree in mechanical engineering from Worcester Polytechnic Institute. Since I was a young man, I always knew I wanted to be involved in mechanical engineering in one form or another, and my love for all things automotive is well known to all who know me. As a newly minted BSME in 1975, I thought I would get a job working for one of the Big 3 automobile manufacturers, but there were no jobs in Detroit for entry-level engineers, so that part of my dream didn't go quite according to plan.

I started in the valve industry with Nibco at their South Glens Falls, NY, plant in 1976, and aside from a brief hiatus from 2000 until 2006 have been in the valve business my whole professional career.

What are today's greatest challenges for those in the industry?

Staying current with all the technological changes. Computers are in everything from engineering design, ERP systems, CNC machines, CMM measuring of manufactured parts, solidification modeling in foundries, 3D printing, the industrial internet of things (IIoT)—the list is endless. Every aspect of the valve business is touched by a computer or the internet in some form or other. It's imperative that businesses keep up to date with the latest technologies so we remain not only competitive, but ahead of the curve.

What do you see as the top priorities for the valve industry and VMA?

It's important that we make the valve industry attractive not only to engineers of many different disciplines, but also to those who are not on a college track. We need CNC machinists, certified welders, production planners and many other factory positions filled with young people who are interested in pursuing careers in manufacturing.



My focus during 2021 will be to help VMA grow its membership to include many more companies at all levels and to find ways to reach more end users and get them involved with VMA.

What can VMA do to address those priorities?

Help point our elected officials in the right direction with a new emphasis and focus on the importance of a strong manufacturing sector in our economy.

What are the greatest strengths of VMA, and how can those strengths be bolstered?

The membership of VMA is a diverse group of over 130 companies. The members range in size from small companies with maybe 25 employees to companies with many thousands of employees. Every member company can benefit from the great employee training programs VMA offers, such as the Valve Forum or Valve Basics. During 2020 we were all forced to learn how to do things virtually and remotely. VMA is working to leverage what we learned this past year to make these great training programs available to a wider audience than ever before.

Everyone can benefit from network-

ing, sharing and learning from each other. Personally, I have found the greatest benefit is just that—the networking. I have made many great friends through my association with VMA, and when I have needed some perspective to help me with a business decision, I have been able to speak honestly and frankly with whomever I have conferred with.

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

My focus during 2021 will be to help VMA grow its membership to include many more companies at all levels and to find ways to reach more end users and get them involved with VMA. The association has the potential to really enhance our industry and members by offering more education to end users, helping our members thrive as we all embrace changes brought on by technology or other factors and demonstrating to the government the value we provide. To do all that we need everyone involved with VMA!

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

Most people know that I am an absolute "golfaholic," so there is no secret being revealed there, but I also have continued my automobile passion that led me to an engineering career. I love spinning wrenches on my Corvette weekend cars from time to time and keeping them in showroom condition inside and out. In addition, I enjoy woodworking projects having built houses and remodeled kitchens and bathrooms; I've also restored furniture and built grandfather clocks. VM

Virtual Valve Forum and Basics Event Draws Attendees from Across the Industry

More than 200 people participated virtually in the VMA Valve Forum and Valve Basics event held in November; included were four days of presentations on technical, manufacturing, management and marketing, valves 101 and valve repair. Participants chose from among 28 sessions, participated in discussion forums, asked varied and thoughtful questions of the presenters, networked with others during group and private chats, and explored products via video demos posted by the event's supporters.

Keynote presenter Kent Greenes kicked off the Valve Forum sharing how to retain critical knowledge as the older generation of workers continue to retire. While there are many ways to transfer knowledge, some methods are better suited to a particular generation, he said. (For more on this topic, see Greenes' article on pages 22-24.)

TECHNICAL AND MANUFACTURING

Numerous technical presentations and discussions helped attendees understand issues related to choosing and using valves in various circumstances, with presenters and attendees acknowledging that understanding the application is a critical factor.

The subject of standards is always of interest to industry practitioners, and this year was no exception. With so many new and changing standards on the horizon, industry experts with deep knowledge of the subject presented summaries of what is to come and answered numerous questions.

Technical and Manufacturing tracks both had sessions on Industry 4.0, and presenters stressed that adoption of all things digital is no longer a future goal—it is here now. Large-scale retirements have been pushing companies to adopt more virtual technologies and robotics as new workers are more comfortable with technology, and some tasks can be replaced with robotics. In addition, gaming is making its way to the plant floor with items like augmented reality goggles and glasses.

MANAGEMENT AND MARKETING

Discussions on how to manage sales teams, communicate effectively with customers and employees, and step up digital marketing and branding were woven through the Management & Marketing track. Here are a few takeaways:

- Expect “virtual” to continue even after the pandemic passes—so jump in and embrace it now.
- Communicating effectively in the workplace has never been more important, especially with so many working remotely. Employees engaged with structured and standing virtual meetings.
- Including “live chats” on company websites is an excellent way to answer customer questions and is particularly relevant to younger generations in the workforce who often expect answers instantly.
- To help boost your marketing efforts and reinforce your brand, make the most of your digital communications. For example: Train employees on how to use social media

that supports your company's messaging. Share company promotions, new hires, retirements and stories about community engagement, all of which lead to a high level of media interaction.



VALVE BASICS AND REPAIR

While the **Valves 101** portion of the program (part of VMA's Valve Basics course) has been conducted for more than a decade with in-person meetings and a hands-on portion allowing attendees to examine products to reinforce the lessons, this was the first time the course was held virtually. Course instructors created videos to display various products and create a virtual “valve petting zoo.” The ability to see various valves and learn about their applications was well received by those new to the industry, as well as seasoned industry professionals.

Valve Repair sessions included a technical discussion covering the overall valve repair process from initial TDI (tear down and inspection) to industry, customer and code requirements used throughout the repair process. In addition, an electric actuation overview that focused on quarter-turn applications was presented; it included critical installation/operation factors such as flange mounting, alignment, stem nuts, bearings, and proper lubrication.

For the latest information on VMA's upcoming events and educational programs, visit www.vma.org. VM


NEW MEMBERS

VMA's newest distributor member is **CGIS** (cgis.ca), a global supplier of high-performance valves, controls and automation. Having originated in Canada 40 years ago, the company has expanded its reach through additional locations in Canada, as well as the U.S. and Australia. CGIS works with engineering, mining and mineral processing, oil and gas, energy, power, pulp and paper, chemical, and water and wastewater companies across six continents. CGIS's main facility is in Vancouver, British Columbia.

Riggio Valve (riggiovalve.com), located in Bayonne, NJ, is the newest member of the Valve Repair Council. Riggio Valve services provide removal rigging, refurbishing, re-assembly, installation and testing for planned maintenance or emergencies. Whether manual, electric, hydraulic or pneumatic systems, their rebuilding and testing programs have been designed to assure like-new performance.

VALVE Magazine: They're the Tops

As we move into the third decade of the 2000s, let's take a look at the most viewed articles on VALVEmagazine.com. While much has changed in our industry and the industries that use valves and related equipment, we see common themes: a continuing interest in standards, materials, testing and how various products work in a range of applications.

The articles shown here are just the tip of the iceberg. VALVEmagazine.com contains hundreds of articles written exclusively for the website, as well as those that originally appeared in the print edition*. 

TOP 25 ARTICLES: 2013-2020

1. The True Meaning of Double Block and Bleed
2. Introduction to Pressure Relief Devices - Part 1
3. Understanding and Selecting Valve Flanges: Design and Standards
4. WCC and LCC Casting in ASME B16.34
5. Mistakes and Misconceptions in Valve Leak Testing
6. Ancient Roman Valves
7. New NACE Standard MR0103
8. Size Matters: Control Valve Sizing 101
9. NACE MR0103 Material Compliance
10. Piping Codes and Valve Standards
11. Understanding Differential Pressure Flow Transmitters
12. Air Valves in Piping Systems
13. Christmas Tree or Wellhead?
14. The A to Z of Valve Materials
15. DBB and DIB: Which is Which?
16. Pipeline Valves—Always Ready
17. Stop Check Valves
18. Water Hammer
19. Flashing and Cavitation
20. PSV Inspection: Test Only, or Full Inspection and Overhaul?
21. Best Practices in Pressure-Relief Valve Maintenance and Repair
22. Specifying Valves for Hydrogen Service
23. Accessories for Control Valves
24. HIC Testing
25. Regulators vs. Control Valves: What's the Best Fit?

To our readers:

We hope you've enjoyed VALVE Magazine over the years and look forward to your continued readership as we adapt our flagship publication to a new decade. And to our advertisers, thank you for your support!

—Judy Tibbs, Associate
Publisher/Editor in Chief

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WHERE
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ARE USED



The Strong and Growing Biopharmaceutical Market

BY SUSAN KEEN FLYNN

When healthcare workers and residents and staff at long-term care facilities received the first COVID-19 vaccinations in mid-December 2020, the world marveled at the speed with which both the Pfizer-BioNTech and Moderna mRNA-1273 vaccines were developed. Less heralded, though equally significant, were the behind-the-scenes processes to ramp up drug production and distribution. Valve suppliers played a key role in helping to ensure timely, safe manufacturing of SARS-CoV-2 vaccinations.

One of the companies that has seen a spike in business related to COVID-19 is ITT Engineered Valves. The majority of ITT's customers are in the biopharmaceutical market, producing medical drugs derived from proteins and nucleic acids for therapeutic or in vivo diagnostic purposes. The company felt well-prepared to step up during the coronavirus pandemic, particularly given its experience in the vaccine production process.

When the H1N1 virus emerged in 2009, ITT worked with a customer contracted by the U.S. government to build a new vaccine facility. "That generated about \$2 million worth of valves in a very short time period," said Dave Loula, global product director of ITT. Fast forward 11 years and the company once again landed business during a pandemic. However, it looked a bit different.

"We expected to see significant capacity needs as a result of COVID-19. But in terms of drug production, we haven't seen a big groundswell of demand," said Loula. "The real demand

Thousands have been involved in the rapid development of COVID-19 vaccines—among them, valve and control manufacturers. Here's how they have helped and what they see for the biopharmaceutical market's future.

is on the filling and finishing side." As the name suggests, filling and finishing—or fill-finish—is the process of filling vials with vaccine and packaging the medicine for distribution. ITT has several projects with companies subcontracted to perform fill-finish.

"These projects have had to move at the same accelerated rate as vaccines going through trials and approvals because as soon as the drugs are approved, companies want to get them filled, packaged and moved to distribution points to get the vaccinations out to people," said Loula.

A SPEEDY PRODUCTION CYCLE

Leading the drive for fast development, production and distribution of vaccinations is Operation Warp Speed, a partnership among several entities of the Department of Health and Human Services working hand-in-hand with other federal agencies and private firms. The goal of the partnership is to make 300 million doses of COVID-19 vaccine available by January 2021.

"One of the challenges throughout the biopharmaceutical market is the pace and speed required for general project execution," said Matt Sullen, regional manager at PBM Inc. Valve Solutions. His company sells a variety of valves used in both upstream and downstream processes to several companies in the biopharmaceutical market. "The customer base needs to get their products to market quickly, and COVID vaccines are just one example. You could see the effects all the way from diagnostics to manufacturing to fill, finish and distribution. As a valve supplier, you need to deliver."

In April 2020, Richards Industrials rolled out an expedited manufacturing process, as did other valve manufacturers, to help biopharmaceutical customers streamline production. "If a customer is expanding a plant to make vaccines as part of BARDA [the Biomedical Advanced Research and Development Authority] or Operation Warp Speed and they need valves quickly, we'll do what it takes to make that delivery happen as fast as it can," said Karl Lutkewitte, product and sales manager at Steriflow Valve Division of Richards Industrials. To meet demand, the company has often had to deliver 50 valves in two weeks or less.

Global supply chain disruptions common during the COVID-19 pandemic sometimes thwarted efforts. Emerson Automation Solutions experienced a significant increase in business in the overall medical market in 2020, initially in the medical device segment as demand for products such as ventilators skyrocketed, then in biomanufacturing as vaccine produc-

tion took off. “Emerson has had to not only shift production around to meet these demands, but also manage a complex supply chain to ensure production could continue to meet those demands,” said Don Launder, director of global strategic accounts—hybrid.

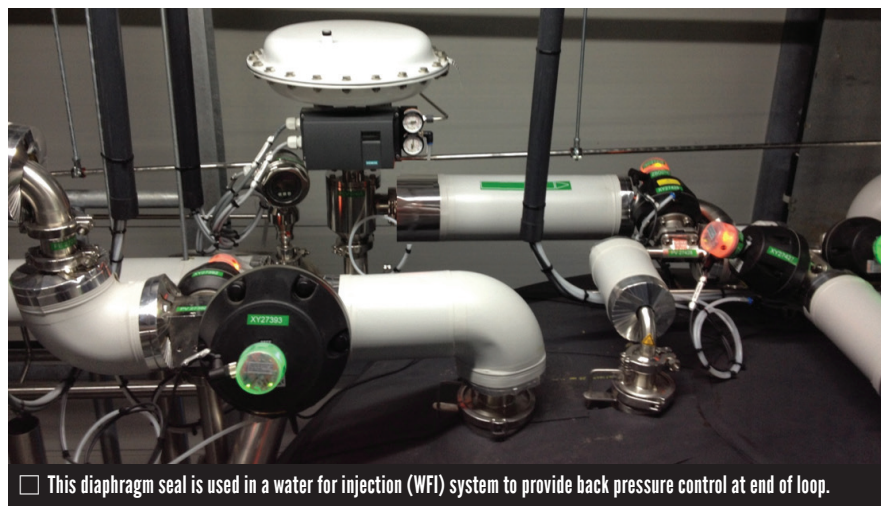
DESIGN CHALLENGES AND SERVICE CONDITIONS

Even amid the global pandemic, valve and control product suppliers continued to meet demand in the burgeoning biopharmaceutical market unrelated to COVID-19. One of ITT's biggest projects in 2020 was for a company increasing its diabetes drug production. ITT collaborated with the end user, equipment OEM and contractors to help specify and design valves using new technology developed to streamline the installation and maintenance process. ITT delivered more than 1,500 valves.

No matter what a biopharmaceutical company is producing, there are a few noteworthy challenges that valve suppliers face related to the regulatory landscape, design requirements and the production environment. As in most market segments, adhering to regulations is paramount.

“In biopharma manufacturing, especially on process valves, there are a number of regulations that must be met due to the fact that the valve can be in contact with drug substances or products,” said Launder. The primary regulatory body is the Food and Drug Administration (FDA), and the American Society of Mechanical Engineers (ASME) publishes the ASME-BPE standard detailing requirements for bioprocessing equipment.

“Any piping and valves used by [a biopharmaceutical company] have to



□ This diaphragm seal is used in a water for injection (WFI) system to provide back pressure control at end of loop.

RICHARDS INDUSTRIAL

be certified,” said Jeff Kane, director of sales and marketing at DFT Inc., which supplies non-slam check valves to the sanitary industry. “Once the system has been certified, companies don’t have a whole lot of options to make a change. They have to make the right choice from the beginning.”

Making the right choice can be challenging as there are a lot of design decisions. “From diaphragm life and ease of change-out to on-board diagnostics and overall valve size and complexity, there are nearly endless possibilities,” said Launder. “Customer requirements and usage is key to determining these design features.”

Maintaining a sterile environment is a primary concern for biopharma manufacturers since they create products from live cells or their components. All the stainless-steel processing systems must be thoroughly cleaned before the next batch of drugs is manufactured. They are typically sanitized in a clean-in-place (CIP) process, then sterilized in a steam-in-place (SIP) process, with valves con-

trolling both processes. “The primary service concern is a sterile environment, where nothing gets entrapped in the system,” said Lutkewitte.

MARKET TRENDS

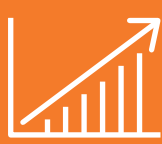
There are several trends in the biopharmaceutical industry affecting valve and control product suppliers. One is the move toward single-use components. Instead of growing cells in a stainless-steel bioreactor, companies will use a large disposable bioreactor made of layered plastic materials. The bags range from approximately 500 to 4,000 liters, with one manufacturer recently introducing a 6,000-liter bag, according to Lutkewitte.

“Single-use production practices reduce the overall cost and complexity of drug manufacturing, primarily through eliminating cleaning and the impacts of cleaning and sterilizing,” said Launder. While the shift away from stainless-steel bioreactors reduces the need for process control valves, disposable bioreactors use a lot of tub-

BIOPHARMACEUTICAL MARKET AT-A-GLANCE



\$239.8 billion
Market Size in 2019*



13.28%
Compound Annual Growth Rate from 2020 to 2025*



Key Players: Abbott Laboratories, AbbVie Inc., Amgen Inc., AstraZeneca Plc., Biogen Inc., Bristol-Myers Squibb Company, Eli Lilly and Company, Novartis AG, Pfizer Inc., Sanofi.



Commonly Used Valves: hygienic diaphragm, ball, linear control, non-slam and springless check, pressure regulator, pinch and sampling.

* Data source: IndustryARC

ing that requires pinch valves.

Biopharmaceutical companies also are striving to downsize their systems and facilities. "Customers are always looking to shrink the envelope of valve assembly. They try to tighten up their piping systems to reduce dead leg and waste," said Loula. "So we try to continue to develop products that meet those smaller and smaller requirements."

In addition to paying attention to product-specific trends, valve suppliers keep a close eye on global trends in the biopharmaceutical industry that affect their business. One is the dramatic rise of cell and gene therapies. Between 2018 and 2024, the compound annual growth rate of cell and gene therapies in North America is forecast to be 28.4%, according to a May 2020 article in Genetic Engineering & Biotechnology News. "With cell and gene therapy taking off, the number of gas regulator valves we sell has gone through the roof," said Lutkewitte.

Personalized medicine, also known as precision medicine, is another emerging practice. Physicians use a patient's genetic profile to choose the proper medication or therapy. "It's still early in the game for personalized medicine, but it's coming," said Lutkewitte.

One biopharma segment that's already flourishing is vaccines. While COVID-19 vaccines are currently grabbing the headlines, others have experienced increased dissemination in recent years. These include annual influenza shots, shingles vaccinations and the human papillomavirus (HPV) vaccine to protect against certain cancers. "Vaccines and other medical therapies are driving biotechnology on a global basis," said Loula.

A BULLISH OUTLOOK

The future looks bright for the biopharmaceutical industry and, by extension, the valve manufacturers that serve the industry. "We are bullish on the biopharmaceutical market for the next three years," said Lutkewitte. "It's a growing industry as long as researchers develop new drugs."

The data supports that research and development will continue at a robust pace. The biopharmaceutical industry employed more than



□ This 4-way divert valve allows process fluids to be diverted, mixed and/or sampled.

290,000 people in R&D in 2017—the largest number of R&D workers in any U.S. industry, according to a report

published by the Pharmaceutical Research and Manufacturers of America (PhRMA) and TEconomy Partners. That figure accounts for 36.2% of all biopharma industry jobs and is nearly three times higher than the U.S. industry average R&D employment, according to PhRMA.

"As more drugs in the biopharma sector are consumed, more of the equipment used to produce them is going to be needed," said Loula. That's good news for valve suppliers in the biopharmaceutical market. **VM**

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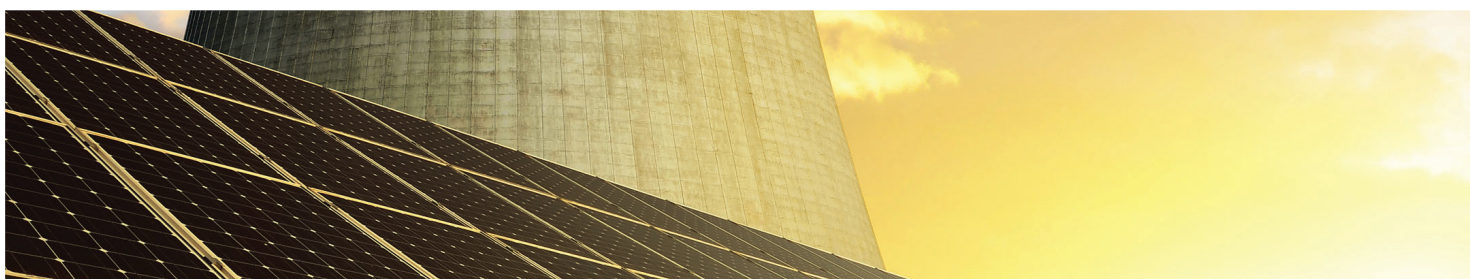
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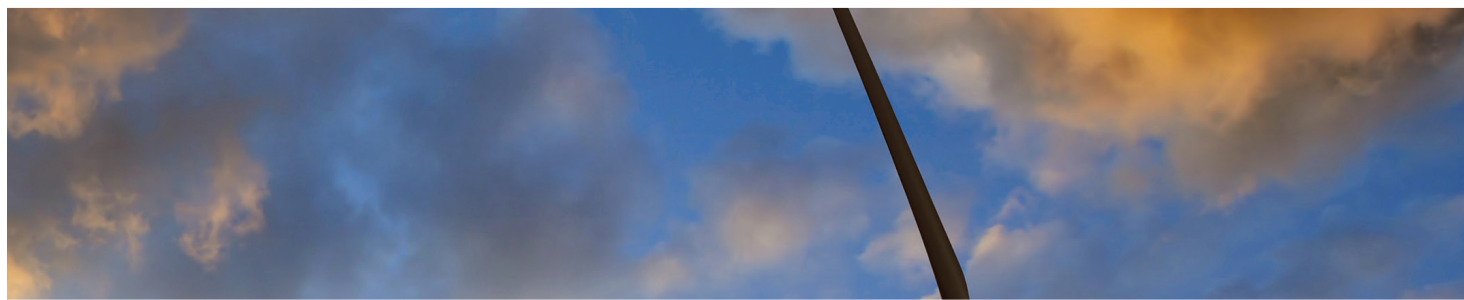
A Partner in the Quest for Clean and Sustainable Energy

The nation's nuclear energy industry has deep roots that have always been focused on reliability and safety. Today, the industry is also seen as a partner with renewables in the world's battle for carbon-free power.

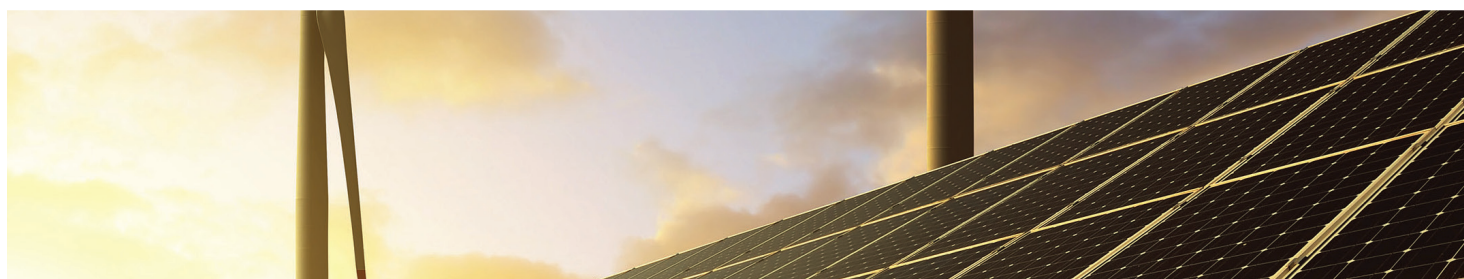
**BY JULIO ADAME AND
BRENNAN WOLFE**

The United States has the largest nuclear fleet in the world with 94 commercial operating reactors at a combined capacity of 97,154 megawatts electric (MWe). The nation produces more electricity from nuclear power than any other single country and contributes more than 30% of the world's nuclear electricity generation capacity.

As of 2019, the next closest country is France with 56 reactors generating 61,370 MWe of power, accounting for more than 70% of that country's electricity generation needs. Meanwhile, other countries, such as China and India, continue to build and push for nuclear power hoping to take advantage of this reliable clean energy source.



CLEAN



Nuclear power once seemed an unlikely partner to the idea of clean energy; nuclear doesn't appear to be a factor in providing cleaner energy and reduced air pollution. However, this source of energy has been a safe, reliable source of carbon-free electricity for decades. Even when the sun isn't shining or the wind isn't blowing, nuclear power keeps producing carbon-free power, using technologies that focus on safety, reliability and economical operation. To better understand why it's a necessary resource in meeting our clean energy needs, we must understand the origins of the industry.

THE HISTORY OF NUCLEAR

The story of America's nuclear power industry includes a young Polish immigrant named Hyman G. Rickover—or as he is better known—Admiral Rickover. Rickover's actions fathered the U.S.

Naval Nuclear Propulsion Program.

Admiral Rickover served in the U.S. Navy from the time of his graduation from the United States Naval Academy in 1922 until his retirement in 1982, and he spent most of his career advocating for nuclear

technology and power. Because of Admiral Rickover, the beginnings of commercial nuclear power plants and the U.S. naval submarine program are intertwined. During a visit to the Oak Ridge National Laboratory in 1946, Admiral Rickover observed work on a

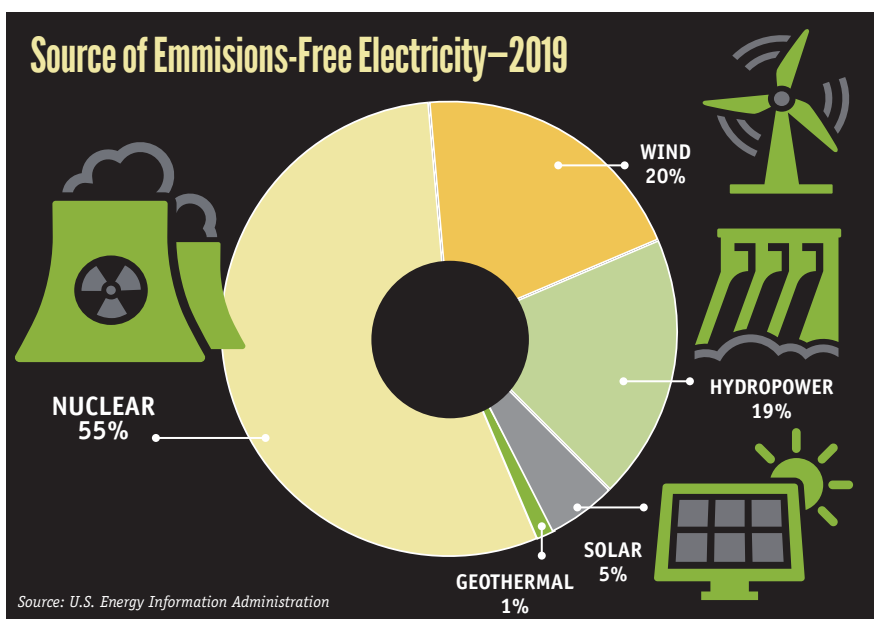


Nautilus in NY Harbor. INSET: Admiral Rickover

nuclear electric-generating plant, which inspired his vision for a fleet of submarines and ships powered with nuclear energy. As he began to share his vision with others in the navy, he garnered support to begin developing nuclear power for submarine propulsion, as well as for commercial electricity operation.

Admiral Rickover was responsible for overseeing the development of both the nuclear-powered submarine and the first full-scale commercial nuclear power plant. In 1949, he continued his focus on nuclear by serving in two government roles simultaneously—director of the Nuclear Power Division, Bureau of Ships, and chief of the Naval Reactor Branch, Reactor Development Division, Atomic Energy Commission (the predecessor to today's Nuclear Regulatory Commission).

During his career, safety and discipline were of utmost importance to Admiral Rickover. For example, in developing the nuclear submarine, he created a culture of accountability and procedure that ultimately led to the success of the naval and civilian nuclear power programs. His

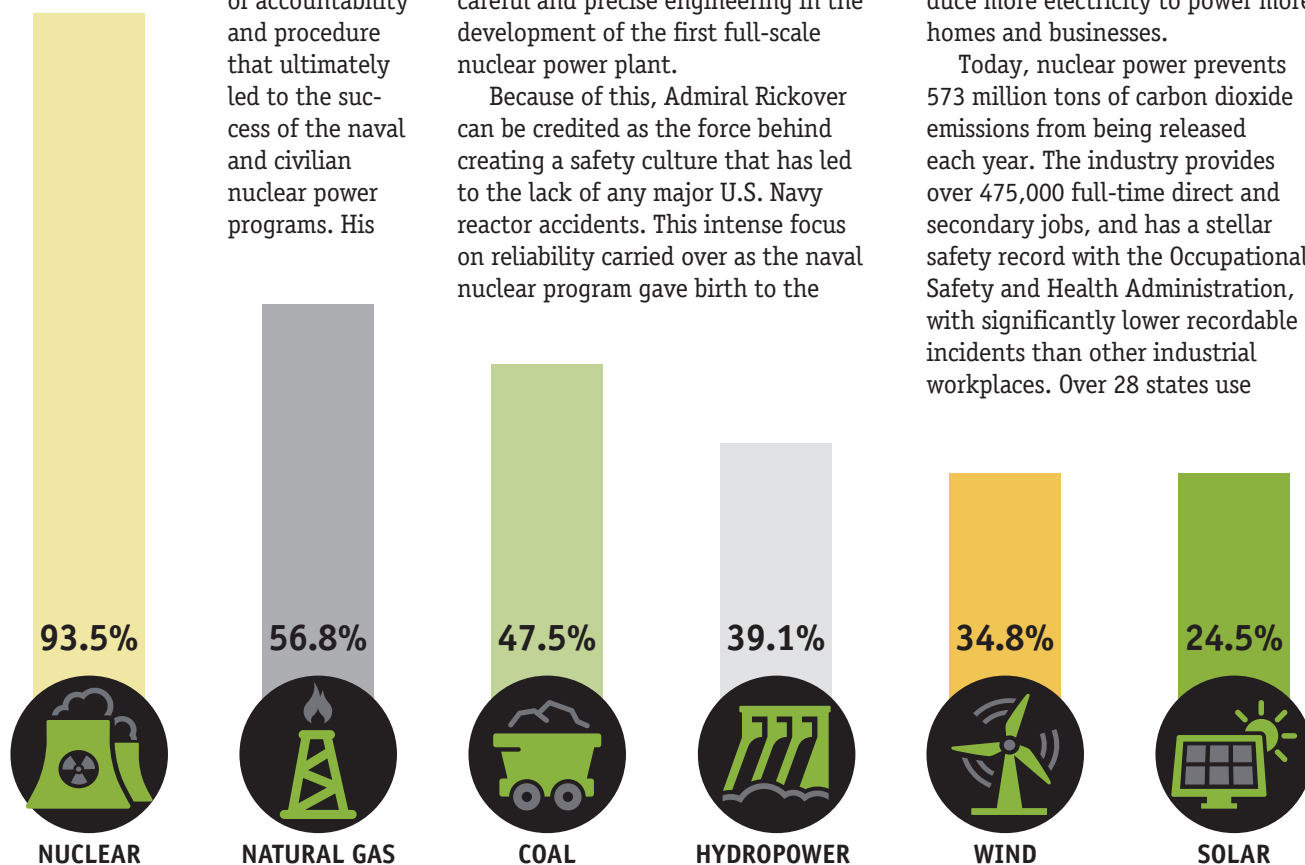


extensive focus on safety and reliability for nuclear machinery led to demands that even completely-built equipment and prototypes needed to be discarded if they were considered flawed or had poor workmanship. Engineers working for Admiral Rickover adopted this attitude, using careful and precise engineering in the development of the first full-scale nuclear power plant.

Because of this, Admiral Rickover can be credited as the force behind creating a safety culture that has led to the lack of any major U.S. Navy reactor accidents. This intense focus on reliability carried over as the naval nuclear program gave birth to the

civilian nuclear power program beginning with the first full-scale nuclear power plant for civilian use—the Shippingport Nuclear Power Plant, which started up in 1957 and operated until 1982. The success of that plant led to larger, more economical nuclear power plants that could produce more electricity to power more homes and businesses.

Today, nuclear power prevents 573 million tons of carbon dioxide emissions from being released each year. The industry provides over 475,000 full-time direct and secondary jobs, and has a stellar safety record with the Occupational Safety and Health Administration, with significantly lower recordable incidents than other industrial workplaces. Over 28 states use



Capacity Factor by Energy Source—2019

Source: U.S. Energy Information Administration

nuclear power plants. In fact, nuclear generates 55% of the power in Illinois, half of the power in South Carolina and 40% of the power in Connecticut.

Nuclear power has been operating since the 1990s at over an 80% capacity factor, a measure that indicates how fully a unit's capacity is used. In 2019, the industry achieved a 93% capacity factor, making it significantly more reliable than other forms of power generation. This reliability ensures critical operation of infrastructure such as hospitals, airports, schools and water/sewage plants. Comparatively, renewables such as solar and wind had a capacity factor of 24% and 34% respectively in 2019.

This gap is why nuclear is so important in complementing those renewables.

A BRIGHTER FUTURE

Admiral Rickover wasn't the only one looking toward the future in the 1940s—the invention of the transistor occurred in 1947 and the digital revolution developed alongside the nuclear industry (continuing to rapidly accelerate over the years). In the 70 years since the launch of the USS Nautilus (the first nuclear-powered submarine), we have moved from transistors to pagers, pagers to smart phones, and smart phones to virtual reality technology. As we become more reliant on technology and populations continue to expand, it is highly likely that power generation will need to rise to meet increasing demands.

On top of this increased energy demand, more and more countries are committing to become carbon-free or carbon-neutral within the next 30 years. With mandates such as California's goal to ban sales of gas-powered cars by 2035 applying pressure for cleaner, more efficient systems, it has become increasingly apparent that achieving carbon reduction goals is going to need the reliability of nuclear.

One reason is that nuclear is currently the largest source of car-

bon-free energy in America. In 2020, the industry produced 55% of America's clean energy (20% of all American energy). This doesn't mean nuclear must be the singular answer to America's carbon woes. The reliable nature of nuclear pairs perfectly with renewables that rely on certain conditions to produce power. This partnership between nuclear and other sources increases the flexibility of the nation's power grid, allowing for large shifts such as the potential virtual power grid proposed in California and smaller-scale operations such as microgrids and vehicle grids.

The nuclear industry also continues to rise to the challenge of increased safety, reliability and cost effectiveness, developing technology to meet growing demands and future expectations. Every stage and phase of the nuclear process is under examination for potential advancements and improvements, ranging from process innovations such as 3D scanning for plant inspections, using augmented and virtual reality products for training and troubleshooting, and producing hydrogen from nuclear processes to product innovations such as new fuel types, fail-proof reactor designs and small modular reactors (SMRs) and advanced reactors (ARs).

SMRs and ARs represent both the future of the nuclear industry and the opportunity for reliable, sustainable power, even for areas that may not have access to other renewable sources. Helped along by government programs, these reactors have a lower capital investment, a smaller physical footprint and a larger variety of site options, all of which have been long-term issues of the conventional nuclear power industry. This flexibility means they also can be used in conjunction with other renewables, maximizing potential space and output power even when conditions are less than ideal for those other power sources. There are several designs currently circulating in the market, each

of which has their own unique features and advantages. All of them possess the same eye for safety that Admiral Rickover fostered in the commercial and naval nuclear power industry.

Companies such as NuScale, TerraPower, GE-Hitachi, X-energy, Oklo, Kairos, the Ultra Safe Nuclear Corporation (USNC) and others have reactors in the planning that can be deployed by the late 2020s or the early 2030s. These reactors live up to the imperative for a clean, safe and reliable source of carbon-free electricity.

In late 2020, NuScale's Power Module became the first NRC-approved SMR design, receiving a cost-share award from the Department of Energy under the Carbon Free Power Project. Other SMR and AR designs are further away, but still viable in the next 10 years. Fast neutron reactors (FNRs) have better fuel efficiency and longer refueling cycles, with some having the capability of running off recycled fuel from traditional power plants. Other options such as high-temperature gas-cooled reactors (HTGRs) and modified light water reactors (LWRs) use more traditional methods, but with innovations.

No singular solution to meeting America's carbon goals or to an entirely clean energy grid exists. However, the demand for safe, clean and reliable energy will only increase alongside population numbers and technological advancements, meaning we need to take steps now to preserve the future. Renewables alone are not enough to meet the needs of our grid while also hitting carbon emission goals because they lack the reliability nuclear offers. By supporting initiatives such as small modular and advanced reactors used in conjunction with renewables, a more sustainable future is within grasp. ❧

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Practical Steps for Transferring Knowledge

Using three fast-learning knowledge transfer techniques will help multiple generations in the workforce learn from each other.

BY KENT GREENES

To do our jobs, we all need the necessary knowledge. Typically, newer employees learn from more experienced folks, and while that happens naturally to some extent, the transfer of knowledge can be encouraged and facilitated.

Considering the large age range among today's older and younger staff, the good news is the gap between generations is closing when it comes to knowledge transfer.

The bad news? It's been 15 years since the start of what we call "the big crew change"—with members of the Baby Boom generation retiring—and many companies think that "hope" is a method of dealing with this change.

KNOWLEDGE TRANSFER IN REAL LIFE

Before focusing specifically on knowledge transfer in my work, I had experience with this concept. Here is an early example where I facilitated the transfer of knowledge—between generations and

between continents. While it marked the beginning of my journey in knowledge transfer, I didn't know it at the time.

When working for BP in 1988, I found myself in a helicopter in Colombia headed for an oil drilling site as part of an initiative for business unit leaders to learn from each other and improve our company performance. Landing on a drill site to tour the operation, I learned the Colombian team had installed the same air compressors used in development of the Endicott Field I had worked on in Alaska. Their young maintenance manager explained the equipment was running at only 50% uptime. This meant half the time they could not drill, resulting in poor overall efficiency. So I popped open my satellite phone and called the senior maintenance manager in Alaska. I explained the situation and, with the help of a translator, connected him with the Colombian maintenance manager and then left for the evening.

When I returned the next day, everyone was happy—especially the maintenance manager. The manager in Alaska passed along some of his hard-earned knowledge about running the compressor that was not in the equipment manual. The uptime had improved to 80% overnight.

MY GENERATION AND YOURS

Today's workplace is made up of five different generations, all of whom contribute and require knowledge. Because of their life experiences, different people and different generations have their own preferred ways of acquiring and sharing knowledge.

Some workers do well with structured classroom-type learning. Many of those who grew up with computers and the internet like and expect to acquire knowledge on the fly from online sources.

Your company can start today using methods to promote the transfer of

knowledge and accelerate team and organizational performance.

Traditional methods such as mentoring, apprenticeships and sharing stories about solving problems are ideal for helping younger workers and those who are changing focus acquire expertise one-on-one from experienced personnel. Other approaches include social media, digital knowledge transfer (podcasts, videos, various virtual methods), communities of practice (groups of people who share common interests and concerns) and fast-learning techniques (described below).

GETTING KNOWLEDGE FROM HERE TO THERE

Since my early experience at that drilling rig in Colombia, I've learned a lot about knowledge and how it is passed along. Here are some basics:

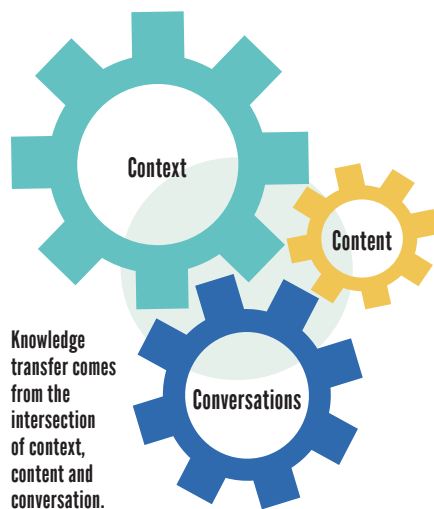
- Knowledge is not limited to certain people. It can come from anyone.
- Knowledge doesn't transfer by itself. It takes energy and time to go from one person or group to another, especially if it is complex.
- Knowledge transfer is everyone's job. We all suffer from information overload, but have you ever heard someone say they have enough knowledge?

We need knowledge to live long and prosper. We need knowledge to maximize business performance while caring for the environment.

A lot of this information about intergenerational knowledge transfer comes from research initiated in 2007 by The Conference Board. The member-driven think tank studied 10 companies to ascertain which knowledge transfer techniques work and when to use them, as well as how to enhance cross-generation knowledge transfer. The project has been continuously renewed from 2010 through this year.

FAST-LEARNING TECHNIQUES

A number of powerful techniques exist for making multigenerational knowledge transfer routine in an organization. They're fast, they work, and they make a difference. They involve learning before doing (peer assist),



learning while doing (action review) and learning after doing (retrospect).

Peer Assist

This learning-before-doing facilitated work session can last anywhere from an hour or two to a couple of days depending on the complexity of the knowledge you want to transfer. Visiting peers share their knowledge with the home-team peers because they want to help. This is not about the visitors telling the home team what's wrong; it's about sharing and learning from each other about what to do differently. The process is done early enough to make a difference in future behavior. Often the people who come to "give" and share, whether it's face-to-face or virtual, get a lot out of it too.

The home team begins the peer assist session. "Here's what we know, here's our challenge, and here's what we don't know and need help with." That opens up the floodgates for people to share.

Then the visiting peers share what they know in their context, stories and experiences. They are not critiquing the home team. Rather, they say, "Here's what I learned when I did something similar." At this point, you are moving toward all the people in the room knowing more together than they did as individuals when they entered the room. That sets the stage for the home team to consider what they should do differently, what they should start, stop or change. At that point, the group often makes a commitment to do something different going forward.

Here is an example of peers assisting each other virtually:

Several years ago, an oil drilling team in Norway was a couple of months away from drilling their first deep-water, high-pressure well in 30 years. Remembering what happened with Deep Water Horizon in the Gulf of Mexico, the government was concerned and needed to be convinced of the project's safety.

We asked the drilling team to reach out to their personal networks to see who had experience with cement casing in high-pressure environments and could share their knowledge and make a difference.

In a few days, the drilling team found eight expert peers from different countries who were willing to participate. They did not know each other, and 50% of them were millennials. In two hours they exchanged ideas and changed the Norway plan so it reduced cementing costs by a couple million dollars and demonstrated to the Norwegian government that they could drill safely.

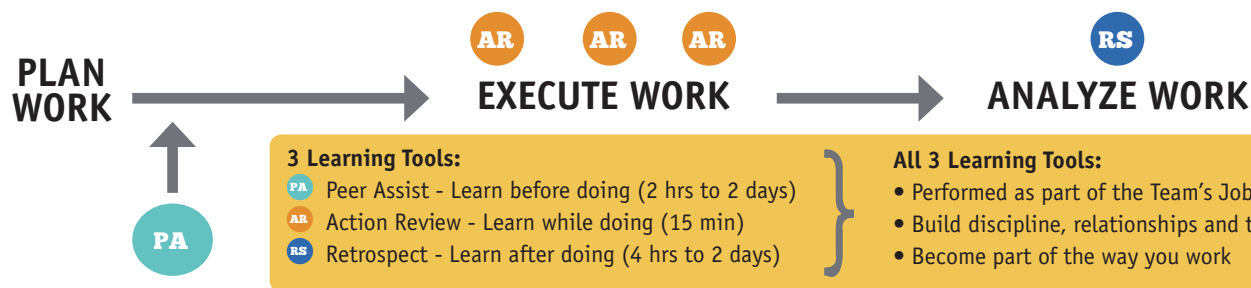
Action Review

One of my favorite approaches, because it works in the moment and makes an immediate difference, is the action review. It's a take-off from the Army's after-action review (AAR) technique developed near the end of the Vietnam War. It is a simple and fast tool for individuals and multigenerational teams in the field, on the job or in a work crew.

An action review involves answering four simple questions. It can take just 15 minutes to transfer knowledge, improve work and build team relationships and trust. The action review can be used when you need it, in the moment of any identifiable event, sub-task, milestone or something the team has experienced. The four questions are as follows:

1. *What was supposed to happen?*
That's usually the first big win because everyone may not have talked in advance about what they expected to happen on this particular job, task or event.
2. *What actually happened?* You get to the truth from direct observation.

Make fast-learning techniques routine



3. *Why is there a difference?* You talk about why there was a difference between what was supposed to happen and what actually happened.
4. *What can we learn from this and do right now?* The team comes up with the next actions.

This powerful technique is fast, easy to remember and works with whoever is on the team.

Retrospect

A facilitated, forward-looking, team work session, the retrospect ranges from a half-day to a couple days for a major project and takes place soon after a milestone or the end of a project. Think of this as a lessons-learned technique. It goes into more detail than the action review, mainly because it is applied to a larger scope of work, and it is also geared toward surfacing and creating new knowledge that can often be used in different contexts.

Built on a process of inquiry, this is not just a "hot wash" or debrief. It examines in depth what happened and gets to the why. It makes learning conscious and explicit, so the learning

becomes embedded in the people in the session who just did the work. They now have knowledge they can reuse the next time they do a similar project. In addition, this retrospect process can capture and package this new knowledge for reuse by others.

START WITH A PLAN

Every project starts with planning. If you don't know everything needed to accomplish the work, do a peer assist to get better informed and have the answers it takes to move forward. While executing the work, do pause-and-learn action reviews to learn quickly as you go. When the project is complete, analyze and learn from it. This is what makes knowledge transfer sustainable. Companies employing these techniques don't have a knowledge-loss problem.

The best results occur when these fast-learning techniques work together and are embedded in the organization so they become routine.

CAPTURING KNOWLEDGE OF RETIRING STAFF

When a seasoned, experienced person retires, the company stands to lose a lot of knowledge.

One approach to retaining the

knowledge is to have your less experienced staff harvest the knowledge they need in their particular role, task or project. You would be amazed at how quickly the necessary understanding is transferred and how quickly someone can come up to speed in a particular profession or task.

The ultimate way of accomplishing this transfer, though, is redesigning jobs for knowledge transfer in phased retirement. When you know someone is planning to retire, set them up a year or so in advance to shed their normal activities and pick up knowledge transfer activities. Have them participate in peer assists, as mentors, as teachers of master classes or informal learning sessions.

Knowledge transfer can happen in many ways. The critical thing is to get started. ■■

This article is based on a presentation given by Greenes at VMA's Virtual Valve Forum, held in November 2020.

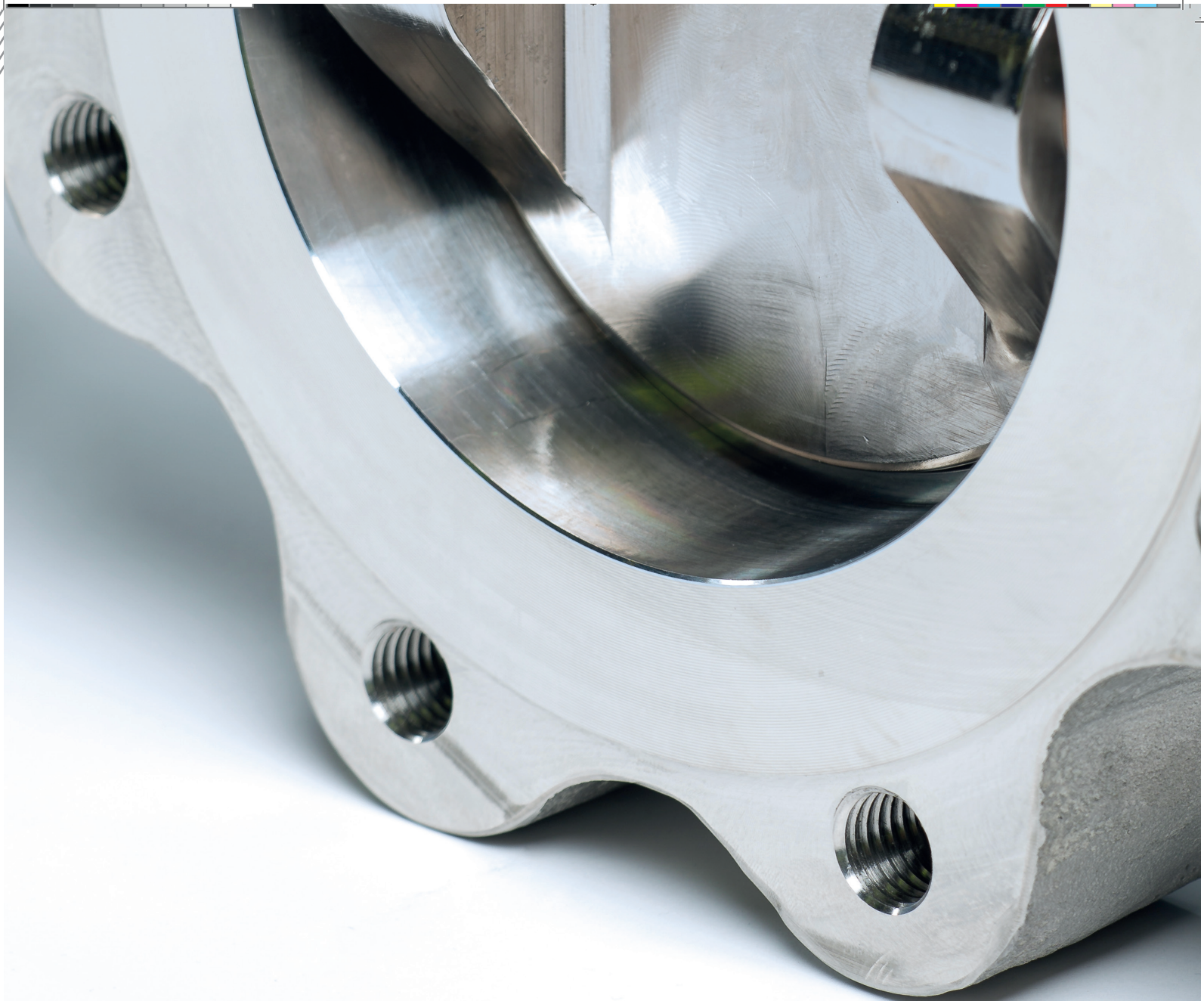
KENT GREENES is founder and president of Greenes Consulting. He also serves as Senior Fellow Human Capital & Program Director for The Conference Board's Knowledge & Collaboration Council and Change & Transformation Council. Reach him at kent.greene@conference-board.org.



5 Generations Working In Today's Workforce

- Traditionalists:** 75 years+ comprise about 5% of workers.
- Baby Boomers:** 56 to 74 are moving toward retirement age or are already there but are not retiring as quickly as had been expected. They still make up about 25% of the workforce.
- Generation X:** 41 to 55 represents 33% of the workforce.
- Millennials:** also called Generation Y (25 to 40), make up 35% of workers.
- Generation Z:** 0 to 24 are coming into the workforce now and comprise 5%, so far.

Source: Purdue Global University 2020



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□ A 36-inch Class 300 tailings disposal pipeline in Chile

SOURCE: VALVETECHNOLOGIES

Isolation Valves for High-solids Severe Service

Understanding suspended solids and their effect on equipment is critical in choosing isolation valves for slurry service.

BY ROSS WATERS

Severe service involves many kinds of flow conditions and fluids, including slurries that have large concentrations of suspended solid particles. Such slurries can be extremely challenging for piping systems and especially hard on valves. This article explains slurries, the effect they have on valves and how to select or design valves for severe slurry service. Of the two types of industrial valves—control and isolation—we focus here on isolation valves.

SLURRIES: LIQUIDS WITH SUSPENDED SOLIDS

A slurry is a two-phase mixture of solid particles and liquid. Slurries are commonly encountered in mining, mineral processing and many other applications. They range from homogenous suspensions of fine, slowly settling particles to

heterogeneous mixtures of coarse, more rapidly settling particles (Figure 1). Slurries can behave like water or thick paste or anything in between, depending on the solids content (Figure 2). Experts debate about how much solids content constitutes a slurry. For purposes of this article, we assume a solids content of 10% or more by weight.

In models of slurry flows, the particles can be divided into two groups:

- Fine particles that mix with liquid, creating a carrier fluid that has a higher density and different flow characteristics than the liquid phase
- The coarse particles suspended within the carrier fluid

To characterize the slurry, factors

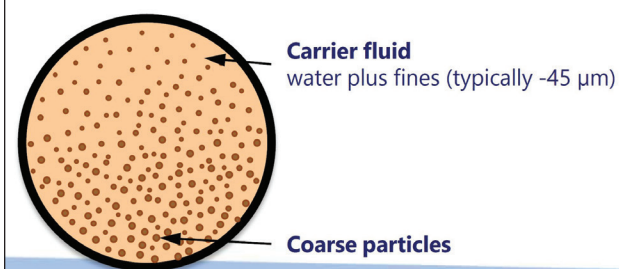
such as the size distribution of particles, their general shape and symmetry and the specific gravity of the solids are taken into consideration.

Sometimes, the solids in a flow are fully or partially dissolved, but they precipitate out of solution in the pipe and valve, forming scale (Figure 3). This presents additional design challenges, including the need to size actuators large enough to deal with the scale.

ABRASIVE PARTICLES ON THE MOVE

One of the particularly challenging aspects of slurry flows is how abrasive they are. Abrasion damage occurs from solid particles striking the surfaces of valve components. This damage happens in addition to any corrosion and erosion that occurs.

□ Figure 1. A slurry is a two-phase mixture.



SOURCE: PATERSON & COOKE

□ Figure 2. Different densities of slurries

Low Density Slurry



High Density Slurry



Paste



SOURCE: PATERSON & COOKE

Table 1. Valve position and lifecycle wear

Valve Type	Position	Phase	Severity	Determining Factors
Isolation	Open fully	Steady dynamic	Medium	Pipeline flow variation
Isolation	Cycling closed	Accelerating dynamic	High	Number/duration of cycles
Isolation	Cycling open	Decelerating dynamic	High	Number/duration of cycles
Isolation	Closed fully	Steady state	Low	Tightness of closure

The size, shape and hardness of the slurry particles (Figure 4) affect abrasion, as does the percentage of solids content. Flow characteristics also matter, including the velocity and the angle at which the slurry particles impact valve components.

SELECTING THE RIGHT VALVE FOR THE JOB

To select or design the right valves in challenging applications involving slurry flow requires drilling down to what the valves must do.

For isolation valves, think not only of the data that normally comes from suppliers about their valves—factors such as the absolute highest pressures, temperatures and media—but also what the valve is doing in the application that either helps or harms longevity of equipment service. People don't usually pay enough attention to the valve's operating cycle.

An isolation valve operates in two static positions: fully open and fully closed. In addition, this valve sometimes goes from one position to the other, creating a dynamic situation on opening or closing. Each condition affects wear on the valve (Table 1).

LOW-PRESSURE SEVERE SLURRY APPLICATIONS

Low pressure is a subjective term; for purposes of this article, we'll label "low" as below ASME Class 600—

below 1450 psi (10 megapascals or MPa). The most appropriate choice for isolation valves in this regime of slurry applications is the guided shear gate valve. This type of valve, invented in 1960 but still not well known, can handle all high-solids applications at these pressures, including pastes. For this service, the valve needs to be designed with elastomeric or polymeric seats and hardened body, gate and wear rings.

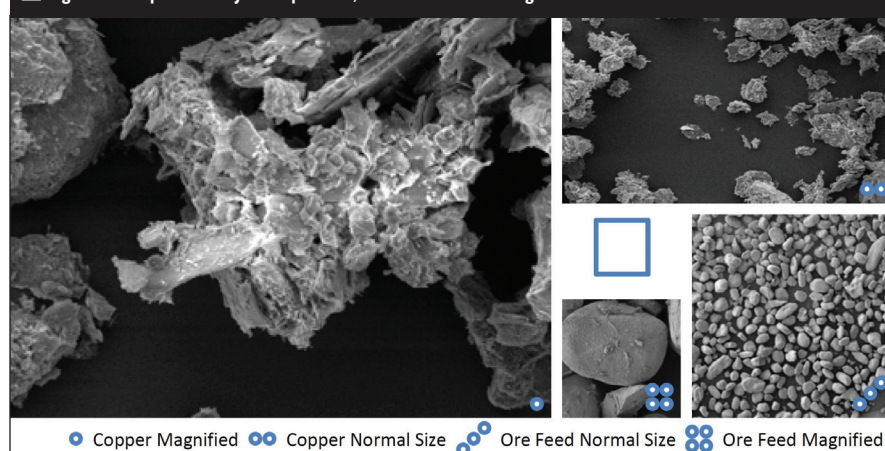
This type of valve is available up to ASME Class 1500. Although one of the five types of knife gate valves, in this case, the valve really is a knife gate. In fact, it is the only knife gate design that can truly cut. Figure 5 shows the

guided shear gate partially open and fully closed, as well as its chisel tip.

HIGH-PRESSURE SEVERE SLURRY APPLICATIONS

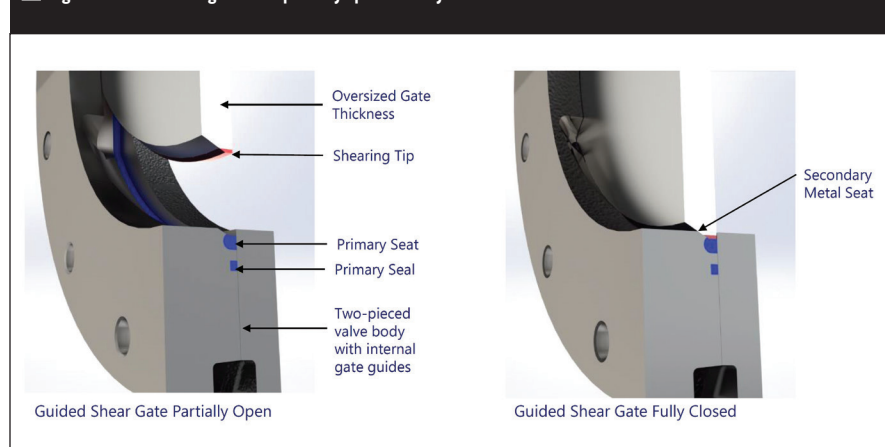
For high-pressure applications—Class 600 and up—metal-seated ball valves are known to be the most effective for use with high-concentrate solids. They also can be useful down to Class 150. This is not just a floating ball valve with its Teflon seats removed and replaced with Stellite or tungsten carbide. It is a ball valve designed specifically to be a metal-seated valve. The fits, tolerances, machining, materials and design are much more challenging to produce, but these are necessary to achieve the degree of

Figure 4. Examples of slurry solids particles, near actual size and magnified



SOURCE: PATERSON & COVE

Figure 5. Guided shear gate valve partially open and fully closed



SOURCE: DSS VALVES INC.

Figure 3. Dissolved solids precipitated scale in a brine transfer pipe



SOURCE: GCS

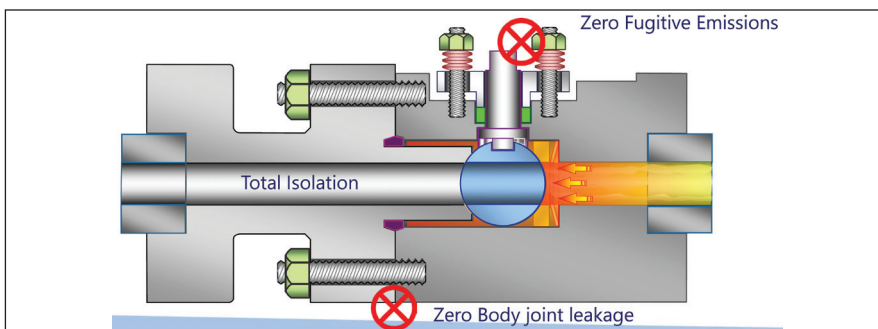


Figure 6. Metal-seated ball valve

SOURCE: VALVE TECHNOLOGIES



Figure 7. Valve and actuator designed to close through 1 inch of scale

SOURCE: CGIS

isolation tightness required.

The advantage of this valve is there is no place for the slurry to get behind the primary sealing components, which means one of the possible leak paths is eliminated.

Notice in Figure 6 on the downstream side, the ball is pushed not only by the differential pressure, but by the Belleville load spring pushing the upstream seat onto the ball and forcing the ball onto the integral seat. The ball and seat are mate-lapped together to produce a very fine seal that can be tested, even with nitrogen, to allow zero bubbles—which creates a true zero-leakage seal. Why is this important? Because if this is used with a slurry and the liquid leaks out, leaving behind the solids, the result is a plug. After that, the valve may open and close, but the process won't move.

ACTUATORS FOR THIS KIND OF SEVERE SERVICE

Actuation for valves in severe service with slurries must be able to generate significantly higher forces than for general-purpose valves in ordinary applications. The size/capacity should be based on the worst-case conditions that could exist. Figure 7 shows a 10-inch valve with a 22-inch-bore actuator cylinder that was designed to cut through one inch of scale, which could happen if the customer's process got out of hand. This situation was anticipated with the design of the actuator shown in Figure 7.

SLURRIES IN MINING AND MINERAL PROCESSING

In the mining and mineral processing industry, slurry pipelines are often the least expensive way to move materials such as ore concentrates and tailings.

The alternative would be by rail or truck.

Isolation valves in high-pressure slurry transportation systems serve to isolate pump discharge, pipelines, rupture disks and instruments, as well as in choke stations. Other slurry applications in this industry are in autoclave processes, mineral concentration and disposal of tailings. The photo on page 26 shows a 36-inch Class 300 tailings disposal pipeline in Chile. Such installations are not inexpensive; but if done properly, they can last for decades.

Sometimes a mine is situated at high altitudes, but the processing plant is at a much lower elevation. In this case, the concentrate slurry feeding down the mountain can develop a significant pressure head. Along the way, choke stations reduce that head by changing the angles of the process flow and pushing it through fixed chokes. This was used effectively at a choke station on an ore feed pipeline in Madagascar carrying nickel-cobalt ore concentrate. The mine is at 5,000 feet (1,524 meters) elevation and is 124 miles (200 kilometers) away from the sea-level ore processing plant.

KEYS TO SUCCESSFUL DESIGNING

As with any system, good practices apply with slurry systems. However, since the flow can be extremely abrasive, flow control is especially important. To minimize damage, the flow should be kept as consistent and uniform as possible. The following guidelines apply:

- Avoid abrupt changes and dead legs in the piping system.
- Maintain a homogenous flow

to help keep the solids in suspension.

- Accurately define the critical velocity (the velocity at which turbulence is likely to occur).

When designing or selecting valves for a slurry system, here are some considerations:

- Select the right materials for the flow conditions.
- Choose the type of valve appropriate for the pressure in the system, high or low.
- Protect internal components with hard coating.
- Size actuators generously.

When specifying a severe-service isolation valve, complete information is needed regarding the operating conditions, including normal valve position and how often that valve will move. When selecting a supplier, look for those with experience designing or sourcing valves for the specific kind of severe service in the system. Do not expect a manufacturer that makes only general-purpose valves to understand the needs of severe service.

These special isolation valves for severe service can be costly. However, when they offer a long operating life, the initial investment will be worthwhile by preventing lost production or the need for repair or premature replacement later in the lifecycle of the equipment. **WM**

ROSS WATERS is chairman and head of international business development at CG Industrial Services (cgis.ca), Vancouver, BC. He has more than 40 years of experience in severe service applications and serves on ASTM and MSS committees. Ross is committed to publishing a new standard practice on SSVs. Reach him at ross@cgis.ca.



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A Reference Manual on Elastomers

BY JOHN BALLUN

The history and general application of elastomers in pipes, valves and fittings is the subject of the recently published Manual of Practice developed by the American Water Works Association (AWWA).

Most water infrastructure piping and equipment contain seals, gaskets or packing made of synthetic elastomers that have been developed over the last 100 years. The AWWA Standards Committee on Gaskets studied elastomers and their application for over two decades and have published their knowledge and recommendations for elastomer selection and use in a new AWWA Manual of Practice, M75. It is hoped that this document will serve as a foundation of elastomer knowledge and guide other product standards committees in the drinking water industry to develop standard requirements for seals, diaphragms, gaskets and packing used in piping and valves. Figure 1 illustrates an elastomeric expansion joint, valves that have seals and piping with flange gaskets.

TYPES OF ELASTOMERS

Elastomeric pipe gaskets, equipment linings, diaphragms and seals have played an essential role in water distribution and the operation of water and wastewater treatment system equipment, most of which are expected to last many decades. Elastomers are used in joining pipes and fittings, sealing valves and other equipment under a wide range of pressure, temperature and chemical environments. The wide array of elastomer types in use today are enhanced with additives to provide improved mechanical and environmental resistance to match the intended application and can be molded or extruded into the desired shape. Since there are no defining AWWA or ASTM standards for specific elastomers used in the waterworks industry, it is important for design engineers to understand the chemis-



Figure 1. Pipe, valves and fittings in a treatment plant

try, properties and test methods associated with elastomers when selecting and specifying their use.

Some of the common elastomers identified for use in waterworks service include:

- Polyurethane
- Neoprene (Chloroprene)
- Chlorosulfonated Polyethylene
- Ethylene Propylene Diene Monomer (EPDM)
- Fluorocarbon (FKM)
- Butyl (Isobutene Isoprene)
- Nitrile (Acrylonitrile Butadiene)
- Synthetic Natural Rubber (Polyisoprene)
- Styrene Butadiene (SBR)
- Silicone (Polysiloxane)

ASTM International publishes a classification system of the properties of vulcanized elastomeric compounds in Standard ASTM D2000. The system is used to categorize rubber products based on their characteristics such as resistance to oil exposure. Basic requirements are established for each type and class along with additional requirements to reflect the intended

purpose of the material. A "line call-out" is used to specify the properties of the material so that properties are easily understood. For example, a typical line call-out for a Nitrile compound can be:

M-4-B-G-7-14-A13-B13-C12-EA14

Where:

M	=	SI unit Designation
4	=	Suffix grade of material
B	=	Material Type based on heat resistance (B = 100°C)
G	=	Material Class based on oil resistance (G < 40% swell)
7	=	x 10 is Type A durometer hardness +/-5
14	=	Tensile strength (MPa) (2031 psi)
A13	=	Heat Resistance Test at 100°C
B13	=	Compression Set Test at 100°C
C12	=	Ozone Resistance Test
EA14	=	Water Resistance Test

Table 1. Common elastomers (adapted from the AWWA Manual of Practice, M75)

Elastomer	Common Uses	Normal Temp. Rating	ASTM D2000 Designation Type, Class
Polyurethane	Water, ozone, hydrocarbons, greases	175°F 80°C	BG
Neoprene	Water, salt water, wastewater, greasy waste, UV light	240°F 110°C	BC, BE
Polyethylene	Water, oil, grease, ozone and outdoor service, UV light	255°F 125°C	CE
EPDM	Water, salt water, wastewater, elevated temperatures, outdoor service, UV light, dilute acids, dilute alkalis, ketones, acetone, alcohol	300°F 150°C	BA, CA, DA
FKM	Water, salt water, wastewater, most chemicals and solvents, aromatic hydrocarbons and fuels, chlorinated hydrocarbons, high temperatures	390°F 200°C	HK
Butyl	Water, salt water, wastewater, low permeability, outdoor service	230°F 110°C	AA, BA
Nitrile	Water, salt water, wastewater, refined petroleum hydrocarbons, chlorinated solvents, fats, greases	250°F 120°C	BF, BG, BK, CH
Natural Rubber	Water, salt water; not for use with residual disinfectants or hydrocarbons and chlorinated solvents	212°F 100°C	AA
SBR	Water, salt water, wastewater; not for use with hydrocarbons and chlorinated solvents	212°F 100°C	AA, BA
Silicone	Water, salt water, wastewater, outdoor service, hot air, electrical insulation.	420°F 215°C	FC, FE, GE

By referencing the ASTM D2000 specification, an engineer can specify the test requirements and specifications for a particular elastomer type and class of rubber compound. Some of the typical properties of the listed elastomers are given in Table 1.

SELECTION OF ELASTOMERS

When selecting an elastomer, consideration should be given to the cost, function of the elastomeric part and environmental conditions. Each elastomer will have a temperature rating at which point some mechanical properties of the elastomer will be degraded. The chemical environment is evaluated with knowledge of the chemical concentration, length of exposure and the surface area of the elastomeric part. Certain pipe gaskets may degrade with exposure to ground-water contaminants, but because of their design, only a small surface of the gasket may be directly affected. It is also important to understand the failure mode of the elastomeric part. A butterfly valve seat may be damaged if it is subject to significant swelling in service. A valve diaphragm must retain its strength and strain ability

throughout its life. Chemical resistance guides for elastomers are readily available to evaluate elastomers in various chemical environments.

In addition to resistance to chemical and temperature effects, the designer must understand the physical properties of elastomers. On a



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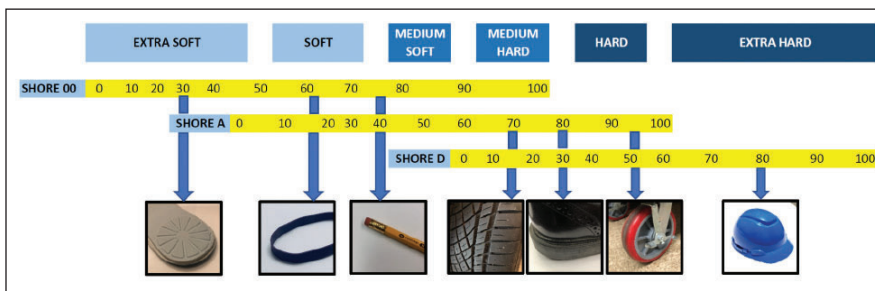


Figure 2. Shore Hardness Scales for elastomers

mechanical basis, elastomers must resist excessive distortion, tear, aging and permanent set while subjected to various pressure, compression and shear load requirements. Once the seal designer quantifies the load and stress condition, the characteristics of various elastomers can be evaluated. Elastomers can be formulated with various additives and chemicals and cured to varying process parameters to achieve the desired strength requirements. The resultant mechanical strength, elasticity and chemical stability can vary widely between elastomers.

To assist the designer in selecting a compound, several standardized tests

have been developed to specify and measure various strength properties of elastomers. For example, pipe gaskets are tested for tensile strength, ultimate elongation, compression set and hardness. Each of these properties are quantified using specific ASTM test methods. Elastomers can be produced in different hardness and tensile strength to work at low pressure or high pressure. Figure 2 illustrates some of the common hardness scales used to measure elastomers.

STORAGE OF ELASTOMERS

Elastomers in products undergo changes in their physical properties

over time, including excessive hardening, softening, cracking, crazing or other surface degradations. These changes may be the result of a single factor or a combination of factors, such as the action of oxygen, ozone, sunlight, heat, humidity, oils, water or other solvents.

Proper storage methods can increase the life of elastomers in storage. New products should be stored indoors or covered before installation. Exposing elastomeric seals to outdoor conditions with ultra-violet sunlight or ozone and elevated temperatures can rapidly degrade the elastomers. The ideal storage temperature range is between 40°F (4°C) and 80°F (26°C). Lower or freezing temperatures are typically not deleterious to the elastomers. Similarly, humid environments are acceptable.

If products containing elastomeric seals must be stored outside, they should be secured with flange covers and dark-colored shrink wrap to minimize exposure to the elements and keep the parts free from debris. It is recommended to store elastomeric parts in the relaxed condition. Therefore, depending on the design, products containing elastomeric seals are typically shipped in the partially open position. Parts should not be stored near ozone generators, including electric motors, mercury vapor lamps and high-voltage equipment.

CONCLUSION

With the proper selection and care of equipment containing elastomers, you can expect decades of service for the products. M75 provides a basic understanding of elastomers for the waterworks service industry along with detailed descriptions, common uses and temperature ratings for each of the listed elastomers. When selecting elastomers, resistance to certain chemicals should be considered, and a chemical resistance guide is furnished. This manual provides the water industry the knowledge needed to safely advance the use of elastomers in the industry. **WM**

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OWNER: Valve Manufacturers Association of America; Heather Rhoderick, President and Publisher; Judith P. Tibbs, Associate Publisher and Editor-in-Chief

HEADQUARTERS OF PUBLISHER, EDITOR AND PUBLICATION:

1625 K Street, NW, Suite 325, Washington, DC 20006

STOCKHOLDERS; BONDHOLDERS; MORTGAGE; OTHER SECURITY HOLDERS: None

	Avg. No. Copies Each Issue Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
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- ☐ 11 Pollution Control Equipment
- ☐ 12 Other:

Creating a Standard for Severe Service Valves

BY GREG JOHNSON

The term “severe service” has been used to develop new valve markets and even create popular new valve types, such as severe service ball valves. That term also has likely been misapplied as much as it has been correctly used.

If you are a process control operator in a plant, you might consider every energy-containing pipe run and valve to be severe service, since the results of a valve failure could be costly or hazardous to your health. Although virtually every valve contains potentially dangerous energy or controls potentially hazardous fluid, the degrees of danger vary. These service criteria are used to determine the valve’s design or the robustness of a valve to safely handle a particular service application.

Often a standard off-the-shelf, “general purpose” vanilla valve will suffice in a particular service and perhaps last for decades without replacement. When a few operating or fluid characteristics are changed, the vanilla valve may need to have a bit of chocolate syrup and a cherry on top (a fit-for-purpose valve) to operate effectively. And when the combination of service criteria is harsh, a banana-split (severe service valve) is called for.

Some flow control conditions/service applications that are often considered severe include the following:

- Autoclave let-down
- Boiler feedwater
- Choke valves
- Coal gasification
- Compressor anti-surge
- Fluids with high outgassing potential
- HP separator drains
- Minimum flow recycle
- Molten salt
- Toxic/lethal service

Severe service valves are offered in several standard designs, including non-return (check valves), isolation and control types. There is generally



agreement in the valve industry as to the definition of a severe service control valve; however, isolation and check valves do not yet have that degree of differentiation, so a proper severe service definition will be welcome for those valve types.

Non-return valves for severe service applications should be treated as control valves and sized so their operation is consistent with the flow rates of the process, rather than the pipe size they are typically sized for. This resizing often goes against the perceived logic that the check valve size should match the pipe run size.

A MOST DIFFICULT JOB

Severe service isolation valves may have the most difficult job in a piping system. They are designed to move from a static state (either fully open or fully closed) to a dynamic state, usually in a matter of seconds. The effects of this near-instant energy release combined with the requisite pressure/temperature and other service-related issues often create a severe environment in which the valve must operate.

Although all these valves, especially the isolation valves, have been closure tested in accordance with a variety of production testing standards, such as the American Petroleum Institute (API) 598, Manufacturers Standardization Society (MSS) SP61, or the Interna-

tional Organization for Standardization (ISO) 5208, these tests are hydrostatic and not dynamic in nature, so the exact emulation of in-service flow control is not achieved. This situation makes gathering and analysis of all the service conditions especially important in the selection of the proper severe service isolation valve.

So just what does “severe service” mean? To clarify the definition of the phrase, the Manufacturers Standardization Society (MSS) is in the process of creating a standard practice (SP) that will help define severe service in a logical, scientific way.

SCOPE OF NEW MSS STANDARD PRACTICE

The new MSS SP is appropriately titled Severe Service Valves, and its stated purpose is: “To provide a method to categorize valves by the severity of the service conditions they will encounter in an application. The categories are to be used as a guide for specifying appropriate requirements for special design features, materials of construction, non-destructive testing, quality inspections, cleaning, painting/coating and testing relative to the service conditions the valve will encounter.”

The purpose further provides that “the definition and common categorization of valves by their severity of service assists in the proper specification and selection of valves, which improves process performance, increased reliability, plant safety and environmental protection.”

To classify the degree of severity, a weighted matrix has been created, where specific service-related parameters are input and calculated for a final score. Some of the determining factors include cavitation, fluid velocity, frequency of operation, process design pressure, process design temperature, toxicity and flammability.

Here is an excerpt from the severe service data input table of the proposed MSS document showing some of the service condition parameters along with their respective scoring:

TABLE 1
Application Severity Checklist for Valves

Corrosivity (average penetration per year)

Mils/year	< 2	2 – 20	> 20
Microns/year	< 51	51 – 510	> 510
Value	0	5	10

Score

Velocity, Gas

ft/s	< 80	80 – 165	> 165 – 325	> 325 – 400	> 400
m/s	< 25	25 – 50	> 50 – 100	> 100 – 125	> 125
Value	0	3	5	8	10

Score

Velocity, Liquid

ft/s	< 6	6 – 13	> 13 – 20	> 20 – 32	> 32
m/s	< 2	2 – 4	> 4 – 6	> 6 – 10	> 10
Value	0	3	5	8	10

Score

Velocity, Slurry

ft/s	< 3	3 – 6	> 6 – 10	> 10 – 16	> 16
m/s	< 1	1 – 2	> 2 – 3	> 3 – 5	> 5
Value	0	3	5	8	10

Score

Frequency of Operation

cycles/24 hrs	< 2	2 – 14	> 14 – 70	> 70 – 700	> 700
Value	0	3	5	8	10

Score

Process Design Pressure

psig	< 150	150 – 750	> 750 – 2500	> 2500 – 7250	> 7250
barg	< 10	10 – 50	> 50 – 170	> 170 – 500	> 500
Value	0	3	5	8	10

Score

Process Design Temperature

°F	< 100	100 – 400	> 400 – 800	> 800 – 1000	> 1000
°C	< 38	38 – 200	> 200 – 430	> 430 – 540	> 540
Value	0	3	5	8	10

Score

Toxicity

<i>Service Limit</i>	not toxic	moderately toxic	extremely toxic
Value	0	5	10

Score

The new document will classify valves in three categories:

- **General Purpose Valve:** Valves that are typically produced in large quantities complying with one or more frequently requested industry standards. They are sometimes referred to as commodity valves and are regularly available in distributor stock.
- **Fit-for-Purpose Valve:** A general purpose valve modified with one or more alterations to part dimensions, materials of construction, factory cleaning, surface preparations, testing or packaging.
- **Severe Service Valve:** A valve that is specifically engineered for an application.

A NEW MSS COMMITTEE

As you might imagine when creating a new standard, there is much debate on the categories and relative weight that each category carries in reaching the final severity score. As the drafts are tweaked and voted on by the workgroup, the tables are being adjusted. Work on this standard is being performed under the auspices of a new MSS committee: Com. 410, Severe and Special Service Valves. This group also will create standards for valves in other applications.

This new MSS SP will be a useful tool for both the engineer and manufacturer when deciding just what type of valve should be selected for a given set of operating conditions. The document, when used with the American Petroleum Institute (API) Recommended Practice (RP) 615

Valve Selection Guide, should be a great help in valve selection for valve professionals.

If you are a valve manufacturer or a valve service company and would like to be involved in this important standards creation work, please contact David Thompson at MSS (dthompson@msshq.org), or visit the MSS website (www.mss-hq.org). ❧

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Severe service expert **Ross Waters** (ross@cgis.ca) of CGIS has been active in development of a new standard practice on SSVs. We acknowledge his contributions to this article.

Extended Reality Tools Enhance Training

BY BARBARA DONOHUE

Training becomes increasingly critical as companies deal with the retirement of more and more knowledgeable, experienced staff. New technologies can help field service engineers become productive quickly while they are learning. Roy Gentry, national training manager at Mazak Corporation, offered some examples in a presentation at the 2020 VMA Virtual Valve Forum. New technologies, especially mixed reality, can train and assist folks in the field as if experts were right there with them.

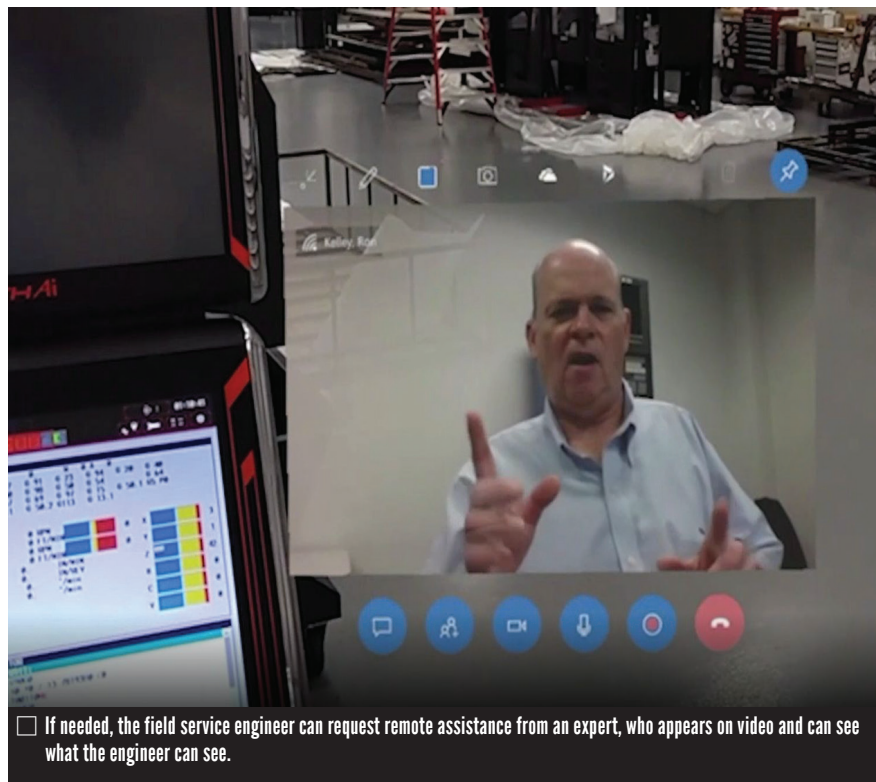
FOUR INDUSTRIAL REVOLUTIONS

To provide some context, Gentry noted what distinguished the industrial revolutions.

- The first, which occurred in the decades around 1800, marked the transition from human or animal work to water and steam power as the source of energy for manufacturing.
- In the second industrial revolution, water and steam power gave way to electricity as the source of energy, starting in the late 1800s. Other changes included the division of labor and development of assembly lines that increased productivity.
- In the third, electronics and information technology made automation widespread in the last half of the 1900s.
- Now, in the 21st century, the fourth industrial revolution, known as *Industry 4.0*, realizes the potential of networked and information technologies such as the Internet of Things, artificial intelligence, machine learning, augmented and virtual reality, and big data.

DIGITAL TWINS

Another aspect of Industry 4.0 is the use of digital twins. A virtual model of a real-world asset or process—its digital twin—can act as a bridge between

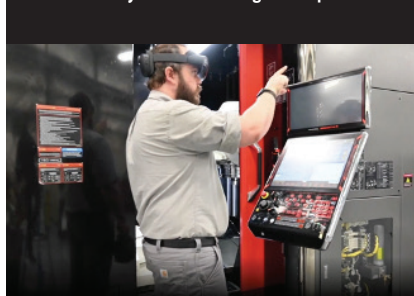


□ If needed, the field service engineer can request remote assistance from an expert, who appears on video and can see what the engineer can see.

the physical and digital worlds. You can try out changes on the virtual twin, evaluating them before making any changes on the real-world version. A twin also allows for data analysis and system monitoring that can help prevent downtime.

A virtual model can also be useful in training. "If I can make an exact digital replica of a machine, and put it in a virtual environment, a service technician can go in and take things apart and diagnose things," Gentry said. This can be safer than working on the real thing, allows repeating the same operations and prevents damage to the real machine.

□ A Mazak field service engineer uses a head-mounted mixed-reality device to follow guide steps.



EXTENDED REALITY

Extended reality is an umbrella term that encompasses all immersive digital technologies. It includes the following:

- **Augmented Reality** adds images or data to a view of the real world. A simple example is a translation app. Aim your phone's camera at written words and the app shows the translation. You can use a smartphone or a tablet for augmented reality experiences or a head-mounted device such as a voice-operated Android unit with a small display positioned in front of the user's eyes.
- **Virtual Reality** places the user in the midst of a created space and requires a closed viewer so users cannot see their actual surroundings.
- **Mixed Reality** takes augmented reality further. It allows you to manipulate digital images as if they actually existed in the real world. Certain

head-mounted devices that track hand and eye movements are designed for this so the user can move and interact with computer-generated images as if they were real.

TRAINING IN A VIRTUAL SPACE

Virtual reality can be useful in a classroom context. However, since the viewer obscures all of the actual surroundings, it would be too dangerous to use on the shop floor.

Augmented reality offers some useful abilities, such as popping up instructions on request.

Mixed reality, however, is well-adapted to training and real-time assistance. The software scans the environment, creating for itself *spatial anchors* to mark the locations of real-world objects. The user can attach computer images to the objects.

MIXED REALITY IN THE FIELD

Mazak has been using mixed-reality software to train field service engineers, aid them as they perform maintenance and give them expert

help when needed. The field engineer wears a head-mounted display specifically designed for mixed reality.

In training mode and for normal maintenance, the software guides the engineer what to do, step by step. For example, when there is a button to push, a hand icon appears over the button on the console. If written instructions are needed, they appear on request.

If a situation occurs that is beyond the engineer's current knowledge, a quick request for assistance brings up an expert on video, who can be present virtually to walk through troubleshooting and repair.

STEP BY STEP

During his presentation at the Valve Forum, Gentry showed a video of the software tools Mazak is using (see figures), along with comments from staff about the value of these training and assistance options.

"With [this display and software] you can call me with a problem, or a customer can call me with a problem," said Ron Kelley, Mazak maintenance training instructor, "and I can

walk them through the whole problem by seeing what's going on."

The mixed-reality guide and remote assistance software "absolutely have improved productivity. I can send out a younger engineer who's very smart and very experienced but not with Mazak machines," Kelley said, "and it's almost like I send him with an experienced person. It's a total game changer. Otherwise, we'd have to pair him up with a seasoned Mazak engineer for four, five, maybe six months to gain all that experience."

For the past 15 or 20 years, we've been wondering how to fill the skills gap left by Baby Boomer workers retiring, Gentry said. "We're dealing with how do we take all of that knowledge and give it to the individuals coming up now. The key here is how do we develop the new generation to utilize the new technology and take the knowledge from the retiring generation and apply it? We really need both." ■

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www.pioneerindustrial.com

Precision Fitting and Gauge

Tulsa, OK
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Precision Pump & Valve Service

Charleston, WV
www.ppv.com

Precision Valve Group

Monroe, NC
www.precisionvalvegroup.com

Puffer-Sweiven

Houston
www.puffer.com

Renew Valve & Cleveland Valve

— FCX Performance Companies
Carleton, MI/Cleveland
www.renewvalve.com
www.clevelandvalve.com

Riggio Valve

Bayonne, NJ
www.riggiovalve.com

Setpoint Integrated Solutions

Baton Rouge, LA
www.setpointis.com

Southeast Valve Inc.

Charlotte, NC
www.sevalve.com

Southern Valve Service, Inc.

Baton Rouge, LA
www.southernvalve.com

TEAM Industrial Services

Houston
www.teaminc.com

United Valve

South Houston, TX
www.unitedvalve.com

Universe Machine Corporation

Edmonton, AB Canada
www.umcorp.com

Valve Reconditioning Service Co.

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www.vrsinc.net

ValvTechnologies

Houston
www.valv.com

VRC ASSOCIATE MEMBER**EFCO**

Charlotte, NC
www.efcousa.com

Quality Valve

Mobile, AL
www.qualityvalves.com

For more information on joining the Valve Repair Council, contact Marc Pasternak at 202.331.0104 (mpasternak@vma.org).

Mueller has expanded capabilities of the Super Centurion hydrant so it can now serve as a communications hub and physical platform for both pressure monitoring and leak monitoring systems. The company's pressure and leak monitoring solutions can be integrated seamlessly into existing water infrastructure and communicate via the cellular network to the cloud-based Sentryx Water Intelligence Platform.



The scalable Sentryx platform records and displays important data communicated from the hydrant, providing utilities with insights to make informed decisions on increasing the life of their infrastructure and lowering future capital and operational costs.

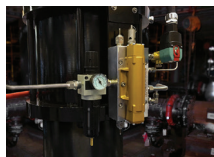
AUMA TIGRON

actuators meet the exacting requirements of the global oil and gas industry. TIGRON combines the highest level of explosion protection, robust design, outstanding ease of operation, and the latest trends in digitalization. The versatile all-rounder provides safe and reliable valve automation across all application sectors, including oil and gas production, pipelines, tank farms and refineries.



TIGRON actuators are ATEX and IECEx certified for the highest gas group IIC, which includes highly flammable hydrogen. The actuators are designed to withstand the harshest environmental conditions, covering a particularly wide temperature range.

Cowan Dynamics announces advancements to its C-PAC Module Pneumatic Manifold and the launch of the C-PAC store. The C-PAC (Cowan's Pneumatic Actuator Control) is an out-of-the-box solution and can save up to 90% in assembly time and easily automate valve actuators without using cumbersome and costly piping to connect various automation components.



Its preassembled manifold configuration eliminates potential leak points and time-consuming troubleshooting that normally would occur with conventional

manual installations.

The online store gives valve automation centers and technicians the ability to easily configure the C-PAC module with over 35 variations for their application.

TRILLIUM Valves USA

announces the shipment of its first order of Atwood & Morrill Forged Wye Globe Valves. This valve is the first of nine forged F91 wye stop check valves for high-pressure main steam lines to be installed at three combined cycle plants in the southeast U.S.



Atwood & Morrill developed the forged ASTM A182 F91 valves to address life cycle concerns that have been identified by combined cycle power plants using cast ASTM A217 C12A valve bodies. Forged valves minimize material defects and provide better quality and longer life valves.

Velan's Torqseal 2.0 triple offset valves are engineered to deliver repeatable full bidirectional zero leakage, lower torques and superior fugitive emissions performance.



Velan has leveraged 20 years of triple offset valve experience in handling critical applications in the navy, nuclear and process industries, and an extensive R&D program to bring customer-driven enhancements and optimizations to the Torqseal 2.0 design. This versatile valve provides lower cost of ownership through improved service life, fugitive emissions control, less downtime and lower maintenance.

Victaulic has launched the new Victaulic Series 124 Installation-Ready butterfly valve for HVAC applications. This product brings an innovative solution to an area of piping that has stayed stagnant for close to half a century. The new butterfly valve will offer customers numerous benefits. It enables 360-degree positioning for optimum flexibility and is for a deliberately low profile in terms of weight and size.



The valve is available in DN50 – DN200 | 2" - 8" sizes and is specifically designed for systems up to 16 bar | 1600 kPa | 232 psi and for bi-directional service to full working pressure.

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VALVE FORUM

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MARKET OUTLOOK

Hear projections on end-use markets and the economy from top economists and industry experts—scheduled for August, perfect timing for 2022 planning.

ANNUAL MEETING

Our premier members-only gathering, this fall hybrid event will have both in-person* and virtual elements—and abundant networking opportunities.

VALVE BASICS

Valves 101 and 201 courses PLUS the Valve Petting Zoo—purchase video lessons and/or attend our in-person* event this fall. And watch for our new “Ask the Instructors” sessions.

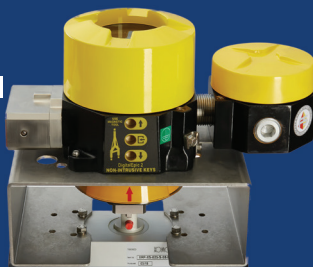
WEBINARS

Look for new webinars monthly, covering breaking issues such as COVID-19, tariffs, government regulations and HR/employment law as well as topics such as materials, standards, critical service issues, cybersecurity, supply chain and more.

Receive PDHs (professional development hours) for participating in VMA's educational events!

*tentative

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