

COMING UP: LEADERSHIP AND VALVE FORUMS

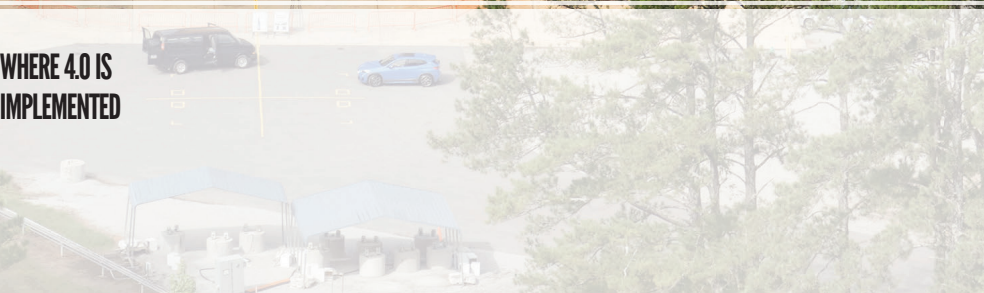
VALVE

MAGAZINE
WINTER 2020
VOL. 32, NO. 1

VALVES IN SPACE



- : ESG PROGRAMS
- : VMA'S NEW PRESIDENT AND CHAIRMAN
- : CYBERSECURITY AND DIAGNOSTICS
- : WHERE 4.0 IS IMPLEMENTED



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WHERE VALVES ARE USED: **SPACE**

Valves that travel on one of the rockets that go into space or on one of the space stations orbiting the Earth face conditions and challenges never before experienced. NASA's valve group helps the agency meeting those challenges.

BY BARBARA DONOHUE



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Digitizing our factories has brought an onslaught of new issues related to how to protect plants from cyberthreats.

BY LEO HUGHES

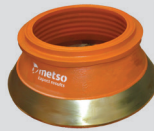
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The association gained two new leaders last fall: Heather Rhoderick, who is VMA's new president, and Bryan Burns, chairman of the board. They share their views and goals.

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- » Back Pressure Control Valve
- » Fractional-size Valve
- » Cartridge Seals

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How to Get the Most from Your Control Valves

Selecting the right control valve for a given application is necessary, but so is pairing the valve with a compatible actuator. Factors in a valve/actuator combination that can cause problems include insufficient resolution, excessive backlash/deadband or increased friction at high operating temperature.

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- » Online Marketplaces Moving into B2B
- » Managing Valves in EPCM Projects
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www.vma.org

New Frontiers Ahead



It many ways it seems fitting that the start of a new decade coincides with my first column in VALVE Magazine as president of VMA. While I've never been one to make resolutions at the start of each year, I do find it's important to take time to reflect both on what has come before and what may lay ahead.

Looking back on VMA's 80-plus year history, it is clear the strength of this organization begins with its members. With their guidance, VMA has supported the industry's growth by providing a platform for forming business relationships, developing approaches to solving issues of common concern, being a thought leader for knowledge and education, and advocating on behalf of the industry. As an association, we have addressed asbestos, fugitive

emissions and manufacturing issues; provided education to end users and all those in the value chain; and provided a place for those in the industry to network and learn from each other.

As I learn more and more about the industry and its members, I have no doubt that our future holds even more promise, new opportunities and exciting developments for the valve industry and VMA. In the pages of this issue, you'll find some of what those issues are, and you'll see that these issues are significant, impactful, challenging, and they have the potential to affect our world. From cybersecurity to determining our environmental and social responsibility to space travel, the flow control industry humbly enables much of what this world relies upon for today's and tomorrow's ways of life.

VMA's strength will continue to be based on a strong foundation of members as well as the others we work with to drive the industry forward. If your company isn't already a member, join us! If your company is a member, we thank you for the time and resources already committed, and we encourage others in your organization to get involved. We promise you—and they—will get as much out of that involvement as all of us put into it.

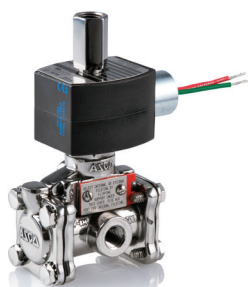
As you'll see reading this issue, there is much we can work on together. VMA is here to help the industry make sense of the challenges and improve the operating platforms of its members—whatever, or wherever, the new frontiers may take us. I look forward to what's ahead!

Heather
Heather Rhoderick, CAE
President



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NEW CONTRACTS

Emerson Automating Canadian Coal-to-Gas Projects

TransAlta Corporation selected Emerson as the main automation contractor for planned conversions of coal-fired units to natural gas. This project is part of TransAlta's \$2 billion Clean Energy Investment Plan, which will convert existing coal assets in Alberta, Canada, to natural gas.

Emerson will lead the design, procurement, installation and commissioning in replacing

automation systems at the Sundance and Keephills power plants. The project is expected to be completed by 2024.

Curtiss-Wright, Clarke Valve First to Meet DoD Spec

The U.S. Naval Sea Systems Command published specification criteria for the design, materials and functional capabilities of "dilating disk" valves for flow control of Naval shipboard water, oil and gas service. Clarke Valve's shutter valve, which is licensed to Curtiss-Wright Corporation, is the only



valve on the market that can currently meet the combination of key attributes for the U.S. Navy's goals of reducing weight and increasing efficiency

to modernize the fleet. All valve products delivered to the U.S. Navy appear under the Curtiss-Wright brand name through its Target Rock business unit, East Farmingdale, NY.

MARKET FOCUS: Industrial Valve Shipments Won't Grow Significantly

Growth in shipments of valves for 2020 will be less than 1%, according to the VMA 2020 Market Forecast of Industrial Valve Shipments. That compares to about 2.5% for 2019.

Overall, shipments to all end-user markets will be about \$4.759 billion, which compares to 2019 shipments of \$4.730 billion.

Still, even though growth is not positive in many end-user industries, a few markets will gain ground including petroleum production, and oil and gas transmission.

Because of that growth, those two markets will increase their share of the market, while water and wastewater will see negative growth in market share for the year.

VMA follows 15 end-user industries. Within those industries chemical now takes the largest chunk at 17.9%, followed by water/wastewater at 16.3% and power generation at 11.7%.

An external forecast prepared by ITR Economics fell in line with VMA's forecast.

Baker Hughes and Ocean Installer Awarded Subsea Contract

Baker Hughes Company and Ocean Installer AS were awarded a subsea contract for the engineering, procurement, construction and installation of subsea systems and associated services for the Balder X project on the Norwegian Continental Shelf.

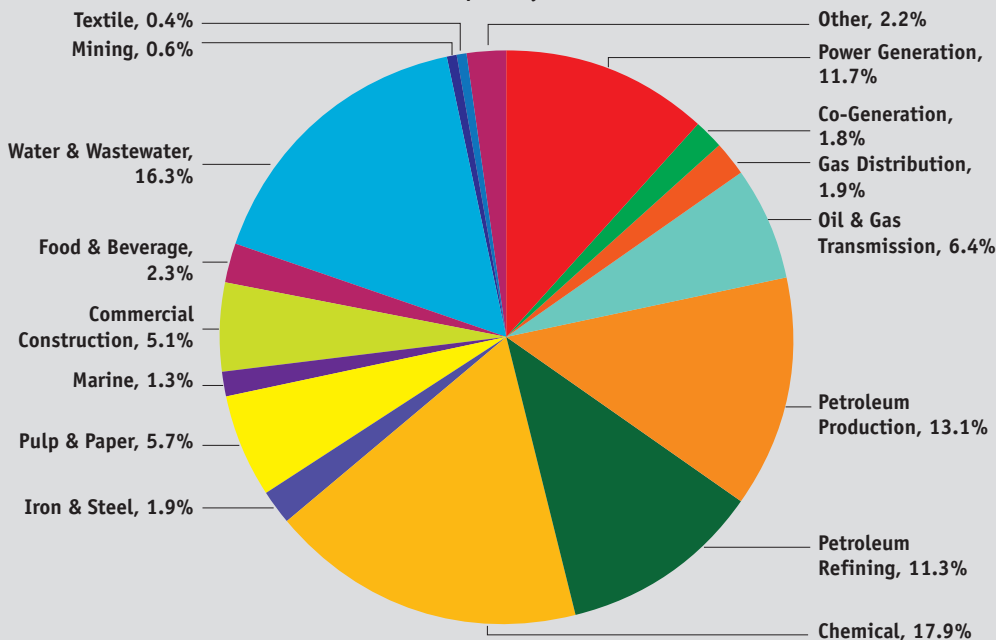
Under the contract, the two companies will engineer, procure, construct and install 16 new subsea production systems, umbilicals, risers and flowlines to the Jotun A floating production storage and off-loading unit. They also will carry out decommissioning work in the field.

RECOGNITION & INVOLVEMENT

VMA Members Named "America's Most Responsible Companies"

Three VMA members were among the 300 organizations named America's Most

2020 U.S. Valve Shipments by End User Markets



Source: Valve Manufacturers Association (www.vma.org)

Responsible Companies by Newsweek and research firm Statista. The ranking involved an assessment of the country's largest companies on a variety of environmental, social and corporate governance categories. Within the Capital Goods category, Emerson ranked No. 1, Flowserve No. 16 and ITT No. 22.

Valtorc International Wins 2019 GLOBE Award

The Georgia Department of Economic Development named Valtorc International a 2019 GLOBE Award winner for having export sales in at least one new international market in 2019.

About 75% of the winners of this award are small businesses with 100 employees or less. The winners collectively expanded their sales into 84 new countries and territories during the year.

Emerson Facility Receives Environmental Recognition

Emerson's fluid control & pneumatics facility in Florham Park, NJ was recently recognized by the New Jersey Department of Environmental Protection for its leadership in environmental stewardship. The facility was highlighted for voluntary and proactive measures taken to improve the environment and foster sustainability. The recognition follows an inspection of the Emerson facility.

Chesterton Expands NSF 61 Certification

To meet the growing demand for certified drinking water supplies, Chesterton has expanded its offering of NSF 61-certified

mechanical seals to include all its single cartridge seals as well as split seals.

Previously, Chesterton's NSF products were limited to the 155 Single Cartridge Seal and the Chesterton 442 with RSC faces. The company recently received approval for all single cartridge seals as well as its flagship split seals.

ASCO Presents Engineering Scholarship Recipients

Emerson awarded two 2019 ASCO Engineering Scholarships to students who demonstrated outstanding potential for leadership and contributions to the engineering profession—Shiloh Curtis, a senior at MIT, and Tristan Ott, a junior at the Missouri University of Science and Technology. Emerson also awarded two grants of \$1,000 to benefit the engineering departments of those two schools.

alliantgroup Once Again Named "Healthiest Employer"

alliantgroup was recognized as The Houston Business Journal's Healthiest Employer for 2019, the second year in a row. The publication awarded the honor in the "small and medium businesses" category during a ceremony on May 23, 2019, in Houston.

To qualify for the award, the nominated companies had to show how they go above and beyond in their promotion and support of both healthy work environments and lifestyles for their employees.

DeZURIK Replaces Old Tool for Local High School

DeZURIK stepped up to revive a shop tool for

students at Sartell High School, Sartell, MN. The machine, a vertical mill, was in relative disrepair until the company paid for a technician to repair and upgrade the machine with a digital screen. A new machine would cost about \$18,000.

NEW FACILITIES

Badger Alloys Expands Capabilities with Major Purchase

Badger Alloys, Inc. bought five parcels of land adjacent to its current facility along the 5100 block of State Street in Milwaukee. The company made the multi-year/multimillion-dollar investment to dramatically improve the company's efficiency, speed and capacity to meet amplified customer demand and anticipated future growth.

The purchase and additional space allow the company to consolidate all its operations within one footprint. This critical strategic decision will enhance collaboration among the company's sand-casting foundry, machine shop and pattern shop.

Baker Hughes Has New Facility in Saudi Arabia

Baker Hughes broke ground on its first chemical manufacturing facility in Saudi Arabia. The company held a ground-breaking ceremony at the facility's PlasChem Park location in Jubail to celebrate the milestone and formalize an agreement with Sadara Chemical Company to supply the facility with feedstock chemicals.

The manufacturing facility will deliver the

FEBRUARY

27-28

VMA Leadership Forum*

New Orleans

www.vma.org/LeadershipForum2020

APRIL

29-May 1

The Valve Forum

Phoenix

www.vma.org/ValveForum

MAY

4-7

Offshore Technology Conference

Houston

www.otcnet.org

JUNE

3-4

Valve Repair Seminar & Exhibits

Houston

www.vma.org/ValveRepairMtg

14-17

ACE20—AWWA Annual Conference & Exposition

Orlando, FL

www.awwa.org

AUGUST

6-7

VMA Market Outlook Workshop*

Boston

www.vma.org/MarketOutlook2020

SEPTEMBER

9-11

VMA/VRC Annual Meeting*

Santa Barbara, CA

www.vma.org/AnnualMeeting

OCTOBER

13-15

VMA Valve Basics Seminar & Exhibits

Houston

www.vma.org/ValveBasics

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

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company's full portfolio of chemical services and technology solutions for the hydrocarbon production, transmission, processing and petrochemical industries. Employees will also collaborate with researchers and subject matter experts at the Baker Hughes Dhahran Technology Center to address region-specific chemical challenges and deliver value-added solutions for customers.

DistributionNOW Adds New Fabrication Facility

DistributionNOW recently added an additional 140,000 square feet of fabrication capacity in the Houston area to complement its existing facilities in Casper, WY. The company will distribute tank battery products, including wellhead production equipment, vessel fabrication and process equipment.

Metso Opening Performance Centers in Chile and China

Metso is opening its first Metso performance center in Santiago, Chile and is building up capabilities for a second center in Changsha, China. Additional centers will be opened in major mining regions during 2020-2021.

The first Metso performance center started its operations in temporary facilities in Santiago and will soon move to new, customized, state-of-the-art premises.

The new performance centers offer continuous automated monitoring, improvements and predictive maintenance services for the customers' mineral processing equipment, components and processes.



Emerson is providing training and more for San Jacinto's new center.

Emerson Aids New Center for Petrochemical, Energy and Technology

Emerson has helped design, equip and provide training tools for San Jacinto College's new Center for Petrochemical, Energy and Technology (CPET), which is designed to empower students of all levels with the skills and training needed to support careers in the evolving petrochemical and refining industries. The new, 151,000-square-foot complex is the largest petrochemical training facility along the Texas Gulf Coast.

Emerson and partner Puffer-Sweiven support and equip the CPET, which features an 8,000-square-foot exterior glycol process unit to develop troubleshooting skills for students and incumbent workers.

MERGERS & ACQUISITIONS

Hunt Valve Completes Pima Valve Acquisition

Hunt Valve Company completed its purchase of Pima Valve. Located in Chandler, AZ, Pima Valve supplies severe-duty bronze marine valves. The company also

has a large variety of special bronze and alloy steel products that meet specific performance requirements for U.S., Canadian and NATO-friendly Navy ships and commercial marine applications.

BHGE Changes its Name

Baker Hughes, a GE company (BHGE), successfully changed its name to Baker Hughes Company. On Oct. 18, 2019, its Class A common stock began trading on the New York Stock Exchange under the symbol "BKR."

Since Baker Hughes has a portfolio that spans the entire energy value chain, the new name and brand better reflect its current and intended principal business operations and diversified portfolio.

EnPro Acquires LeanTeq

EnPro Industries closed the acquisition of LeanTeq Co., Ltd., a privately held, Taiwan-based company. LeanTeq will become part of EnPro's Sealing Products segment and be integrated into its Technetics division.

Founded in 2011 and headquartered in Taoyuan City, Taiwan, LeanTeq has two locations in Taiwan and one in Silicon Valley.

Sunbelt Supply Buys Severe Service Specialists

Sunbelt Supply, part of the FloWorks family of companies, purchased Severe Service Specialists (Triple S) with the backing of Clearlake Capital Group LP. In the last five years, Sunbelt Supply has added 12 new branches organically and through acquisition.

Triple S, a provider of valves and services, is based in Trussville, AL and has field sales support throughout the Southeastern U.S.

Emerson Adds Digital Transformation Group

Emerson Automation Solutions established a dedicated organization focused on digital transformation technologies and programs. The new Digital Transformation business, which was announced at the annual Emerson Global Users Exchange, brings together critical resources to help manufacturers develop and implement pragmatic digital transformation strategies. It combines existing expertise in consulting, project execution, smart sensor technologies, data management and analytics, which are all part of Emerson's Plantweb digital ecosystem.

Forum Energy Technologies Announces Sale of Interest

Forum Energy Technologies, Inc. and its subsidiaries entered into an agreement to sell their aggregate 40% interest in Ashtead Technology, a subsea rentals company. Forum will receive \$39 million in cash proceeds at close. The buyers of Forum's interest are Buckthorn Partners and other investors that currently own the majority of the equity interests in Ashtead.

PEOPLE IN THE NEWS

TRILLIUM FLOW TECHNOLOGIES...

named **Nick Adcock** managing director of the Trillium Valves Division. In this role, he'll be responsible for Trillium Valves worldwide.

He's held several senior leadership roles in the oil & gas and energy markets and joins Trillium from IMI, where he was president of IMI CCI & IMI Bopp & Reuther. The early part of his career was spent in the automotive and aerospace sectors.

FLOWSERVE... announced that **John**

E. (Jay) Roueche, III, Flowserve's vice president, treasurer and investor relations, assumed the role of interim chief financial officer (CFO) effective Dec. 3, 2019. Roueche's appointment follows **Lee S. Eckert's** departure from Flowserve as senior vice president and CFO. Flowserve initiated a comprehensive search to identify a permanent CFO.

Flowserve also appointed **Igor Stamenkovic** as vice president, marketing and technology of its flow control division. He most recently served as director of global technology for Eaton Corporation.

VELAN... announced the appointment of

Bruno Carbonaro as president. An engineer by training, Carbonaro brings more than 20 years of experience in the industrial equipment industry, spending the last eight years at Groupe Fives. He started his career in the automotive industry and at the Boston Consulting Group's Paris office. He received his engineering education at Ecole Polytechnique in Paris.

METSO... proposed the election of **Jukka**

Moisio as chairman of the board of directors of the future Neles Corporation. Moisio previously served as CEO of Huhtamäki Oyj and Ahlstrom Oyj, in addition to many other management positions.

The future Neles Corporation is planned as a partial demerger of Metso—the company's minerals business will combine with Outotec to create Metso Outotec. Simultaneously, Metso's flow control business will become the continuing business of the currently listed Metso, then subsequently renamed Neles.

Metso also named **Simo Säskilahti** senior vice president, finance for Metso's Valves business area. During the course of creating Neles Corporation, he will be nominated for CFO of Neles.

EMERSON... elected **Mark Blinn**, the former president and CEO of Flowserve Corporation, as an independent director on its board of directors.

Blinn has more than 20 years of experience operating multi-industrial businesses in senior executive roles, as well as significant legal expertise and board experience.

CONVAL... appointed **Don Bowers, Jr.** as vice-president of sales & marketing. In this new role, he will be responsible for domestic and global sales and marketing initiatives and results. Bowers joined Conval in the spring of 2017 as director of sales—nuclear & key accounts. He serves on VMA's VALVE Magazine Editorial Review Board.



Don Bowers, Jr.

Conval also named **Rod Alford** its midwest regional manager. In his new position, Alford will serve customers in power generation, energy production, chemical processing, pulp and paper, engineering, procurement and construction.

BADGER ALLOYS... named **Tim Truitt** as an environmental health & safety (EHS) specialist. As an EHS, Truitt will be responsible for developing company safety and environmental programs. He also will oversee safety policies as they relate to federal, state and local regulations and codes.

Truitt brings to Badger Alloys a strong background in EHS. He has worked with the Environmental Protection Agency and other federal compliance agencies. Truitt is certified in heavy crane and equipment operations through the National Commission for the Certification of Crane Operators.

FORMOSA PLASTICS CORPORATION,

U.S.A... named **Ken Mounger** executive vice president. In his new role, Mounger will oversee all business and manufacturing operations for the company.

Mounger joined Formosa in January 1983 and spent his entire 36-year professional career with the company. He has held positions of increasing responsibility including the general manager roles at Formosa's Baton Rouge, LA and Point Comfort, TX facilities. Most recently, Mounger served as the vice president and general manager of the Polyolefins Division.

Valve Industry Leadership Forum: Connect. Lead. Inspire.

This year's Leadership Forum will maximize the opportunity provided by a conference designed to bolster and broaden leadership skills among member companies. The event, which is Feb. 27-28, 2020 in New Orleans, is packed with opportunities for networking and learning from peers and experts; it has been created not only for top-level company executives but for emerging management within organizations.

These current and aspiring leaders from VMA and VRC will learn about trends in the industry that affect managing and leading valve businesses both now and in the future. The event has been fashioned to allow many opportunities for developing strong relationships among attendees. For example, the association is arranging "dutch treat" opportunities that will encourage people to go to dinner together to meet new friends and professional peers. The idea is to expand the Leadership Forum so that it's not only for top-level executives but for those within each company who need to increase



their knowledge and network. To encourage this broader reach, the association is offering discounts to companies that bring multiple attendees.

The information-packed program leads off with keynote speaker Jason Young, a training and career development specialist, who will discuss his ideas on making leadership a daily challenge. His session, "Lead Smart through High Performance Cultures," will include lessons he learned as a key driver in creating the innovative customer service training programs at Southwest Airlines, as well as tips and guidance from his years of advising top corporations.

Other planned sessions include:

The National and Global Economic Outlook: Taylor St. Germain, an economic

analyst at ITR Economics, will share insights on the global and national economic forecast for the valve and flow control industry.

Legal Issues for Today's Valve Industry: Eric McClafferty, a partner at Kelley Drye & Warren LLP, will update attendees on the latest in trades and tariffs and how developments will impact the various valve industries. He also will discuss infrastructure, climate change and the potential impact of an election year. McClafferty also will address issues that are more localized or state- or agency-specific, such as the legalization of marijuana.

A Local Political View on National Politics: The political discussion continues as Louisiana State Senator Eric LaFleur presents his take on current

state issues in the U.S. As a 17-year veteran of Louisiana's House of Representatives and Senate, LaFleur has a unique perspective

Capturing Value in the Smart Factory: Attendees will gain insight on the current value of a smart factory via insights from industry research by Deloitte Consulting in collaboration with the Manufacturers Alliance for Productivity and Innovation. They will learn about new capabilities and what companies are doing to manage production-related resources, physical assets and schedules as well as how companies can advance along a maturity curve through smart factory investments.

Registration is now open for the Valve Industry Leadership Forum with early bird registration available through Feb. 3. Go to www.vma.org/Leadership-Forum2020 for specifics and to register. Only VMA and VRC members may attend. To find out how your company can join, please visit www.VMA.org/AboutVMA or contact Heather Rhoderick, VMA president, at hrhoderick@vma.org.

Another Successful Valve Basics

More than 75 people attended the latest Valve Basics event Nov. 12-14 at the Houston Area Safety Council (HASC) in Pasadena, TX. They included valve end users, EPC firm personnel, distributors and valve manufacturers, along with 19 students from San Jacinto College. The event featured both Valve 101- and 201-level presentations, the popular "petting zoo"—a hands-on learning experience—and time with industry exhibitors. The next 3-day Valve Basics event will take place at the HASC, Oct. 13-15, 2020.



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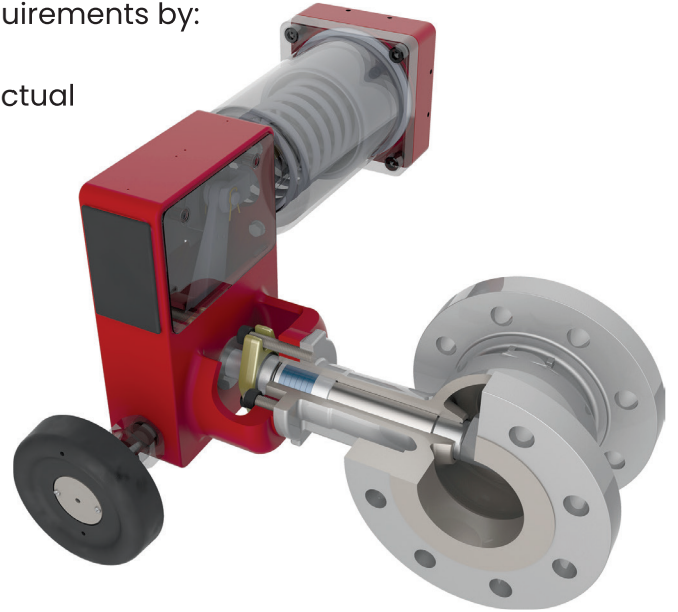
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The Valve Forum: Conference & Exhibits

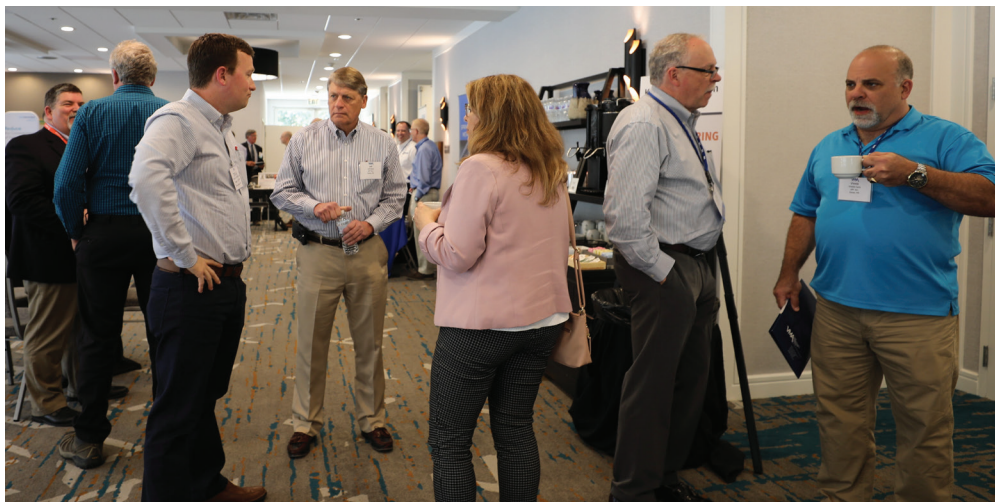
Those working in all aspects of the valve, actuator and control industry will benefit from the diverse array of topics on tap April 29-May 1 at the VMA Valve Forum in Phoenix. This unique event, now in its third year, offers numerous networking opportunities and addresses a wide range of topics in three areas of specialty—technical, manufacturing, and management and marketing.

The keynote address covers a topic that's on everyone's mind as vast numbers of baby boomers retire: How to transfer knowledge in today's workplace and how to attract the multi-generational workers of today.

The **Technical** track of the forum dives deep into some of the more complex, specialized issues facing the industry, including corrosion analysis, new sealing technologies, data mining and analysis, design automation, industry standards, and more.

Manufacturing track sessions address specifics of operating and managing factories and plants. Presentations include virtual reality for assembly instructions and quality control tools; flexible manufacturing that provides high variety and low volume; and new developments in areas such as coatings, finishes, dimensional analysis, rapid prototyping and smart technologies that can help with production testing and customer inspections.

The track on **Management and Marketing** covers day-to-day considerations in running and successfully marketing a valve



business. Among the topics are: cybersecurity and data mining, employment law, crisis preparation, how to create videos for industrial marketing and training employees on social media. A special focus in all three tracks this year will be how to use new Industry 4.0 tools to fulfill the needs of the different areas of business.

The agenda also includes a joint session designed to apply to all participants at the Valve Forum: Improving Communication between Manufacturing, Engineering, Marketing and Management Teams Using Personality Assessments. Such tools can demonstrate how to improve productivity, team-

work and communication.

Before the Valve Forum program begins, a workshop will be held the afternoon of April 29 providing an overview of non-destructive testing techniques used on valves to confirm their material composition, integrity and potential metallurgical fitness for service. This

course will cover radiography (RT), ultrasonic (UT), magnetic particle (MT), dye penetrant (PT), hardness and PMI testing and how these techniques are applied to valve components.

Along with a variety of educational sessions on April 30 and May 1, a tabletop exhibit will feature vendors who will showcase their products and services to attendees. Plans are also being finalized on several pre-conference tours of facilities implementing practices being discussed at the forum. Attendees will learn about the latest valve technology and devices and also have time to network with their peers.

Visit www.VMA.org/ValveForum for more information and to register.

WELCOME NEW MEMBER

VMA officially welcomed **Industrial Valve** as its newest distributor/channel partner associate member. This was the tenth new company to join the association in 2019.

With locations in Alabama, Louisiana and Tennessee, Industrial Valve repairs all brands and sizes of safety valves and has an extensive library of manufacturer specifications for Farris, Consolidated, Crosby and Anderson-Greenwood.



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Valve Manufacturers Association

VALVE FORUM CONFERENCE & EXHIBITS



Featuring a robust educational program, exhibits and networking, the Valve Forum is designed for and open to all those who make, distribute, specify and use valves, actuators and controls, as well as industry suppliers. Program topics are developed by industry experts to prepare you and your colleagues for the coming decade. Make your plans now to attend and be ready!

APRIL 29 - MAY 1, 2020
Phoenix, Arizona

You'll find timely education topics delivered by thought leaders and exhibit displays that showcase products and services for the valve industry. Plus, plenty of networking opportunities to help you reinforce existing business relationships or create new ones, and local tours that provide an opportunity to see first-hand applicable innovations from outside of the flow control industry.

Manufacturers, suppliers, distributors, end users, engineers, production managers as well as marketing and sales professionals will all find value in attending – and will leave with a certificate noting Professional Development Hours!

CONFERENCE PROGRAM

The conference program offers three tracks in technical, manufacturing, and management and marketing for those new or not so new to the industry. Experienced technical and engineering professionals, those who work in production and assembly processing, and those who want to understand the various components needed to operate a successful valve business should attend.

Example topics: design automation, IIOT, data management, standards, Industry 4.0, robotics, product testing, rapid prototyping, flexible manufacturing, cyber security, employment law, social media and video marketing, and much more.



REGISTER NOW



Technical



Manufacturing



Management & Marketing

REGISTRATION

Register by February 17th for the best rates!

Early Bird (Through February 17, 2020)

VMA/VRC Member: \$600

Non Member: \$725

Regular Rate (After February 17, 2020)

VMA/VRC Member: \$650

Non Member: \$825

Discounts available for multiple registrants from the same company!

EXHIBIT OR SPONSOR

Tabletop exhibits are available, all with dedicated networking events in the exhibit area. Sponsorships are also available.

LEARN MORE AND REGISTER

www.vma.org/valveforum

Information on registration, hotel, the full conference program, speakers, pre-conference events and exhibitors is available on the website, or call VMA at (202) 331-8105, ext 310.



SCHEDULE AT A GLANCE

Wednesday, April 29

Pre-Event Activities (additional fee may be required)

Morning: Local Tours

Afternoon: Pre-Conference Workshops

Thursday, April 30

Conference & Exhibits

8:00 am

Opening Session with Keynote: **Knowledge Transfer in Today's Multigenerational Workplace**

10:15 am

Conference Program

11:15 am

Lunch with Exhibits

12:30 pm

Conference Program

2:30 pm

Networking Break with Exhibits

3:15 pm

Conference Program

5:30 pm

Reception with Exhibits

Friday, May 1

Conference

8:00 am

Conference Program

12:00 pm

Conference Concludes



WHERE
VALVES
ARE USED



VALVES IN SPACE

BY BARBARA DONOHUE

EDITOR'S NOTE: Jim Richard is assistant branch chief for valves, actuators and ducts design and development at the Marshall Space Flight Center (MSFC) in Huntsville, AL which is part of the National Aeronautics and Space Administration (NASA). Richard, who grew up within sight of the huge Saturn rocket test stands located at MSFC, currently serves the Propulsion Systems Department as the lead technical mentor and expert in propulsion valves, lines and actuators for rockets and other spacecraft (See "A Life in Valves").

Because of his unique exposure to this equipment, as well as his long background in the field, VALVE Magazine asked him to talk about his experiences and the challenges today's valves, actuators and controls face as they travel or work in outer space.

Jim Richard' first memory involving valves occurred when he was 12 years old and his engineer dad, who was employed at NASA, talked about problems he was having with a valve at work. At the time, he didn't understand the importance of what his dad was saying. That situation has changed tremendously at the same time the equipment that faces space has become increasingly complex.

As far as his current job, "Our branch decided to count up how many valves [and related components] we are following: 2,500 on different rockets," Richard said in a recent interview with VALVE Magazine. "Some

Executive Summary

SUBJECT: Valves that travel into space or serve one of the space stations face a unique set of challenges.

KEY ISSUES:

- What NASA's valve group faces
- Design challenges for space
- Case studies of what's happened

TAKE-AWAY: Working with equipment designed for rockets and space travel shows exactly how important valves can be to a process.

of these are commercially available check valves—you can hold five of them in your hand. Some weigh hundreds of pounds. Some you can buy for reasonable amounts of dollars. Some cost multi-millions.”

All of these valves need to be built to precise fits and finishes and to stringent performance requirements because: “On a spacecraft, everything has got to work. If it breaks, you’re done,” he said.

Because of that reality, “We go through excruciating development programs, with qualification programs where we test to the extreme over every environment so all the valves will work on any mission.” This must be done for all 2,500 pieces of valve equipment.

NASA’S VALVE GROUP

The valves, actuators and ducts design and development branch that Richard runs supports the Propulsion Systems, Department at MSFC.

“We have responsibility for the design and development of rocket engine valves, actuators and lines for most NASA propulsion elements.”

As such, his group covers components flying on commercial rockets, has responsibility for several flight systems on the space station and payloads, is working with crewed vehicles (commercial as well as NASA) and is now working on human lunar landers.

“Our branch has grown from about ten folks when I joined to 45 today,” he said. “We have a contractor force of more than 25 that supports us, and we keep growing. This is a very good time to work for NASA. I see a much more diverse set of goals and functions than those of the Space Race years.”

Richard’s group works in an oversight role, he said; NASA doesn’t build the valves itself. Instead, “Our prime contractors contract with valve manufacturers, and we ensure they build to our standards.”

Still, Richard also said he sees a need for internal development of valve expertise within NASA. His staff works to solve known problems such as leakage and chatter, developing and building perhaps two or three valve projects per year. By doing this, his group has the skills and knowledge to be smart buyers, he said.



Jim Richard spoke at the recent VMA valve seminar developed by VMA’s Education & Training Committee for NASA engineers.

A LIFE IN VALVES

As a youngster hearing about valves from his father, Richard recalls thinking, “How can valves be so complicated?” After that revelation, he started paying close attention to valves. He remembers being drawn to valves when visiting the rocket museum in Huntsville, AL. Later, as an engineering co-op student with the Navy, he gravitated to the mechanical division where valve work was a constant part of the job, he said. As such, he became even more fascinated. Yet, “It all started with those discussions with my dad.”

But before valves became part of his daily job, Richard had another career. Like many teenagers, “I rebelled against the wishes of my parents and sought my own path,” he said. He wanted nothing to do with rocket engineering, so he went to trade school to train in welding. “This seemed to be a more creative, less stressful, and very rewarding type of work; I could see real progress every day.”

Richard said that, although he was a good welder, he struggled to make a living, searching continually for work and often working long hours in uncomfortable conditions. Finally, “I called it quits and went off to engineering school at the University of Alabama in Tuscaloosa.”

While studying mechanical engineering at school, he spent his co-op semesters working with the U.S. Navy in Charleston, SC, which resulted in a job after graduation in 1979. A few years later, he and his wife moved back to Huntsville, where he worked as a contractor at MSFC.

“My work at the shipyard and for the contractor gave me hands-on hardware experience with various terrestrial mechanical systems, from submarines to cryogenic facilities,” Richard said. His fascination with valves returned, and he sought and was assigned jobs related to this equipment and the lines that connected it. “I became very familiar with valve design practices and worked more and more with NASA engineers solving their flight-related issues,” eventually becoming known in the aerospace valve field. In 1999, “I was lucky enough to be presented with a chance to become a NASA employee,” he said.

Although his path to space and valves was not a direct one, Richard said that having worked hands-on as a welder gave him “huge respect for [those who] actually do the work we design for. It opened my eyes to what can realistically be made. When I’m designing, I think how will we make that part? Is it forged? Is it cast?” The challenge is as much how to make the equipment as what it will do, he said.

“I think my background gave me a huge appreciation for the trades and the people who do this work. I say to my staff, ‘Have you talked to the machinists? Go talk to them. They have great skills and you should [listen to] them.’”

“When I’m designing, I think how will we make that part? Is it forged? Is it cast?”

DESIGNING FOR SPACE

After safety and performance, lighter weight is the goal in spacecraft work, Richard explained. The MSFC website explains why: It costs \$10,000 to put one pound into earth orbit.

"Weight is the enemy of our valves. If you have a steam plant and one valve weighs 10 pounds more than another, it doesn't matter. We [NASA] shave off every bit of our valves to meet our specs," he said.

This reality clashes with his past experiences with valves, Richard said. For example, at his first job working on Navy submarines, the most important trait for valves was reliability. "You can't have your sub break in the middle of a battle," he explained. "They [Naval engineers] couldn't care less how much [a valve] weighed." A heavier valve just meant less ballast was needed."

Also, while terrestrial valves might allow a 200% performance margin, "Ours are more like a 20-30% margin," Richard said.

To achieve those stringent requirements, Richard's group conducts detailed flow, mechanical and thermal analyses.

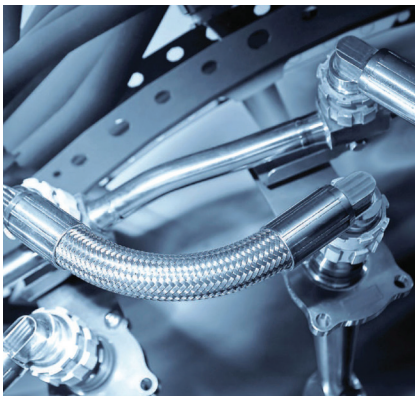
"We nail down everything we can think of and quantify it and then test it and make sure it works," he said. In this case, cost is not as much an issue as performance, weight and "surviving the ride," he said. Because of this, a valve specification may run to 65 pages.

SURVIVING HARSH CONDITIONS

Aerospace valves need to withstand a vast variety of environments. Temperatures range from the cryogenic—about -420°F (-251°C)—to over 3000°F (1649°C).

The vibration environments also can be extreme, sometimes up to 50g in a rocket. Rockets and their components have to withstand severe shock as well; when a pyrotechnic system fires to separate a stage, the action shakes the whole vehicle.

Another factor in space is that some valves may need to operate on a launch vehicle only as long as it takes to go into orbit, maybe eight minutes; others, such as those on the space station, need to last 25 years, he pointed out.



MSFC developed a simplified method for installing valve seats that eliminates the need for a swaged assembly process and the additional hardware and equipment found in conventional, elastomeric valve seat installations. This saved costs but resulted in leakage protection by minimizing acute stress in seal material.



This advanced check valve invented at NASA has a pressure-sensing design that allows the valve to crack open at low pressure differential while providing required sealing stress on the valve seat at all pressures below cracking pressure.

Because of all these challenges, materials are critical for valves. Richard said he could count on his fingers how many materials can be used.

Many of those materials have to deal with caustic fluids and other issues. The primary propellants [for space propulsion]—monomethylhydrazine and nitrogen tetroxide—can present many difficulties. "Everything else erodes, burns, swells, breaks or becomes embrittled," he said.

Some materials that could do the job are not widely manufactured, which presents another problem. To

obtain those materials could require buying a mill run of tons of material, which is not generally an option for a government agency on a budget.

The valve body needs to be as light and strong as possible. In general, carbon steel can't be used, and the choice is limited to Inconel and other exotic materials. For cryogenic valves, high-strength 7000 or 2400 aluminum can do the job, Richard said.

MYSTERIES SOLVED

Richard gave some case studies of different valve problems solved at NASA

Engineers at MSFC developed this new reed valve for controlling fluid flow back and forth between two chambers. This allowed a fine-tuned system response to pressure that builds on one side of the valve. The device can be tuned to operate as a flow meter over extremely large flow ranges compared to fixed-orifice meters.



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that show just how challenging the field can be.

The first incident happened back in the days of the space shuttle, he said. There was a solenoid valve used to pressurize an external tank. This was a small valve, about the size of a human thumb. It ran at high pressure, 3000 psi, and high temperatures of about 600°F (316°C). The valve allowed flow into the tank to pressurize it, operating similar to a mushroom or poppet valve. One day “we discovered a piece missing from the edge of the valve,” Richard explained. The first issue was: what happened to break it? The second was: where did it go? It could have gone into the engine.

About 20 people investigated in various ways, including conducting stress analysis and computational fluid dynamics. Some time was required to pinpoint what the problem was, but once that was identified, the fix was straightforward. The valve in the high-flow position was inducing a vibration on the edge of the poppet, and the fatigue failed. The question then became: why had this not occurred before since the same design had been in use for years? Finally, someone discovered the operations had been changed to keep the valve in a high-flow position for a longer time than in the past. Whoever made the change apparently thought this was acceptable; the result was a part vulnerable to breakage. Since the valves were already built, they now had to be inspected after every flight.

A second mystery involved a valve that had a detent mechanism. The valve would hold in one position until the actuator pushed the detent roller to another position where the detent would hold it. These valves were installed at six positions on each of four vehicles. But a roller was cracking and breaking, though only in a valve in one position on one vehicle. Also, the equipment did not break on every mission.

The staff came up with all kinds of theories. It turned out that one valve had a tolerance stack-up issue.

“We thought there was enough room for the detent to stroke, but it couldn’t fully stroke,” Richard explained. The actuator would push



When the call came from Jim Richard requesting valve basics training for a group of NASA engineers, the VMA’s Valve Ed team was ready and able to help Richard complete his training mission. Members of VMA’s Education & Training Committee and other experienced presenters gave a 2-day presentation at NASA’s Marshall Institute Education Resource Center in Huntsville, AL, Oct. 1-2, 2019. The 19 attendees (shown here) were primarily engineers with less than three years of experience. For more information on VMA’s custom training program, visit www.VMA.org/CustomTraining or contact Abby Brown, education & training coordinator (abrown@vma.org).

on the equipment and there was enough force to break the roller, which occurred only when the valve was cold and shrunken enough to catch the roller. On a hot day or if the valve wasn’t chilled, the roller had its full travel.

Once the tolerance stack-up was discovered, the parts were changed out for ones on the low side of tolerance, and the problem did not reoccur.

THE PROMISE OF 3D PRINTING

Richard said additive manufacturing offers opportunity for work in his field. He said he looks at an additive-manufactured part as if it were a high-quality casting part. However, 3D printing allows less spending on that part while providing a high-quality component, he said.

Also, additive manufacturing allows really unique geometry, he said. “In a valve, we can make a converging-diverging nozzle you couldn’t cast or machine.”

Overall, while additive manufacturing currently has limited application, the technology is definitely interesting to explore and offers possibilities. Bi- or multi-metallic 3D printing, for example, offers some promising applications. In such an approach, the additive manufacturing system builds a part

in the usual way, but the process can change materials.

Also, hybrid additive/subtractive technology—where the same machine performs both additive and machining operations—also may show promise for the future, he said.

LOOKING BACK

Richard said his career has been fulfilling and that work such as what his group does offers promise for up-and-coming engineering enthusiasts.

“I have been a mentor to interns, co-ops and new engineers,” he said. “I teach them to take ideas, try them out in the lab to see if they work.”

When they do work, “you can speak from a position of power,” he said. When they don’t work, “you learn to understand the limits.”

In his youth, Richard wondered how the valves his father talked about could be such a big deal to the overall process of space engineering. Today, one of his pet peeves is to hear: “It’s just a valve; how hard can that be? I can go to Lowe’s and buy a valve for \$10. Why is this costing \$500?” In other words, people greatly misunderstand how important valve design and construction is, he said. “It’s not just a valve. It’s a complex machine,” he said. **VM**

Barbara Donohue is web editor of VALVE Magazine. Reach her at bdonohue@vma.org.

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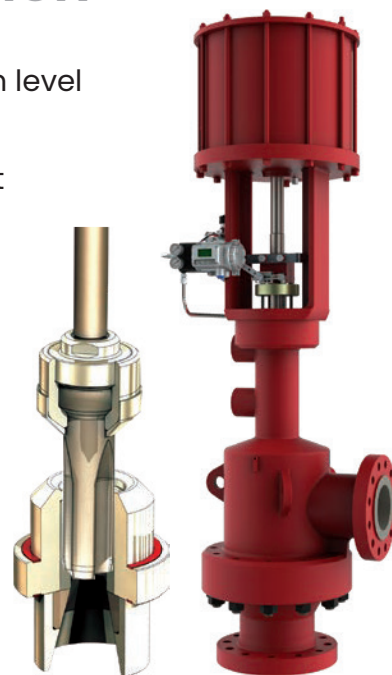
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The Valve Industry Finds Value in ESG Initiatives





BY JOHN V. BALLUN, P. E

In the 1970s, the Nobel prize-winning economist Milton Friedman taught us that the primary goal of a corporation should be to create profits and build value for the shareholders. As concerns for our environment and social challenges have grown, that philosophy has evolved. This past year, the Business Roundtable, an association of the nation's leading CEOs, restated the purpose of a corporation to say it should include a commitment to serve other stakeholders by providing value to customers, investing in employees, partnering with suppliers, supporting communities and protecting the environment.

More than 180 top CEOs of the Business Roundtable took this pledge, and many more have become aware of social responsibilities. They are now driven to be productive corporate citizens by their employees, investors and industry members.

The valve manufacturing industry in North America is one of the industries that have embraced this new way of thinking and is leading the way with the integration of environmental, social and governance (ESG) initiatives. These initiatives range from valves designed to mitigate climate change to community involvement activities.

The reason the industry does this is that, while ESG initiatives may not directly impact a company's bottom line, they certainly increase the value of the company in the minds and hearts of customers, employees, suppliers and communities. This article presents examples of some of the outstanding initiatives under development and practiced across the continent and the nation in the valve, actuator and controls industry. While it encompasses only a fraction of what's being done, it illustrates where the industry is heading.

ENVIRONMENTAL INITIATIVES

In North America, over 30,000 men and women in the valve industry work to supply 35% of the world's demand for high-quality, safe and sustainable products. Without these valves, actuators and controls, homes and factories would have no water, power or fuel.

The manufacturing and operation of these products can have a profound effect on the environment in several ways.

The primary uses for valves have evolved and grown with centuries of progress. But the basic function still comes down to controlling the flow of fluids and preventing leakage. When fluids are pumped through valves, it is essential that the design of the valve consider energy losses from friction and turbulence. Manufacturers devote extensive research to reducing those losses as well as leakage through valves. The research has pushed forward the effort to reduce the carbon footprint of fluid systems.

Executive Summary

SUBJECT: Valve industry leaders in North America have undertaken many environmental, social and governance (ESG) initiatives to increase the value of their companies.

KEY ISSUES:

- Environmental
- Social responsibility
- Governance efforts

TAKE-AWAY: Driven by employees, investors and industry members, the bottom-line focus of companies has shifted to support significant ESG initiatives.



□ Product development focuses on saving energy and reducing fugitive emissions.



□ LEED-certified Emerson facility in Florham, NJ

Valves also often are required to control hazardous chemicals and petroleum products that emit greenhouse gases (GHG) such as methane, which has 25 times as much impact on the greenhouse effect as carbon dioxide (CO₂). In the past, mechanical equipment, including valves, pumps, tanks and pipe joints, contributed to releasing significant quantities of damaging gases from refineries, chemical plants, pipelines and wastewater treatment plants.

The entire valve industry is dedicated today to meeting strict emission requirements established by the U.S. Environmental Protection Agency that will improve air quality and reduce GHG emissions.

Also, manufacturers such as Powell Valves, who has been in business since 1846, and many other long-time and newer companies, have worked with industry partners to develop American Petroleum Institute (API) standards for testing and qualifying valves with the goal of reducing fugitive emissions to near zero.

Beyond these industrywide developments are individual efforts towards environmental stewardship.

Like any factory, valve and actuator plants consume electricity, use water and transform an abundance of materials, which can result in waste and use of natural and other resources. Manufacturers such as Emerson have shown a commitment to sustainability in the way they operate and build their facilities. Emerson's Florham Park, NJ facility, for example, was recently recognized by the New Jersey Department of Environmental Protection because the facility

was designed to meet LEED Silver standards (Leadership in Energy and Environmental Design, a rating system created by the U.S. Green Building Council). This means the facility will use less water and energy and follow other steps that will reduce its greenhouse gas emissions. The building joins six other Emerson facilities that are LEED-certified, and the company has also taken other significant steps to ensure a sustainable future, including management of wetlands, diversifying arboreal investments and managing developed meadows.

In addition to seeking certification, Emerson has retrofitted many of its other buildings to use energy-saving light-emitting diode [LED] lights. The company has calculated that this will yield an estimated annual reduction of carbon dioxide emissions of nearly 11 tons and save the equivalent of about 5.5 metric tons of coal emissions.

"The major incentives for deciding to upgrade these facilities to LED lighting was energy efficiency and increased worker safety," said Russ Kerstetter, president, Electrical and Lighting, Emerson Automation Solutions. The safety factor is based on brighter work areas.



□ Factories with renewable energy sources include this DFT Valves facility.

Another effort to save energy comes from DFT Valves in Exton, PA, which installed solar panels on the roof of a facility to generate its own electricity. The system is expected to fulfill up to 60% of its electricity demand.

These efforts include both internal and external actions. Metso, a manufacturer with facilities across the globe, has a climate program that has created science-based CO₂ emission targets for its suppliers, production, transportation and product use. The company is aiming to offset energy used in business flights, push research and development projects that set energy-efficiency targets and investigate opportunities to reduce emissions that originate from its offices, employee commutes, car leasing and much more.

Other examples of sustainability efforts include using coating processes for valves and actuators that are better for the environment. Many valve coatings have migrated from solvent-based coatings to coatings with high solids content to reduce volatile organic compounds (VOCs). Also, more advanced coatings include powder-based coatings with zero emissions such as fusion-bonded epoxy. Furthermore, a common practice for factories today is to recycle spent materials and control the input of materials in accordance with industry standards and government regulations such as Waste Electrical and Electronic Equipment and Restriction of Hazardous Substances. Both of these are European directives.

Also, as a required element of many quality management systems, excess

and scrap materials are carefully controlled, segregated and shipped to recycling centers for reprocessing, often back into the same foundries that produce castings for new valves.

David N. Farr, chairman and CEO of Emerson, summed up how many companies feel these days with this comment:

“As part of operating responsibly, we have always sought to minimize the environmental impact of our business operations and to use energy and natural resources wisely to reduce waste, pollution and costs.”

SOCIAL PURPOSES

Although corporations are legal entities with a profit motive, most of them today know that to be successful, they must also serve the needs of customers, employees, suppliers and communities, not just the bottom line. Common sense dictates that industry players see customers as a top priority for the success of the company. However, that reality also goes beyond the bottom line into providing products that make that customer successful, sustainable and a contributor of value to society.

This social responsibility mindset also extends to staff. Behind the products we supply are the employees that develop, build and test those products. Today, most employees have a social mindset that their companies need to support. For example, Velan, a global valve company headquartered in Montreal, has a long tradition and reputation for supporting employees and its communities through countless philanthropic projects in Canada and overseas. Employees are given time to support local efforts. For example, a cycling team of employees at Velan participates in events that help a community hospital battling against cancer.

Similarly, American Valve, which is headquartered in North Carolina, has partnered with Living Waters for the World (LWW) to provide clean water for communities in need throughout the world. American Valve's CEO Seth Guterman, who is LWW's board president, explains that, “I was recently in Cuba with LWW and there's no greater return on investment than what I



□ Team Velan crosses the finish line.

have seen with these systems and partnerships. Community and church leaders are taking charge of the health of their fellow citizens, and we are all blessed in the process.”

These water systems are operated and maintained by local partners who typically sell the water in locations where no safe alternative exists. The results are lives changed for the better, reduction of child mortality and creation of economic opportunity in those locations.

This kind of social effort is especially important today because most millennials and the generations that follow are looking for employers with a conscience. With the shortage of available people to fill an increased number of plant jobs, finding ways to reach out to those who are interested in employment is an important social consideration for most industrial companies today.



□ American Valve delivers water systems in Cuba through LWW

Members of the valve, actuator, and controls industry work in several ways today to attract interested and talented people from diverse backgrounds into the industry.

VMA, for example, sponsors a Valve Careers website to expose young people to the opportunities in this exciting industry. At numerous conferences and training events, companies offer training for students and young people to help them understand the products and careers within the industry.

These efforts also cement relationships between companies and their communities.

For example, DeZURIK/APCO/Hilton of Sartell, MN recently rebuilt and upgraded a vertical mill for the local high school. The mill was in disrepair so the company paid to have it upgraded, including adding a digital screen. The machine will now be used by hundreds of students every year. Another effort by that company was a weekend-long design challenge workshop created for students at St. Cloud State University.

Generous acts like this create an ongoing working relationship between industry and the community.

SOUND GOVERNANCE

The third leg of ESG involves creating corporate policies and procedures that assure companies act responsibly.

The stories about corruption on Wall Street or abandoned chemical dump sites that have threatened or destroyed our environment are all-too-common. Some of these tragedies and damage might have been avoided if the company itself knew what was going on or had outlined for its own people what is acceptable and unacceptable.

When a corporation has proper governance and oversight by a mindful board and leaders, such tragedies can be prevented.

Progressive companies today such as Mueller Water Products, Decatur, IL, put their core values in writing and make their employees commit to ethical conduct.

Core values in the industry include factors such as:



□ The next generation learns about industry products.

- Leadership with integrity and trust
- Respect and loyalty
- Quality and safety
- Fostering inclusion

CEOs instill these core values into the everyday operations of the company and thereby gain the trust, respect and loyalty of customers and suppliers.

Trade associations, such as VMA, provide leadership to the industry on complying with anti-corruption and anti-trust laws to promote integrity within the industry.

Through competition and following these core values, the quality of valve products has been heightened to “world class” in North America.

Also, the industry works behind the scenes to develop and publish technical product standards through organizations such as ASTM International, the American Society of Mechanical Engineers, API and the American Water Works Association.

North American manufacturers take it one step further and often obtain independent third-party certification to these standards. With these standards and certifications in place, the

North American valve industry has gained the reputation of producing the most reliable valves, actuators and controls in the world.

The industry is also creating safer facilities. An important concern about employees in any plant is keeping them in good health and danger-free. Many companies in the industry are developing governance policies that assure that goal.

For example, ITT Engineered valves in Lancaster, PA has named safety as one of its key operational pillars. The company was recognized as a Star Site in the Occupational Safety and Health Administration’s Voluntary Protection Program, which includes factors such as management leadership and employee involvement, worksite analysis, hazard prevention and control, and health and safety training. Such programs can influence practices industrywide.

As far as inclusion, as global manufacturers, the valve industry must adapt to diverse cultures across the globe where different levels of ethics may exist. These global efforts aim to develop diverse workforces capable of interacting with customers that

practice a wide variety of customs and have many cultural beliefs and values. Global companies also counsel customers in other areas of the world on ways to make their systems more efficient.

Both on foreign soil and closer to home, one way many companies are expanding their reach is by creating opportunities for a broad, diverse group of people.

Like many companies and associations in the industry, Emerson is tackling this challenge through scholarships, grants and programs such as STEM [science, technology, engineering and mathematics] campaigns to provide opportunities for young people, and open more doors for women and minorities.

LOOKING AHEAD

The North American valve industry cannot solve all of society’s problems, but they can have a permanent and positive impact. The industry is working on innovative technologies to make valves safer, more efficient, and smarter to reduce the impact on the environment. As investors become more keenly aware of the positive impact of ESG initiatives, the value of valve companies as an investment opportunity will only climb upward. It is rewarding to see the firm commitment from so many companies in the valve industry. The result will be felt by people and communities for generations to come. ❧

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Other good deeds: The programs compiled for this story are only a handful of the many ESG initiatives

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developed or under development by VMA members. As the magazine and association learn of these programs, they are published on VMA.org and VALVEMagazine.com ("Valve

Manufacturing" news). To tell us about your programs, contact Genilee Parente, managing editor at gparente@vma.org or Barbara Donohue, web editor, at bdonohue@vma.org.

ONLINE CONTROL VALVE DIAGNOSTICS IN TODAY'S CYBERSECURITY WORLD

BY LEO HUGHES

The topic of cybersecurity usually

brings to mind data breaches that impact financial or private information, stolen intellectual property or disruption of major events such as political elections. But even more severe threats exist, including cyberterrorism. Industrial leaders, in particular, need to be aware of the situation because of the risks associated with operating a plant. Power, gas and hydrocarbon derivatives are all essential to daily existence today, yet each of these resources involves highly dangerous processes that, if compromised, could become major weapons of cyberwarfare.

As we digitize our industrial plants to optimize operations and gain efficiencies, we add more intelligence and create easier access to data that drives process benefits. In the world of online control elements, we see advances in communication, sharing of data and real-time availability, while we simultaneously gain better control of critical processes. Compromising or losing control of one of these online control elements has the potential to turn a highly efficient plant into an immediate threat.

It's more important than ever to understand the power of the tools at our fingertips and to differentiate software functionality today to what is accessible online versus what is accessible offline, especially when it comes to system diagnostics and control override commands.

CONTROL VALVES IMPACT

Pressure control valves are critical for process management as well as for keeping downstream equipment safe from over-pressurization. In most cases, secondary safety devices in a plant protect the plant from dangerous events. But a loss of control to a power plant's steam line could result in over-pressurization of an entire steam system.

Secondary safety devices protect by causing safety valves to relieve line pressure. However, this also takes the plant offline from generating power until the system can properly restart and pressurize. A huge loss in productivity and potential impact on the electric power capacity available to a local area or damage to a regional grid can affect millions of people.

More severe impacts are possible when we're dealing with combustible

SUBJECT: Diagnostics have become a critical tool in digitizing our factories. But they must operate in a new world of cyberthreats.

KEY ISSUES:

- Today's cyber dangers
- The criticality of ICS and diagnostic tools
- Where the vulnerabilities are

TAKE-AWAY: The most secure diagnostic tools are designed so that the same software that provides needed data is not what is used to control the processes.

Executive Summary



fluids such as natural gas or oxygen service. Loss of pressure control to a residential pipeline, for example, could lead to immediate over-pressurization at homes, where backup safety systems may not be as robust. If a hack to a process yielded a spark that occurred within an oxygen line in a chemical plant, the results could be disastrous. In either scenario, whether a spark or a pilot flame is involved, the fluid could ignite, causing major destruction.

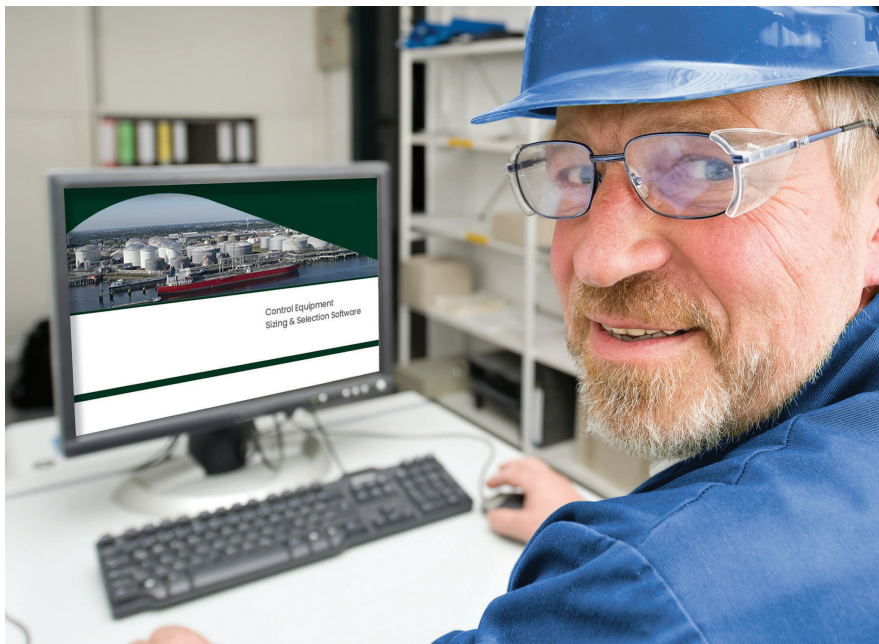
These are just two of infinite amounts of dangerous scenarios that exist every day. Yet plant optimization and the call for operational efficiencies demand real-time availability of data. Maintaining control and eliminating disruption are essential, which makes understanding the role of industrial control systems (ICS) in this whole scenario critical for avoiding possible compromises and to secure the safety of our plants.

INDUSTRIAL CONTROL SYSTEMS

Industrial control systems (ICS) deliver the data necessary for optimizing a plant and taking direct control of the process. As such, they are the intriguing targets to hackers because they serve as a single point of access that controls an abundance of raw, unharnessed power. Because of this, gaining control of this point of access could induce severe disruption, chaos and catastrophe. This reality means considerable focus has been dedicated to securing ICSs as they come online and implementing additional layers of protection beyond a firewall, protection that prevents hackers from modifying the process if they break through the first line of defense.

However, inherent designs in older plants make this more difficult. These designs have vulnerabilities such as 1) 'back-door' access to facilitate remote service and troubleshooting, 2) improperly installed firewalls that can be breached, 3) insufficient training of users or contractors that have the ability to modify or override settings and 4) readily available auxiliary software that can communicate with control elements such as prime movers or automated valves.

In 2010, real disasters were caused



□ An engineer uses software for selecting and sizing the proper valves.

by the release via portable thumb drives of the Stuxnet virus to sabotage centrifuges. Much like a biological virus, the infection spread rapidly, and within months, thousands of programmable logic controllers around the world were infected with this incredibly complex virus. Many of those affected were in the process control industries, including power plants, chemical plants and pipelines. It is widely believed this was the first shot fired in the battle to begin the industrial cybersecurity war. Malware with more complex designs such as Duqu, Flame and Gauss followed this trend, all targeting ICSs. Electricity, fuel and food sources were attacked, exposing vulnerabilities not only to plants but to entire populations should shutdowns occur for extended periods of time.

ONLINE DIAGNOSTICS

Most leading control valve manufacturers today offer software tools for

online valve monitoring that track performance trends and detect outliers while a valve is in operation. This is most often achieved with software integrated into the ICS and connected to the control valve digital positioner via data acquisition networks (depending on the communication protocol deployed). In a Foundation Fieldbus or Profibus system, all valves and positioners are connected to the control system directly through multi-drop buses. In a hybrid analog/digital HART protocol network, valves and positioners are connected to the control system via HART analog output cards. In either scenario, users must fully understand the override possibilities and ramifications of diagnostic monitoring software that has access to control valves at any time during plant operations.

As end-users' usage of these communication protocols has evolved, valve OEMs have continued developing online diagnostic software as part of their core portfolio scope. Along this journey, many OEMs have found the fastest path to market has been to simply expand their existing calibration and commissioning software platforms to include real-time online diagnostic feedback. While this method is initially attractive because of the ease of installation and speed to market, a deeper understanding reveals that this approach breaks the cardinal rule

□ A digital valve positioner



of cybersecurity. If hacked, any online software that allows access to controlling the valve for closing or opening could result in an emergency plant shutdown, or worse, a lethal event.

This topic of online diagnostics that have the ability to control is especially important given that many plants typically prioritize their most critical valves for diagnostic monitoring. Because of this, hackers can make the greatest impact on the most critical applications by simply tapping into a misapplied online diagnostic tool. This type of indirect cyberattack is known as "Island Hopping," and it is a well-known tactic whereby attackers move laterally within a compromised network looking for less defended programs or systems, and penetrate quickly, often without detection.

Because of this reality, the ideal cybersecure approach to online control valve diagnostics is to separate software programs that continuously monitor valve performance from those tools that can be used to control and move the valve.

A U.S.-based cybersecurity firm specializing in ICS recently issued an alert

identifying a cyberattack group that is primarily active in the Middle East whose sites are now set on disrupting the U.S. refining industry. The group's recent 2018 attack successfully infiltrated a refinery's safety instrumented system with the intent to cause a lethal explosion. The International Society for Automation (ISA) responded to this growing threat by forming a Global Cybersecurity Alliance that endorses cybersecurity standards, such as ISA/IEC 62443. This consortium of OEMs, end users, government agencies and expert consultants was created to share awareness, education, readiness and knowledge in the face of growing global cyber threats.

Today, valve OEMs play a critical role in this consortium, not only to develop safe software tools, but also to provide education so users understand the proper application of the tools. When designing a strategy for optimization and valve lifecycle management using online diagnostic software, system architects must consider not only the benefits of performance management but also the cybersecurity of their total solution.

CONCLUSION

Combining all-in-one, online solutions exposes plants to potentially catastrophic scenarios that could otherwise be eliminated with the right tools in place.

Online diagnostic tools are essential, and they offer a wealth of features via friction and error-trending algorithms for tracking trends, diagnosing and predicting failures during real-time operation before actual visible performance degradation occurs. However, recent events and increased awareness of potential threats emphasize that online monitoring programs should be scrutinized and separated from tools with the ability to command and override control.

Various options exist today, but only a few are designed specifically to provide the full, real-time benefits without the cyberexposure. The most secure designs include separate online diagnostic software that cannot write commands to any valve it is monitoring. **VM**

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VMA'S NEW LEADERS

BY GENILEE PARENTE

President Heather Rhoderick: A Passion for Associations and Industry



“One challenge for associations today is to engage the different generations within each organization so that all those in the workforce find value in interacting and connecting with the association.”

Ask VMA's new staff leader Heather Rhoderick, CAE, why she made associations her career, and she'll give you a multi-bulleted response.

Rhoderick, who took over from VMA's long-time president Bill Sandler in November, has more than two decades of trade organization experience.

“When you work with an association, you really learn an industry,” she says. “You have the opportunity to witness the impact the association has on its members and the industry,” she says.

“Trade organizations can help members make sense of the external environment and can provide a platform to create discussions on common issues and how to address them together,” she continues. “They facilitate information sharing, education, business connections and government relations,” she adds.

She also loves the business side of the equation, however.

“Relationships with members and staff are a vital aspect of leading, managing and working in an association, but there is a strong organizational, operational and financial management aspect as well,” she says. She recognized that reality early in her association work and pursued her Master's in Business Administration and then her Certified Association Executive (CAE) designation, and she runs her teams with the bottom line in plain sight.

HER CAREER PATH

Rhoderick comes to VMA after 11 years with the American Composites Manufacturing Association, most recently serving as senior vice president, events and information. While at ACMA, Rhoderick was responsible for leading the association's strategies for increasing non-dues revenue, establishing a branding and marketing campaign, and creating an overall strategy for education and conferences, to name a few of her successes.

Before ACMA, she held management positions for four years within the Newspaper Association of America, overseeing large trade shows, directing marketing campaigns and managing member volunteers, and for nine years with the American Chemistry Council, where she directed an affiliate membership program and worked on issues related to the transportation of hazardous materials.

That background gave her a heavy dose of member services experience, issue management and event production, all of which are designed to add value to association membership.

“One challenge for associations today is to engage the different generations within each organization so that all those in the workforce find value in interacting and connecting with the association, both in person and digitally,” she adds.

“The generations that grew up in a digital world are creating many new events,” she adds. “While the events may look different [than traditional programs], this generation has joined with previous generations to recognize the need for and benefits of face-to-face communication,” she explains.

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Chairman Bryan Burns: The Strength of Working Together



“I’m amazed every day at the role the flow control industry plays in providing clean water and other necessities for modern civilizations around the world.”

Bryan Burns has been immersed in an intense learning experience for nearly a decade. Like Heather Rhoderick, his background before becoming head of DeZURIK did not involve valves: It involved heading up a business. Burns was working for a recreational products corporation in the marine industry when the opportunity to take a position with DeZURIK bubbled to the surface.

“Between that first call from this company and now, I’ve been on a crash course for how this industry, and in particular, the DeZURIK segment of the industry functions,” he says.

What he’s learned is how important both the business and its individual companies are in the grander scheme of the world.

“Although I could never have imagined working in this industry, I’m amazed every day at the role the flow control industry plays in providing clean water and other necessities for modern civilizations around the world,” he says.

“We are at the forefront of helping customers provide these essential building blocks,” he adds.

He’s also proud of the progress the valve, actuator and control industry has made over the last few decades. For example, “In our industry, which is water treatment and production facilities, we are accomplishing what we do more reliably and safely than ever before while having less environmental impact,” he adds.

BECOMING DEZURIK’S AND VMA’S LEADER

Burns was hired by DeZURIK in 2010 as vice president of operations. About a year and a half later, he was put in charge of sales and marketing, and just three years after he joined the company, he became president and CEO. He gives credit to those who came before him and those in leadership positions within his company as well as his peers for providing the education he needed.

“I was very fortunate to join an already accomplished leadership team at DeZURIK as well as an independent sales channel. Both those parties went out of their way to help me learn both the industry and our company in a short amount of time,” he says.

He’s also been active in VMA since 2013 and became the Chairman of the Board at the annual meeting last September. That involvement has been a vital step in the education process, he says.

“The connections made through VMA in the last six years have benefitted me tremendously as I learned what makes this industry tick and what other companies have experienced in creating quality products and providing top-level service to customers,” Burns says. “VMA provides the services and the connections that member companies can’t get on their own,” he adds.

Like Rhoderick, Burns says he sees current association priorities as education and communications as well as government affairs and providing the opportunity for peer networking.

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HEATHER RHODERICK

Events and associations can be the place where the new and old are brought together, “but we also need to provide the programs, services and activities that appeal separately to the diverse expectations, styles and experiences of those in the industry—regardless of how many years they have been in the workforce,” she says.

WORKING FOR VMA

Rhoderick says one of the reasons she accepted the position at VMA is that, like with ACMA, the members are manufacturers.

“I grew up in a rural community, and I firmly believe that manufacturing and the trades are vital to our country, our communities and to the individuals. Manufacturing companies make strong contributions to the economy and better our quality of life,” she says.

She also heard many positive things about the association and its efforts to help members network, share information and create education for industry players.

She’s spending her first few months listening and learning, meeting with members and getting to know the

industry. Her first event was the Valve Basics Seminar in Houston in November, which she says gave her an excellent overview of the products made and how they function.

What she’s found from listening and that meeting is that, “workforce, technology, knowledge transfer, the current political climate, tariffs, education of end users, and market forecast and trends are some of the vital issues to members,” she says.

What she’s discovered from meeting face to face is that “this is a welcoming industry and people are excited to be part of it. Those involved in VMA are positive about the organization and have ideas to help the industry and VMA provide value and services to a new generation of leaders and employees in the industry,” she says.

She’ll be working with the board and members to set the future direction for the association, but “expects that over the next year VMA will offer new ways to learn and be engaged with VMA and VRC members, whether that’s through webinars, refreshed looks on our website, communication products or new channels for raising the visibility of

the industry and its products,” she says. She is also excited to build on the already well-received events, conferences and meetings of the organization.

Rhoderick says she has some tough shoes to fill in taking over for Bill Sandler, who was with the association for more than 40 years, but that she’s already learning she can count on the board and members to help.

“I’m excited to see where VMA can go in the future to support and guide the valve and flow control industry,” she says.

As she does so, she says she’ll put into practice the lessons her mentors have taught her, which include, in no particular order:

- “Start with the big picture, know what you’re trying to do and why.”
- “Ensure that every project or activity addresses more than one problem, issue or goal.”
- “Understand and get to know what energizes those you work with.”

Lastly, “Reflect on what you’ve learned from everything you do and everyone you meet,” she says. ❧

BRYAN BURNS

“I don’t think the categories of what we need to do in an association have changed tremendously, but the challenges we face in doing what we must do migrate over time,” he says.

Going forward, “We want to build on the strengths that retiring President Bill Sandler and the VMA staff have developed over decades,” he says.

At the same time, Burns says he’s thrilled to be taking over leadership in a year when the transition to a new president is taking place.

“Our new president Heather Rhoderick is learning the organization and the industry very quickly—talking to members to better understand how and why they are involved in the organization and what VMA can do to better serve them,” he says.

The feedback she’s getting will be instrumental in what happens to the association in the coming years, he adds. “It’s exciting to be part of

a new era in guiding VMA in ways to serve existing members more broadly, grow the membership and tackle new hurdles,” he says.

THE INDUSTRY’S CHALLENGES

Burns says that several issues have emerged that he feels are near-term priorities for all players in the valve, actuator and controls industry.

Among them is what to do about the people who have top-level skills but are leaving the industry.

“We’re in the early stages of a significant wave of retirements that will affect our companies, customers, vendors and sales channel partners,” he says. “This wave will challenge how we hire and train as well how our customers research and buy products,” he says.

Every player in the industry is facing this issue simultaneously. As a result, “In addition to planning within our own organization, we look to peer

groups such as VMA on how to manage the transition,” he says.

Another immediate issue is trade conflict, he adds. “Uncertainty over trade and potential consequences that will arise from how our government and other countries react are challenges for all flow control companies. Staying abreast of the latest moves and getting counsel on likely outcomes are critical,” he says.

Still, these are only the latest in a long history of bumps in the road that valve companies and the industry have faced together in the past.

“There’s always a new industry challenge—trade is just the latest. The constant is that we are part of an industry that’s facing uncertainty but we know that by coming together as an association, we can better educate ourselves, fortify our ranks and influence outcomes,” he concludes. ❧

GENILEE PARENTE is managing editor of VALVE Magazine. Reach her at gparente@vma.org.



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The Evolution of OEM Support Services

BY GREG JOHNSON

The last several decades have seen a change in the U.S. valve industry landscape from the mainland of “do-it-all-ourselves” companies to independent islands of commerce focusing just on what they do best—design and manufacture. The do-it-all philosophy used to include warranty, service, modification, repair and R&D work. The realities of today’s valve manufacturing economy, however, make subcontracting some of this work a necessity.

Probably the biggest area of OEM support lies in the service function. As valve manufacturing facilities grow larger and some facilities get further away from installation points, the importance of quality service providers becomes paramount. While some manufacturers still perform their own service work, these numbers are a fraction of what they were in the 1950s and 1960s.

Those that still perform their own service work are typically one of three types: 1) smaller manufacturers that have the flexibility to break into new valve production setups and schedule repair work, 2) manufacturers that fear compromising their intellectual design property or 3) manufacturers whose products are technically very complex and difficult to repair.

AUTHORIZED SERVICE CENTERS

The most popular method of OEM support service is the authorized service center (ASC) approach. In this scenario, a manufacturer sees a need to authorize a company to support its brand by providing repair, warranty or modification services, usually in places geographically distant from the OEM.

The ASC approach started to become popular in the early 1960s with pressure relief valve (PRV) repair facilities approved by PRV OEMs. The PRV sector had an added quality assurance advantage in that the independent PRV repair facilities also had to be authorized by the National Board of



□ Working on a 24-inch valve disc

Pressure Vessel Inspectors. This reality better ensured that the potential service centers knew what they were doing because they had to prove it to the National Board to obtain their repair stamp.

Control valve manufacturers were the second industry segment to embrace the ASC approach. However, their engineered products and related control systems dictated that the OEM had to thoroughly train any ASC personnel. This created some long-seated relationships that still exist decades later.

The manual valve (gate, globe, check and ball) OEMs did not begin to embrace the ASC concept until the import rush of the late 1980s. The overseas companies, with their manufacturing floors thousands of miles away, needed boots on the ground in the U.S. so they could earn acceptance from the end-user community. The ASC approach proved so successful that many domestic manufacturers soon adopted that model as their service personnel retired or their service departments were eliminated.

To ferret out potential service providers, OEMs usually ask the locals,

either distributors or end users, to recommend candidates for consideration as an ASC. After initial calls are made, the OEM’s quality and/or engineering departments conduct a follow-up audit. Following a successful audit, the service company will usually need to provide proof of product liability insurance, and in some cases, corporate financial statements. Oftentimes, an official legal agreement is drawn up that includes a non-disclosure clause pertaining to the OEM’s intellectual property.

START-UP ASSISTANCE/WARRANTY REPAIR

Frequently, initial plant startups require that a factory representative be on hand to tweak the newly installed valves and ensure that they are operating as specified. Since most OEMs don’t employ many experienced field hands, the help of an ASC or a subcontracted, non-ASC valve repair firm can be helpful.

Motor-operated valves (MOVs) and pressure seal valves are particularly needy when it comes to requiring startup assistance. Actuators may need to be adjusted to make them perform correctly in the actual field flow

conditions, while pressure seal bonnets will almost always need tightening as the line pressure is brought up to working levels. Having experienced OEM representatives (either employed by the manufacturer or from an ASC) onsite during these operations is important to the valve manufacturer and reassuring to plant personnel.

Another situation where timely OEM support is critical is in the area of warranty claims. All OEMs have someone who can respond to these situations, but quite often that person wears multiple hats and may not be available for every field inspection warranty job. A trusted ASC is often employed. When performing warranty assessment for an OEM, it is very important for the service company to be tight-lipped while onsite and to always remember they are working for the OEM. This political astuteness is one of the attributes of a good ASC service technician when assessing potential warranty issues.

COMPONENT SUBCONTRACTING/MANUFACTURING

Since many U.S. valve manufacturers have outsourced some or all their machining and fabrication work,


opportunities exist for third-party companies to perform subcontracting work for valve OEMs. This work can range from production-line CNC component machining to welding fabrication and assembly work.

Logistics can be a deciding factor in whether an OEM needs to outsource work to a third-party valve service company. If an ASC is close to the ultimate point of installation for unique or very large valves, for example, then the OEM might enlist that ASC to perform final assembly, testing and inspection on their valves.

Many times, an end user will have testing requirements that call for their representative to witness the actual pressure testing on a batch of valves. Sometimes this is easier and cheaper (for the end-user representative) if performed in an ASC, rather than serving as a witness at a faraway factory that requires heady travel expenses. The scheduling can be much more flexible as well, since the witnessing inspector is only traveling across town or across the country and not across the globe.

With today's economically lean valve manufacturing climate, some manufacturers have dispensed with

their R&D departments. Valve service companies are now often enlisted to perform specific R&D testing protocols, since the OEM in some cases has no more R&D capability than finite element analysis and other computer simulations. These tests can range from cryogenic testing to actual service simulations at various operating temperatures and pressures. Some testing requests are as simple as random hydrostatic testing of stock on hand, just to confirm the efficacy of OEM testing procedures and confirm product repeatability.

These examples are some of the ways in which a valve service company can be an active partner with the OEM community. Today, many successful valve OEMs that use support services can echo those famous Lennon-McCartney lyrics: "I get by with a little help from my friends." 

GREG JOHNSON is president of United Valve (www.unitedvalve.com). He is a contributing editor to VALVE Magazine and a current Valve Repair Council board member. He also serves as chairman of the VMA Communications Committee, is a founding member of the VMA Education & Training Committee and is past president of the Manufacturers Standardization Society. Reach him at greg1950@unitedvalve.com.

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Automating old sluice gates with electric actuators

BY CHRIS WARNETT

Since the early days of water and wastewater treatment plants in the United States, municipalities and industries have continued to expand and upgrade existing plants and distribution infrastructure as well as build new facilities.

But as the existing plants age, sluice gates in service for many decades that haven't needed replacement may have actuators and controls that have become obsolete more rapidly since this equipment is more complex and susceptible to technology advances.

Automation equipment and processes of 30 or 40 years ago, particularly for fluid power systems, are vulnerable for many reasons. Repairs become difficult because of the scarcity of replacement components, which might be obsolete or out of production. Also, as these systems age, they need more and more service and maintenance. At the same time, suppliers of the automation package could have ceased trading or moved production overseas.

This presents a problem for the owners and operators of older plants.

Hydraulic actuators and controls have advanced significantly in recent times, with the integration of digital controls and improved diagnostics. However, there are some municipalities that have had maintenance problems in the past and are looking for a different solution.

Also, even the remotest possibility of a hydraulic fluid leak often precludes the consideration of these types of actuators.

One popular solution is to completely replace the old fluid power system and its central hydraulic power unit (HPU) with individual electric actuators directly mounted on sluice gates. This presents some technical challenges, but the benefits are significant (Figure 1).

Fluid-power-operated sluice gates usually employ a linear pneumatic or hydraulic cylinder with the piston rod as part of the gate stem to raise and



Figure 1. Equipment retrofitted to replace old hydraulic units with new electric actuators

lower the gate. The thrust generated by the cylinder can be replicated by substituting a multi-turn electric actuator with a new, acme-threaded segment of the gate stem (Figure 2).

One of the technical challenges of this actuator modification arises from the torque imparted onto the stem from the action of the rotating actuator out-

put. This introduces a new force that must be constrained. But the problem can be overcome in a few ways.

HOW IT'S DONE

First, a non-rotating thrust nut can be substituted for the thrust collar in the gate pocket. This prevents the stem from rotating, but the stem must be capable of resisting the torque over its length without significant torsional wind-up (Figure 3).

An alternative method is to machine a groove in the stem that fits into a special supplemental base on the actuator with a matching key. This prevents rotation of the valve stem and contains the actuator torque close to the actuator. Although this is more costly, it does prevent stem wind-up and obviates the need to replace the thrust collar at the base of the stem.

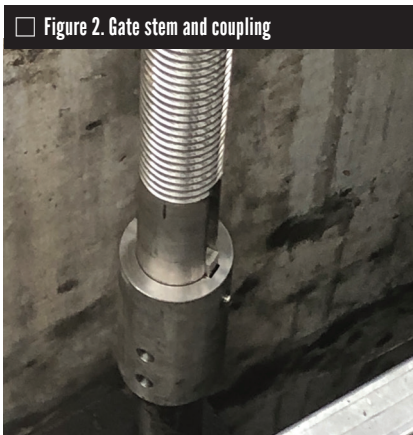


Figure 2. Gate stem and coupling

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Figure 3. A thrust nut

A central HPU often uses accumulators in conjunction with electrically powered hydraulic pumps. These allow pressure to be maintained on the system without the pumps running constantly. If there is enough capacity designed into the accumulator bank then it would have the added benefit of being able to store enough pressurized fluid to open or close the gate should electric power be lost.

This emergency operation is not so easy to do with a conventional 3-phase electric actuator. However, some mitigating points exist. Every electric actuator has an easy-to-use manual override provided as a standard feature. On sluice gates, the travel may be significant, so municipalities often have portable power tools to facilitate easier operation on large-travel gates. Additionally, many plants have their own back-up power generators for critical equipment in case grid power is lost.

Removing a central HPU often frees up space for other equipment or controls. The individual electric actuators are themselves quite compact and usually fit into the footprint of the fluid power cylinder that's being replaced. The old gate control panels often were located adjacent to the HPU in a dedicated building. When operating the gates, a direct line of sight might not have been possible, so visual confirmation of gate position could be difficult.

BENEFITS/CHALLENGES

Electric actuators are self-contained and have their own integrated motor starters and control circuitry. In addition, they have the advantage of their own local pushbutton controls and illuminated position indicators. Because of torque and position sen-

sors integral to the actuator, having an instantaneous readout of torque and travel on a local display is possible. This data also can be stored in the actuator to provide diagnostic information on the gate operation. Although full-travel position sensing can be achieved on fluid power cylinders with an internal encoder, it is difficult to retrofit to existing cylinders.

High-pressure HPU systems require specialized personnel for routine maintenance and accumulator pressure checks. HPUs may be at a remote site where service support is difficult, particularly during off-hours. By contrast, modern electric actuators are environmentally sealed to ensure the internal electric and electronic controls are clean and dry so the maintenance requirements are very low.

The physical change-out of old to new actuators requires access to the gate stem. This may mean dewatering of the gate. However, on gates with longer stems, there is usually a stem coupler between the hydraulic piston rod and the lower portion of the stem. This means that when a grooved stem piece with a keyed base is used with the electric actuator, access is only

needed down to that first coupler and full dewatering may not be necessary.

The old mounting support for the fluid power cylinder may be suitable for the new electric actuator; certainly it must already be capable of withstanding the weight of the gate and seating force. But with an electric actuator, torque must be resisted. Torque constraint on the mounting is not a consideration if it is contained in the grooved key arrangement. But with the alternative installation, where the torque is constrained by the thrust nut in the gate below, then the actuator mounting will need to contain the full torque of the actuator.

As the infrastructure in the U.S. grows along with the expanding population, the upkeep of water and wastewater facilities has to keep pace. Plant automation is a key element in this picture, and these modifications contribute to the productivity of our municipal and industrial water and wastewater treatment facilities. ❧

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Innovation Across Many Industries

BY BARBARA DONOHUE

The digitalization revolution was brought about by the creation of technologies that integrate data gathered during physical processes. Those technologies can include Big Data, analytics, the Internet of Things, 3D printing, wireless technology, artificial intelligence (AI), robotics and drones, and virtual and augmented reality (see sidebox for explanations on where some of those technologies fit together). Different industries and industry segments deploy these technologies in different ways. The constantly evolving world of Industry 4.0 is difficult to track, but here are some examples of the possibilities for different end users of valves and related equipment:

FOOD AND BEVERAGE

Industry 4.0 technologies can monitor and automate many features of food and beverage production for increased efficiency and safety. Examples include:

- Highly selective sorting to reduce food waste and inventory holdings
- Inspection equipment for easier detection and the separation of ever-smaller foreign particles
- Monitoring of refrigerators and other temperature-controlled environments with automated alerts
- Greater supply chain visibility for the traceability of ingredients, allowing for faster recalls.¹

An e-book from SpecPage describes cyber-physical production systems (CPPSs), online networks of machines organized like social networks that are used in this industry and others. CPPSs link information technology with electronic and mechanical components to allow communication among devices via a network. This system offers the ability for a smart factory to react quickly to changes in stock levels, demand or defects.²

Monitoring capabilities and GPS location technology are used in the food and beverage world to enable



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tracking of deliveries and verifying the conditions to which products are exposed during transport, including temperatures and humidity levels. Such capabilities today not only benefit the food and beverage industry, but any business that depends on controlled storage and shipping conditions to maintain product quality.

UPSTREAM OIL AND GAS

A report from PWC says that even though this industry is known for its innovative technologies, the sector is well behind others when it comes to becoming digitally enabled, but that exceptions exist. For example, the report describes BP's initiatives in developing Industry 4.0 capabilities such as running "digital boot camps" (online learning across the organization for topics such as advanced statistics and machine learning) and creating a 1-petabyte central "data lake" of global operations information available to company engineers.³

The upstream market already uses data analytics and 3D visualization as part of the exploration process. Some exploration and production companies are also experimenting with 4D models that integrate production data to follow changes in a reserve's oil and gas levels.⁴ This would allow an understanding of the production potential and lifespan of each well.

Another area where technologies are advancing is oil rigs equipped with submersible pumps that lift oil to the surface. These pumps need periodic

adjustment. According to a report from Cognizant, one oilfield services company remotely analyzes and optimizes the pumps' function and can remotely adjust or recalibrate the pumps.⁵

An Internet of Things (IoT) approach to monitoring gathers pump information from sensors, analyzes it to determine which changes need to be made and programs the required adjustments remotely.

PHARMACEUTICALS

Though the pharma industry has long used batch processing, companies and regulatory agencies are moving toward continuous processing. [In batch manufacturing, all materials are loaded before the start of processing and discharged at the end of processing; in continuous manufacturing, material is simultaneously loaded and discharged from the process.]

A draft guidance document issued by the U.S. Food and Drug Administration (FDA) in February 2019 provides FDA's current thinking "on the quality considerations for continuous manufacturing of [certain] small molecule, solid oral drug products."⁶ Continuous processing has been used in other industries for a long time and offers many benefits, including fewer steps, shorter processing times and a smaller footprint than batch processing.

Connected sensors, data collection and analysis, and control using artificial intelligence, which are all Industry 4.0 tools, will support and enable the shift to continuous processing. Also, because safety and quality in pharmaceuticals is a top priority, Industry 4.0 methods present the industry an ideal way to monitor and control the continuous processing, which helps to ensure that safety.

A report from McKinsey outlines the progression of digitalization in the testing of pharmaceuticals in the plant, ranging from digitally-enabled testing to automated processes and finally distributed quality control. The distributed approach automatically and continuously performs quality testing

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SOME TERMS YOU SHOULD KNOW

The list of terminology surrounding Industry 4.0 is growing at the same rapid rate applications and technologies are growing. Many of these terms are intertwined and sometimes confused with each other.

To begin with, there's the difference between "Industry 4.0" and "The Fourth Industrial Revolution." Although the two terms are often used interchangeably, the 4.0 designation actually refers to factories that have machines augmented with wireless connectivity and sensors whereas the revolution encompasses what's happening across all types of businesses. The factory equipment involved in 4.0 is connected to a system that can visualize the entire production line and often make decisions on its own.

Under the Industry 4.0 umbrella are manufacturing technologies and processes including:

- **Cyber-physical Systems (CPS):** mechanisms controlled or monitored by computer-based algorithms.
- **The Internet of Things (IoT) and the Industrial Internet of Things (IIoT):** IoT is a system of interrelated computing devices given unique identifiers and the ability to transfer data over a network without requiring human intervention. IIoT is IoT used in industrial applications through tools such as robotics and software-led production processes.
- **Cloud computing:** the on-demand availability of computer system resources such as data storage and computing power without active management by the user.
- **Cognitive computing and artificial intelligence (AI):** Cognitive computing describes technology platforms that allow the computer to learn through tools such as AI and use the knowledge to determine what might happen next.
- **Smart manufacturing and smart factories:** Smart manufacturing is a technology-driven approach to production that uses some of these tools for connecting, communicating and taking action to identify ways to automate or improve, thereby creating smart factories.

All of these terms are interconnected. For example, Industry 4.0 fosters the smart factory. Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real-time both internally and across organizational services offered and used by participants of the value chain.

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at locations on the production line. This supports AI/machine learning-enabled process and product control on a continuous production line.⁷

POWER PLANTS

An F. E. Moran publication on power generation described ways that Industry 4.0 technologies can ensure power plants operate more effectively and safely.⁸ Using sensors and data analytics to benchmark and monitor equipment and processes allows adjustment or maintenance to be done before a failure causes an outage, the report says.

On the safety side, fixed gas detection sensors and employees equipped with personal gas detection devices connected via a plant's network can send immediate notification to emergency responders giving the location and content of an incident. Emergency workers can home in on the problem directly. Plant staff and management receive alarms and messages instantaneously from the facility's network.

Some electric grid IoT applications in distribution channels have been up and running for a while. Advanced electric metering, wirelessly connected,

provides data that supports efficient operation and improved customer experience. For example, a Sensus study reports on a rural electric utility co-op in Wake Forest, NC that uses smart metering and voltage monitoring to improve customer service, streamline outage management and maximize asset life.⁹

Sensors on the system report data wirelessly, and analytics translate the data into useful action. Daily and even hourly usage data is available to both the utility and its customers. Customers with access to usage information can see the results of their energy conservation choices, such as replacing appliances or turning off lights in unoccupied rooms. The utility can use voltage monitoring and a transformer utilization utility to discover which transformers need replacement and which are not used to capacity as well as which have allowed replacement with less expensive, appropriately sized equipment. Finally, when an outage occurs, meters in this process send the condition directly to the utility's outage management system, so customers need not report the outage, and repairs can begin quickly.

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WATER

Water scarcity is common in some western states, including California. However, some water systems are taking steps enabled by sensors and connectivity to make the most of the water they have. Another Sensus case study reports how in Fountain Valley, CA, a small city once known for its high water table, the utilities department developed a plan to help conserve water.¹⁰ Installing smart meters at residential and commercial customers and connecting them via long-range radio network allowed data analysis for monitoring usage and discovering leakage. Restrictions on high users and rebates for conservation brought about a reduction in water use of 23%, exceeding the original goal of 20%.

CONCLUSION

These are only a handful of examples of how Industry 4.0 technologies can improve production, increase safety or enable conservation. As companies become more familiar with the technologies and develop applications and integrations for them, the potential gains are enormous. **WM**

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By Chris Warnett

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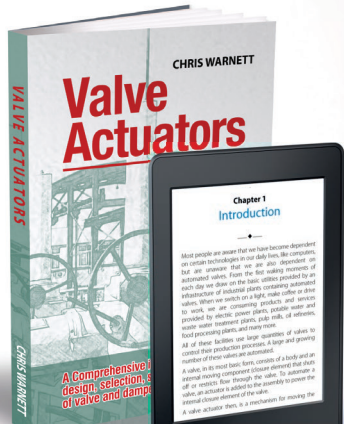
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www.avpvalve.com

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Bay Valve

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www.bay-valve.com

CFM/VR-TESCO LLC

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www.globalfield.net

Chalmers & Kubeck

Watkinsville, VA
www.candsouth.com

Classic Controls, Inc.

Lakeland, FL
www.classiccontrols.com

Curtiss-Wright Industrial Division

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www.cw-industrial.com

Dowco Valve Company

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www.dowcovalve.com

Eastern Controls, Inc.

Philadelphia

www.easterncontrols.com

Emerson

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St. Louis, MO
www.emerson.com/FinalControl
Emerson Lifecycle Services

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www.flotechinc.com

Flowserve Corporation

Baton Rouge, LA
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www.fpcusa.com

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Renew Valve & Cleveland Valve

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www.SetpointIS.com

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Valve Reconditioning Service Co.

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

ATI engineers modified existing piston and diaphragm actuators specific to Orbit performance requirements. As a result, the modular actuator design gives users more inventory flexibility by eliminating the need to purchase specific application and customized automation thereby helping with production lead times.



Because of lack of design flexibility coupled with unique automation sizing requirements such as valve size, supply pressure, pressure class, application, valve material trim and specific pressure end sizing, companies have had to wait up to 42 weeks before receiving a specific Orbit actuator.

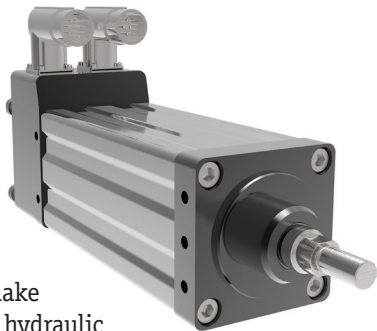


Metso launched a new range of OEM crusher liners. The Metso O-Series complements Metso's existing wear part offering, enabling balance between performance, affordability, secured fit and function for Metso crushers. The Metso O-Series range is

now available for Metso Nordberg HP Series and GP Series cone crushers as well as C Series jaw crushers.

Curtiss-Wright's Industrial Division

released its newest integrated motor/actuator, the Exlar GTX100. The product is the second frame size in the integrated series. Its high-power density and compact form factor make it an ideal replacement for hydraulic cylinders.



With continuous force ratings up to 15,392 N (3,460 lbf), speeds up to 953 mm/sec (37.5 in/sec), and standard stroke lengths from 150 mm (5.9 inches) to 300 mm (11.8 inches), the GTX100 can be applied across a wide range of factory automation applications.



Spirax Sarcos US announced the addition of stainless steel to its Spira-trol line of modular control valves, which ship in four days

or less through the company's Quick Ship program. The valves leave the factory preconfigured for the intended application, simplifying installation and minimizing customer downtime.

In addition to stainless steel, Spira-trol valves are available in carbon steel and cast iron and include both electrically and pneumatically actuated models.

Emerson introduced the Daniel V707 back pressure control valve, which features an adjustable spring that does not require diaphragms or pilots



Back pressure valves currently available in the marketplace use rubber diaphragms that are prone to wear, failure and leakage, and have pressure limits to operation. Alternative technologies such as gas-loaded valves require the customer to maintain a nitrogen control system. The new Daniel valve includes an integrated check valve for two-in-one functionality.



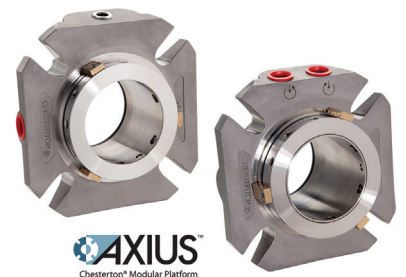
ITT Engineered Valves


announced the latest addition to the extensive EnviZion valve product line. The new BioviZion fractional-size valve includes the breakthrough technology of the EnviZion valve platform in a compact package for quarter- to half-inch applications, with features that provide a more reliable and less costly valve to operate and maintain.

Assembled with a simple mount and turn motion, the EnviZion valve is maintained in about three minutes without using any special tools or difficult torquing procedures.

A.W. Chesterton Company

launched new single and double cartridge seals built on its new AXIUS modular seal platform. These modular seals enable customers to make quick seal face and feature changes around a standard seal base to meet varying applications quickly and economically.



The Chesterton 1810 Heavy Duty Modular Single Cartridge Seal is a plant-wide seal that has performance and reliability enhancing add-on capabilities. It has environmental control options such as multi-port flushing and quench & drain. 

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