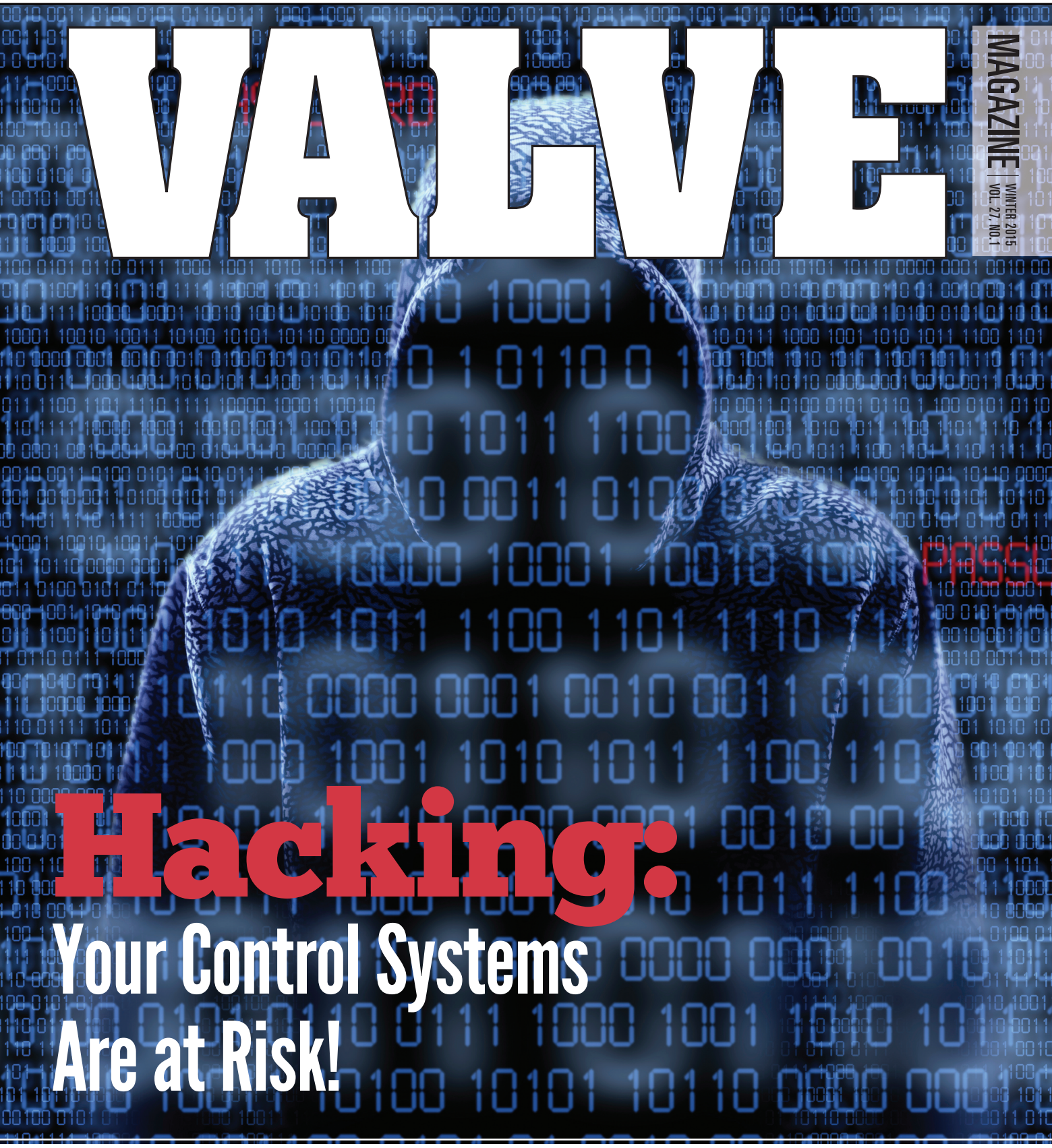
OPEN TO THE INDUSTRY! VMA'S TECHNICAL AND BASICS SEMINARS

VALVE MAGAZINE

WINTER 2015
VOL. 27, NO.1



Hacking: Your Control Systems Are at Risk!

BUILIDNG A BETTER WORKFORCE

FOCUS ON THE OFFSHORE MARKET

FORGINGS: QUALITY WITH A COST

REGULATORS OR CONTROL VALVES?

Flexitallic

FLEXITALLIC'S BRAND OF SAFE IS THE RESULT OF DEVELOPING NEW MATERIALS THAT BETTER WITHSTAND TEMPERATURE AND PRESSURE EXTREMES. COENGINEERED SEALING SOLUTIONS AND ONSITE BOLT TRAINING TO IMPROVE INSTALLATION.

800-527-1935 / **flexitallic.com**

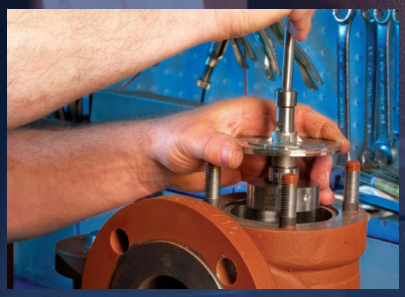
Invest IT'S SAFE

Do you have a five-year duty cycle with **two-year gaskets?** Standardize on **high performance Flexitallic products** and receive onsite **installation training,** a dedicated Flexitallic engineer and our **man-hour reducing** Turnaround Manager™. The SAFE Investment Program. It delivers a strong **five-year** return.

innovate/customize/educate

Real value behind every Farris valve

That's the FAST Center guarantee



Farris Engineering's global FAST Center network adds value to every Farris valve. Our FAST Centers offer total valve replacement, service and repair any hour, any day. FAST Centers employ factory trained valve repair technicians working in ASME and VR certified valve testing facilities. At Farris, our support does not end once you purchase a valve. Our FAST team is there keep your valves in service and your plant safe.

Responsive. Experienced. Dedicated.

CURTISS-WRIGHT

To locate your local FAST Center, please visit us at farris.cwfc.com or email us at FarrisFAST@curtisswright.com

Meet Joe Calabrese, a mechanical engineer who's worked at Velan head office for 18 years and travelled the world extensively for the company. Joe specializes in selling highly engineered valves, like this 36" Class 900 pressure seal valve destined for a power plant in China.

What you might not know about Joe is that, in his own way, he's a rock star: During his years on the job, he's become an amateur geologist, amassing a significant collection of rock samples during his expeditions.

Velan: We're more than just valves.

Velan. Quality that lasts.

+1 514 748 7743
www.velan.com

VELAN

VALVE MAGAZINE
WINTER 2015 | VOL. 276, NO 1

VALVE MAGAZINE

www.VALVEmagazine.com

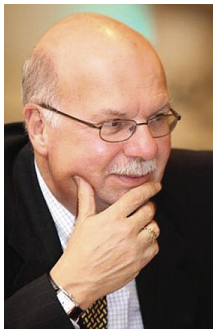
VALVE Magazine (ISSN No. 1057-2813) is the official magazine of the Valve Manufacturers Association of America (VMA) and is published quarterly by VMA, located at 1050 17th Street NW, Suite 280, Washington, DC 20036-5521; 202.331.8105; Fax: 202.296.0378. Advertising queries: 540.374.9100. Periodicals postage paid at Washington, DC, and at additional mailing offices.

POSTMASTER: Send address changes to **VALVE Magazine**, P.O. Box 1673 Williamsport, PA 17703-1673. Subscriptions are free to qualified readers in the United States and Canada; $40 per year to unqualified readers in the United States and Canada; $60 per year for all subscribers outside the United States and Canada. Statements of fact and opinion made are the responsibility of the authors alone and do not necessarily imply endorsement or agreement on the part of the officers or membership of VMA. Materials may not be reproduced in any form without written permission of VMA.

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

www.vma.org

Different Trade Shows Separated by an Ocean



I just returned after spending three weeks traveling on both sides of the Atlantic and what struck me most from these travels is what rewards our association gets by attending these shows. The first two weeks were spent going to Valve World Expo 2014 in Dusseldorf, Germany and the Power-Gen Show in Orlando, FL, two major shows we've participated in for years that just get bigger every year. Here are my thoughts on those two:

2014 Valve World Expo—Dec. 2-4

The Expo moved to Dusseldorf in 2010 after being in Maastricht, the Netherlands since 1998. The reason for the move was to accommodate increased exhibitor participation. This year, the expansion meant the show took over a third building. VMA shared a stand with the British Valve and Actuator Association (BVAA), an arrangement that has occurred three times and continues to work well for both associations. Each organization has its own area, and we share a common seating area for visitors. That seating area was used a lot this year!

VMA's goal at this show is to place the magazine you are now reading in the hands of as many global end users as possible. As with the show itself, this effort was a huge success: we had distributed 400 magazines by the middle of day two. Back home, we saw an indication of our success when we started receiving subscribers right away. Because of the success of this show, VMA will once again join BVAA for 2016's event. VMA also plans to join BVAA at Valve World USA in Houston next July.

Power-Gen International—Dec. 9-11

This show was held in Orlando for the third straight year, a decision that may have been responsible for a fall off in attendance. Next year it will be held in Las Vegas, and VMA will be there again.

VMA's goal at this show, in addition to introducing VALVE Magazine to a new audience, is to speak with prospective members, seek magazine advertisers and find authors for future issues of the magazine. Despite the lower attendance this year, we were successful on all three fronts—membership, advertising and editorial. We also had the opportunity to visit with many of our current full, supplier and distributor members that attended the show.

BVAA 75th Annual Meeting

Those two shows I've mentioned took two of the three weeks away. On the third week, my wife Ellen and I attended the BVAA 75th Annual Meeting in Darlington, UK. It was an opportunity to find out what VMA's British counterpart and companies on that side of the ocean are doing today.

The common thread that ran through all three of these events is the importance of networking for our association and its members. We are a well-respected organization that seeks knowledge on the latest and greatest in our industry and the best way to get that is to see what others are doing, exchange information and spread the word even further. VM

Bill Sandler
President, Valve Manufacturers Association of America

Universe Machine
CORPORATION

CELEBRATING 50 YEARS | 1965 – 2015

VALVE MODIFICATIONS TO INDUSTRY STANDARDS OR NOT DONE AT ALL

WE SPECIALIZE IN VALVE SERVICE, REPAIR, MODIFICATION & MANUFACTURING WHICH INCLUDES:

- TRIM CHANGES
  Stellite, Monel, Stainless, etc.
- CLEANING & TESTING
  Oxygen, Hydrogen Peroxide
- END CONNECTIONS
  Flanged, Buttweld, NPT/SW
- FLANGE MACHINING
  RF, RTJ, Flat Face
- VALVE REFURBISHING BACK TO OEM SPECIFICATIONS
  Weld Overlay, Remanufacturing
- VALVE EXTENSIONS
  Stem, Double Shell, Enclosed, Cryogenic
- AUXILIARY PIPING WITH UNIVERSE MACHINE CRN#
  Bypasses, Equalizers, Drains
- BOLTED TO WELDED BONNET MODIFICATIONS
- MOUNTING GEAR OPERATORS
- HYDROTESTING
  API-598, API-6D, ASME B16.34, CSA Z245.15, etc.

5545 – 91 Street, Edmonton, Alberta, Canada T6E 6K4
Ph. 780-468-5211 Fax 780-468-5430
Email: sales@umcorp.com www.umcorp.com

NEW CONTRACTS

Cameron Awarded Contract for Hebron Development

ExxonMobil Canada Properties awarded Cameron a multi-year contract for wellhead equipment and production trees for the Hebron project, a 52-well development located offshore Newfoundland.

Cameron will supply large-bore, high-pressure equipment including wellheads, production trees and risers. The contract also includes installation and commissioning services. The company will build a new service center in St. John's, Newfoundland in conjunction with the contract.

GE Oil & Gas to Invest $60 Million in Foundry

GE Oil & Gas plans to invest $60 million in expanding and modernizing its foundry operations in Lufkin, TX. The company will demolish 30,000 square feet of its existing 515,000-square-foot facility and construct 72,000 square feet in new buildings. The company also plans to refurbish the remaining facilities at the site. Construction is expected to be complete in about three years.

Metso Receives Largest Ever Pulp Industry Valve Order

Metso will supply several thousand valves with accessories and spare parts for PT OKI Pulp & Paper Mills, Southern Sumatra, Indonesia. The order is the company's largest flow control products delivery for a pulp and paper industry customer. When commissioned during 2016, the new plant will be the biggest single pulp plant in the world.

Emerson Automating Shah Deniz

BP has awarded Emerson Process Management a contract of more than $40 million to become the main automation contractor for the Shah Deniz Stage 2 development project. The project is in the Azerbaijan sector of the Caspian Sea. Emerson will provide integrated control and safety systems to help ensure safe and efficient control of gas production on two new offshore platforms and at an expanded onshore gas processing plant at the Sangachal terminal.

WSSC Expands Relationship with Echologics

Washington Suburban Sanitary Commission (WSSC) has awarded Echologics, an affiliate of Mueller Co., a contract to assess the condition of its buried water assets. The contract is for one year with options for WSSC to renew for two additional years. WSSC is among the largest water and wastewater utilities in the U.S.

Under the contract, Echologics will assess 65 miles of water distribution mains (less than 16 inches) and about 10 miles of water transmission mains (16 inches and larger).

FACILITIES

Metso Has New Valve Service Centers in Europe

Metso opened new service centers in Germany and France to support the company's strategy to grow its valve and field device service business and to strengthen its service capabilities for the petrochemical, energy, oil and gas, and pulp and paper industries.

Since 2012, Metso has established 10 new valve service centers around the world. By the end of 2014, Metso valve and field device service centers will total more than 40.

Balluff's ribbon cutting

Balluff Celebrates New Customer Support Center

The grand opening celebration of Balluff's new Customer Support Center in Florence, KY included a ceremonial ribbon cutting and speeches from Gov. Steve Beshear, Balluff president Kent Howard and the managing directors of Balluff GmbH, Florian Hermle and Michael Unger.

Balluff's new 48,000-square-foot facility includes green concepts and worker-friendly features such as 100% employee access to daylight from work spaces. Collaborative areas and open-concept desks are located throughout the facility, along with high-end technical application and vision labs for product testing, and a state-of-the-art training room.

Anvil International Opens New Florida Distribution Center

Anvil International LLC, a subsidiary of Mueller Water Products, Inc., has a new distribution center in Orlando, FL. The distribution center is located in the city's first industrial smart park.

The 41,000-square-foot distribution center services the Florida, Alabama, Georgia and South Carolina wholesale pipes, valves and fittings (PVF) market and carries products for the fire protection, mechanical, plumbing, HVAC and PVF markets.

Rotork Opens New UK Manufacturing Facility

Rotork recently celebrated a new $12.5 million (£8 million), 24,000-square-foot (7,450-square-meter) manufacturing and operation center in Leeds, UK.

The Leeds facility provides sales and customer support operations for Rotork Controls, Rotork Gears and Rotork Fluid Systems. The center also houses Rotork Site Services, providing 24/7 support of companies and industries. As a Rotork Center of Excellence, the Leeds facility also offers complete valve solutions.

Groth Corporation Cuts Ribbon for New Lab

A ribbon-cutting ceremony was recently held for Groth Corporation's new 3,200-

square-foot Flame Control Laboratory along with enhancements to its Flow Laboratory at the Stafford, TX manufacturing facility.

The new Groth Flame Control Lab is designed to perform deflagration and burn tests per the European ATEX, Factory Mutual and U.S. Coast Guard test standards. The lab has the capability to test with various gases, including methane, propane and ethylene.

Emerson Expands Capabilities in Saudi Arabia

Emerson Process Management has expanded the capabilities of its Jubail facility in Saudi Arabia to include the production, testing and servicing of pressure-reducing regulators.

The Emerson Jubail facility opened in 2011 in partnership with Saudi FAL. It now delivers an annual production capacity of 2,500 pressure-reducing regulators. The facility can also conduct full assembly and testing of Emerson's regulators, and provide repair and calibration services.

ValvTechnologies Adds Welding, Robotic Coating Equipment

ValvTechnologies, Inc. has expanded its existing in-house welding capabilities by adding six new machines dedicated to the welding process including an Arc-5 cladding machine and five Fronius cladders.

In addition, ValvTechnologies expanded its existing in-house coating capabilities by purchasing two additional robotically integrated spray booths.

AWARDS & HONORS

Rotork One of Britain's Most Admired Companies

Rotork once again topped the Engineering & Machinery category and finished 7th overall in the Britain's Most Admired Companies awards. Other highlights included 2nd place in the Quality of Goods & Services and Use of Corporate Assets categories.

Organized by Management Today magazine, the awards are based on the results of a survey conducted by Birmingham City University. Companies across 26 sectors marked each other from nine different criteria that range from the firm's ability to innovate and the quality of its marketing to its financial performance and the strength of its management team.

ASCO Numatics Supports Engineering Students

ASCO Numatics has selected recipients of the 2014 ASCO Numatics Industrial Automation Engineering Scholarship. The scholarship winners were announced at PMMI's annual Amazing Packaging Race at PACK EXPO 2014 in Chicago. They are Nicholas Aerni of Taylor Mill, KY, a senior at The University of Kentucky in Lexington, KY, and Kaitlyn A. Martin of Baytown, TX, a senior at the Colorado School of Mines in Golden, CO. Each was each awarded a $5,000 scholarship from ASCO Numatics towards bachelor's program degrees in electrical/computer engineering and mechanical engineering. The ASCO Numatics Industrial

CONTINUED ON PAGE 8

Emerson's Jubail facility

MARCH

5-6
VMA Technical Seminar & Exhibits
San Antonio
www.vma.org

MAY

4-7
2015 Offshore Technology Conference
Houston
www.otcnet.org

12-14
VMA Valve Basics Seminar & Exhibits
Charlotte, NC
www.vma.org

JUNE

7-10
ACE15
Anaheim, CA
www.awwa.org

9-11
Global Petroleum Show
Calgary, AB, Canada
www.globalpetroleumshow.com

JULY

15-16
Valve World Americas
Houston
www.valveworldexpoamericas.com

AUGUST

6-7
VMA Market Outlook Workshop*
Chicago
www.vma.org

SEPTEMBER

30-OCT. 2
VMA/VRC Annual Meeting*
Naples, FL
www.vma.org

OCTOBER

21-23
VMA Valve Basics Seminar & Exhibits
San Antonio
www.vma.org

*Open only to VMA/VRC members

VALVE MAGAZINE

STAFF

PUBLISHER
William S. Sandler

ASSOCIATE PUBLISHER/
EDITOR-IN-CHIEF
Judy Tibbs

MANAGING EDITOR
Genilee Parente

SENIOR EDITOR
Kate Kunkel

ASSISTANT EDITOR
Chris Guy

CONTRIBUTING EDITOR
Greg Johnson

ART DIRECTOR/
PRODUCTION MANAGER
Michelle Wandres

ADVERTISING DIRECTOR
Sue Partyke

How to Contact VALVE Magazine

EDITORIAL OFFICES
13613 Baycraft Terrace
Midlothian, VA 23112
phone: 804.639.1365
email: jtibbs@vma.org
website:
www.ValveMagazine.com

ADVERTISING SALES
Sue Partyke
145 Harrell Road
Suite 119
Fredericksburg, VA 22405
phone: 540.374.9100
fax: 540.374.9265
email: spartyke@vma.org

CIRCULATION/SUBSCRIPTIONS
phone: 570.567.1193
fax: 570.320.2079
email:
valve@PublishersServiceAssociates.com

NEW PRODUCTS, MEDIA AND
INDUSTRY NEWS
Chris Guy
phone: 571.274.5224
email: cguy@vma.org

ARTICLE SUBMISSIONS
VALVE Magazine welcomes articles, proposals, manuscripts, photographs and ideas from our readers. For a copy of the magazine's Author's Guidelines, contact Genilee Parente, managing editor, at gparente@vma.org.

Automation Engineering Scholarship program, now in its seventh year, has awarded $70,000 in merit-based scholarships to 14 students, based on potential for leadership and for making a significant contribution to the industrial automation engineering profession. The company also has awarded $14,000 in grants to 12 schools of engineering.

Mueller Recognized for Best Smart Water Solution

Mueller Water Products, Inc. recently received the 2014 Best Smart Water Product or Solution award at the inaugural Smart Water Summit in Palm Beach Gardens, FL. The company was recognized for its suite of Intelligent Water Technology solutions.

Thirty-three participating smart water technology providers competed for the award, which was voted on by 100 North American water utility executives.

MERGERS & ACQUISITIONS

Emerson Process Management Acquires Paine Electronics

Emerson acquired the Paine Electronics business of Paine Electronics, LLC. Paine Electronics, which manufactures pressure transducers, will join the Rosemount portfolio of measurement technologies.

Headquartered in East Wenatchee, WA, Paine Electronics opened a new research and development center earlier this year that offers advanced design capabilities as well as simulation and testing facilities.

Samson Merges U.S. Subsidiaries into One Entity

Samson Controls, Inc. absorbed both Samson Products, the production company located in Baytown, TX, and Samson Project Engineering, the project management company located in the Houston energy corridor.

The merger brings together all contact points with customers, sales, quotations, project management, manufacturing, assembling, logistics and service, under one executive team.

In the Fall 2014 issue of VALVE Magazine, we inadvertently ran an unauthorized photo to accompany our Distributor Channel column, page 46. The online version of this article no longer includes the original photo. View the corrected article at: http://bit.ly/1s58J59

PEOPLE IN THE NEWS

CAMERON… announces that **Scott Rowe** will assume the newly created position of president and COO. In his new role, he will report directly to **Jack Moore**, who remains chairman and CEO.

Additionally, **Jim Wright** has elected to retire from his role as president of the Valves & Measurement group. **Doug Meikle**, who currently serves as vice president, operational excellence, will replace him.

CURTISS-WRIGHT… executive chairman **Martin R. Benante** retired from the company on Jan. 1, 2015. As part of the formal transition plan announced in 2013, Benante will continue as a member of the Board of Directors until the conclusion of the company's next annual meeting in May 2015, at which time he will retire from the board. **David C. Adams** has assumed the role of chairman and CEO.

A.W. CHESTERTON… design engineering manager **Phil Mahoney** has been appointed vice president of the Fluid Sealing Association (FSA) Board of Directors. Mahoney currently serves the FSA as vice chair of the membership committee, as well as a member of the government affairs working group, the marketing committee and the technical coordinating committee. He is past chair of the compression packing division and the compression packing technical committee.

POWELL VALVES… has divided its customer-service structure into three primary areas, which will be led by the following personnel:

Kate Boggs is now manager/capital projects quotation and management. **Katie Rominger** becomes manager/customer service, distribution and MRO. **Jeff Sizer** is manager/international customer service and business development.

Michael Briningstool has also joined the company as manager of shipping & receiving and store operations at the company's Starflo manufacturing plant and distribution center in Manning, SC.


ANDERSON GREENWOOD CLARKSON CROSBY FCT KEYSTONE KTM SEMPELL VANESSA YARWAY
TOGETHER WE ARE PENTAIR
VALVES & CONTROLS
These world famous Pentair brands are synonymous with the very best valves and controls. They also command huge respect across so many industries, which is why we are determined to make sure they continue delivering the advanced performance and reliability you've come to expect. Welcome to the Pentair family. Together we are valves and controls.
For more information on Pentair Valves & Controls visit www.pentair.com/valves
PENTAIR
INSPIRED SOLUTIONS FOR A CHANGING WORLD
PENTAIR.COM/VALVES

New Members

Ci Valves & Actuation is now a VMA associate distributor/channel partner member. This brings to 23 the number of new VMA members for the year 2014. Eleven are members in this newest category of membership.

Founded in 1989, Ci Valves & Actuation, with headquarters in Houston, is a full-service, valve and valve actuation integrated supplier, and has several distribution and service centers around the country.

Eastern Controls, Inc. has been approved as a member of the Valve Repair Council (VRC), becoming the fifth new VRC member in 2014.

Founded in Philadelphia in 1969, Eastern Controls is a manufacturers' representative and distributor of process control and instrumentation equipment.

Repair Council Unveils New Logo

VMA's Valve Repair Council (VRC) has unveiled a new logo designed to reflect the council's growth over the past 20 years while keeping its tradition of quality and service. The VRC has grown significantly in recent years and currently has 41 members—the highest in the history of the organization.

In 2014, the organization held its well-received Valve Repair Meeting & Exhibition in Houston and more than 60 valve repair professionals and 20 exhibitors participated. The council will hold its next event in 2016. For information about the VRC, please contact Marc Pasternak at mpasternak@vma.org.

EVENTS

Technical Seminar to Address Advances in Valve Design, Tools and Technologies

VMA's 2015 Technical Seminar & Exhibits is designed to bring attendees up to date on the latest and greatest in valve design, tools and technology. The event is March 5-6 at the Grand Hyatt in San Antonio, TX.

The seminar is designed for mid-to-senior level management, engineering and technical personnel. The first day of the event offers a tabletop exhibit that shows off some of the latest products and services from industry suppliers.

Keynoting this year's seminar is **David Leigh**, president of Harvest Technologies. He will lead off the event by talking about 3D printing and additive manufacturing, which has been used by aerospace manufacturers for over a decade, but is little understood in many industries that could be taking advantage of this technology.

His remarks will be supported by several other experts in these areas:

- **Sheru Kamara**, director of the Rapid Prototyping Consortium, Milwaukee School of Engineering, who will talk about assessing the mechanical properties of metal additive manufacturing
- **James Sears**, senior mechanical engineer for GE Global Research Center, who will address the progress made in the additive manufacturing field
- **Nathan vanBecelaere**, engineering services, American Foundry Group, who will give the foundry perspective on additive manufacturing

Other topics and speakers at the conference will be:

- **Ron Manson**, director of Application Engineering, Cameron Valves & Measurement, will talk about piping codes, valve standards and ball valve selection.
- **Ken Sundberg**, product engineer manager, Metso Automation USA, Inc., will give a historical perspective as well as an update on NACE MR0103 & 0175.
- **David Escobar**, VMA Technical Committee vice chairman and director of Engineering, Metso Automation USA, Inc., will address oxygen cleaning and safety.
- **Ron Walters**, product manager for Fugitive Emissions Products, Teadit North America, will speak on API fugitive emissions standards.
- **Mark Ezekiel**, subject matter expert, BP North America, will talk about BP's approach to reliability.
- **Chris O'Brien**, partner, Exida Consulting, will bring the audience up to date on focused field studies and advanced modeling.
- **Asher Glaun**, principal engineer, General Electric, will talk about advanced computer aided engineering.
- **John Lambert**, president and CEO, Design Automation Associates, will speak about new technology for reducing modeling times in mechanical/electro-mechanical systems.

At the end of each day, time has been set aside for a panel discussion so that people can ask specific questions of presenters.

Offered before the conference begins is an optional tour Wednesday, March 4 of the award-winning Toyota Texas Manufacturing Plant and Visitor's Center, which is a 2.2-million-square-foot facility.

The tabletop exhibit is open the afternoon of Thursday, March 5 and features a variety of products and services offered to valve manufacturers and end users.

For information and to register online, go to www.vma.org, "Meetings."

Third Day Added to Valve Basics Course, May 12-14 in Charlotte, NC

This popular VMA course was designed to educate newcomers to the industry as well as provide more experienced professionals with a refresher on a wide variety of topics. The first offering in 2015 is set for May 12-14 in Charlotte, NC.

More than 1,000 people have already attended Valve Basics Seminar & Exhibits, also known as Valves, Actuators & Controls 101. This year, an additional day of all-new "201" lessons are being added to the program.

The seminar begins with an introduction to the industry, then goes on to introduce attendees to specific types of valves, actuators, controls and accessories, as well as educate attendees on how these products function and appropriate applications.

The new third day will be dedicated to more advanced topics, including:

- Valve standards
- Fugitive emissions
- Materials
- Critical service applications
- Valve data, feedback and asset monitoring

The course is being expanded so that the many people who have attended previous 1- or 2-day Valve Basics courses can return for a third day of additional education. It has also been expanded for those seeking an even more immersive experience over the course of three days.

The valve 'petting zoo' is rated highly by attendees who appreciate the opportunity to learn more about how products work.

One of the most popular features of the event is a valve "petting zoo" where attendees experience how valves, actuators and controls work by seeing them up close. Attendees also get a chance to see specific products and services in the industry at a tabletop exhibit held in conjunction with the seminar.

For those unable to attend the May event, the course will be presented later in the year, Oct. 21-23 at the Hyatt Regency San Antonio, TX.

For information and to register online, go to www.vma.org, "Meetings."

OTC Holds New Kind of Event

The Offshore Technology Conference, which is May 4-7, 2015 at NRG Park (formerly the Reliant Center) in Houston, has been extended another day to May 8 for a new, off-site event—d5, the Next Big Thing. The event will be at the University of Houston and is designed to spark innovation in the offshore energy industry by bringing together some of today's top thinkers for discussions on business, technology and people. Those thinkers will address a wide range of critical issues such as the general business outlook for energy, environmental challenges and solutions, game-changing technology and what motivates people in the industry.

Meanwhile, the main OTC event has its own general and technical programs that address a wide range of research & development, technological and business issues in the offshore energy industry. The programs deal with everything from project updates across the globe to how to attract skilled talent to the energy industry to the economic future of the industry and to unconventional sources of oil and gas. Last year's OTC drew a record-breaking 108,000 people from all over the world.

In addition, the conference has one of the largest exhibits of products and services sold to the energy industries, an exhibit that features about 2,700 exhibitors and is open all four days of the conference.

For information, go to www.otcnet.org. For additional coverage on the offshore market in this issue, go to page 30.

HACKING:

Control Systems Are Not Immune

BY CHRIS SHIPP AND JONATHAN POLLET

Almost every day we read about a cybersecurity breach of a major bank, retailer or government computing system. These attacks have become so commonplace we are no longer surprised by what we read. In fact, a recent panel of top-level security experts from industry, military and government concluded that "the threat posed by cyberattacks targeting U.S. critical infrastructure and private industry now outweighs any other national security threat."[1]

In the last few years, we have begun to learn more about successful hacking attacks against industrial control systems (supervisory control and data acquisition systems and distributed control systems). Many people who work in control system environments wonder if these systems are really vulnerable to hackers, and if they are, who would attempt to hack them.

In this article, we provide a basic working knowledge of the issues involved that can help protect control systems and hopefully inspire readers to seek out more information on the topic.

Executive Summary

SUBJECT: The belief that industrial controls systems are safe from hacking is outdated. Not understanding that reality presents many dangers to the nation's industries.

KEY CONCEPTS:

- A review of hacking's history
- How it's done
- How it can be prevented

TAKE-AWAY: Although hacking has increased, so has the number of solutions. A well-planned, systematic program is the first step.

THE CURRENT THREAT

In the early 2000s, a key leader in the industrial control system community proudly stated that "control systems are not hackable" primarily because they are "built upon proprietary operating systems and software that hackers are not familiar with." The leader pointed out that these systems typically have very little or no outside connectivity.

The last few years have demonstrated, however, that controls systems are indeed vulnerable to system compromise. To understand how we've come to this point, we'll look back at the recent history of successful attacks on control systems to better understand the current threat.

A BRIEF HISTORY

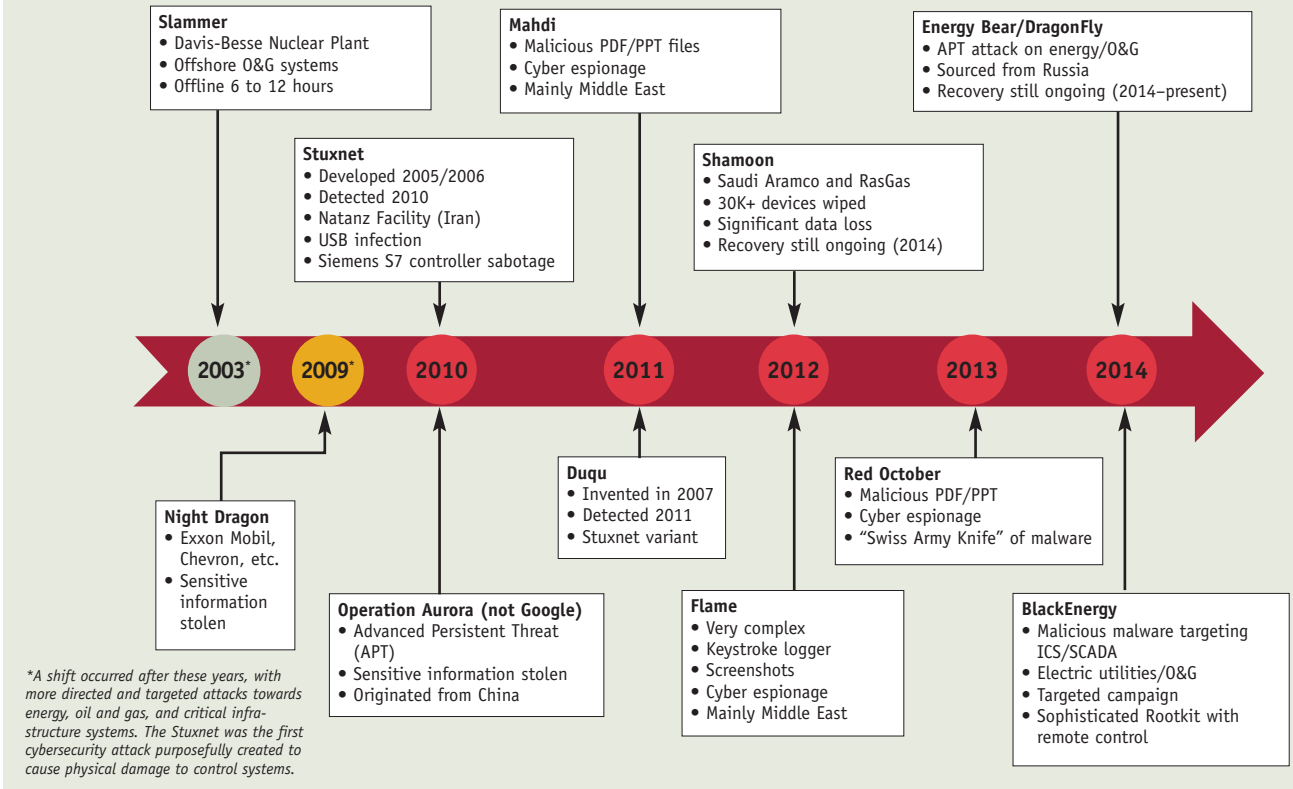
In January 2003, computers at the Davis-Besse nuclear power plant were infected with the Slammer worm[2]—a piece of malicious code that spread faster than any before or since. This particular infection is noteworthy for two reasons: First, the code was only able to spread because computer owners did not apply security patches in a timely manner. (Microsoft had released a security patch to mitigate the vulnerability six months before Slammer began its historical spread). Second, during the ensuing investigation, personnel at the plant indicated they thought they were protected from such attacks because they had a firewall. Unfortunately, this lack of understanding with respect to cybersecurity is still prevalent—especially in the control system community.

Today, most knowledgeable individuals readily admit it is possible to successfully hack control systems. However, the belief that even if a control system is hacked, no real damage will occur because of safety features incorporated into the system also prevails. There is just enough truth in this belief to make it a dangerous one. While safety features in many modern control systems do make it more difficult to cause damage, they do not make it impossible. Furthermore, because the average lifecycle of a control system can be 15-20 years, many antiquated systems are susceptible to compromise and may not have some of the more modern safety features.

In September 2007, Cable News Network ran a television segment about the Aurora Project—a control system security evaluation conducted by the U.S. Department of Energy's Idaho National Lab. During the evaluation, researchers demonstrated the ability to completely and stealthily take over a control system and use this control to push a highly expensive generator far beyond its operational limits, resulting in catastrophic failure of the generator[3]. The Aurora Project represents an important milestone in control system history because it proved that control systems can be successfully compromised by cyberattack to the point that the attackers have complete control and can cause significant and costly damage to equipment and to operational capability.

That brings us to Stuxnet, one of the most important milestones in control system cyberattack history. Some may not be aware that Stuxnet was a sophisticated cyberattack perpetrated against the Iranian nuclear program. This attack successfully compromised and caused significant long-term damage to the Iranian nuclear program by causing centrifuges that make nuclear materials spin out of control while erroneously displaying normal behavior on operators' consoles and suppressing alerts. Two important facts came out of Stuxnet:

Figure 1. ICS cyberattack timeline by Red Tiger Security



A shift occurred after these years, with more directed and targeted attacks towards energy, oil and gas, and critical infrastructure systems. The Stuxnet was the first cybersecurity attack purposefully created to cause physical damage to control systems.

- Stuxnet successfully compromised a sophisticated control system apparently not connected to the Internet in any way (it's said to have arrived via a USB drive).
- Forensic data indicated that earlier versions of Stuxnet date back as far as 2005[4].

In looking at the entire history of hacking, it is important also to understand many people hold misconceptions of who is hacking control systems. They think of hackers as pimple-faced teenagers typing away at home computers (as in the "War Games" movie of 1983). The truth is more alarming. We now know that nation states such as China and Russia are actively and systematically engaged in cyberattacks against U.S. control systems.

The U.S. Department of Homeland Security is quoted in a recent news account as saying, "Chinese hackers targeted 23 natural gas pipeline companies over seven months beginning in December 2011, and breached at least 10."[5] The same news report also noted that FBI agents have recorded raids by other operatives in China and in Russia and Iran looking for security weaknesses that could be employed to disrupt the delivery of water and electricity or impede other functions critical to the economy.

The important points to take away from this brief review are:

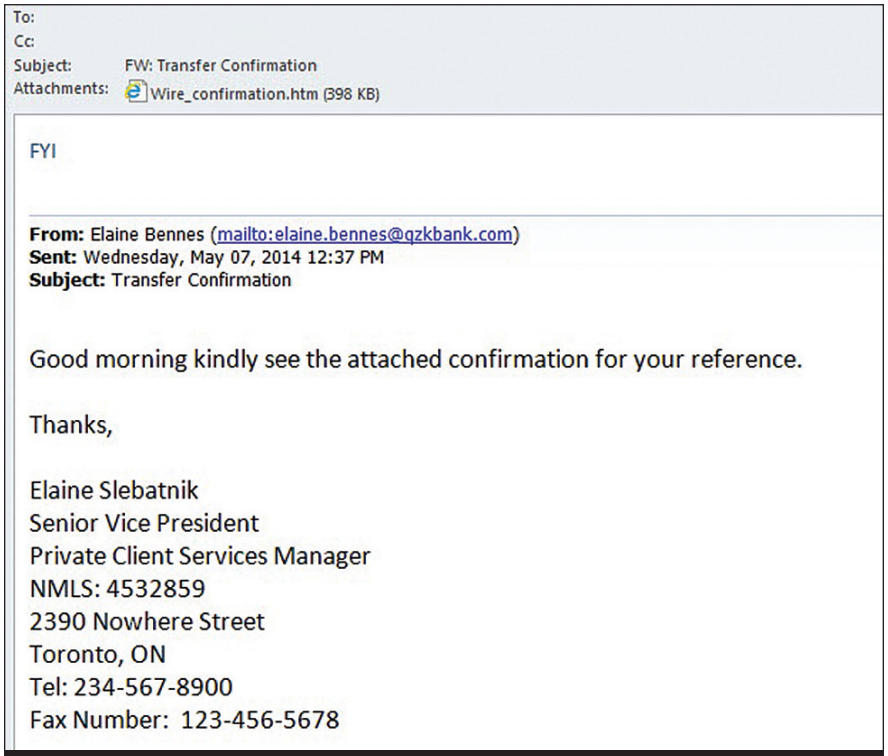
- Even industrial control systems that have a firewall or those not connected to the Internet are vulnerable.
- Hackers are not just individuals; they are also nation states.

ANATOMY OF A HACK

While the press of recent years has raised public awareness, a great deal of misinformation and misunderstanding remains regarding how cyberattacks occur. In fact, even some people involved in cybersecurity have no idea how such attacks actually occur.

Most successful attacks fall into two categories: client-side attacks and misconfiguration-based attacks (which include unpatched systems). Client-side attacks are typically aimed at end users. They are the most common type and widely thought the most likely to succeed.

Following is a sample, four-phase attack based on a live hacking demonstration using a software program (MetaSploit) that is easy to use and efficient, even for hackers with little or no programming skill.


To:
Cc:
Subject: FW: Transfer Confirmation
Attachments: Wire_confirmation.htm (398 KB)

FYI

From: Elaine Bennes (mailto:elaine.bennes@qzkbank.com)
Sent: Wednesday, May 07, 2014 12:37 PM
Subject: Transfer Confirmation

Good morning kindly see the attached confirmation for your reference.

Thanks,

Elaine Slebatnik
Senior Vice President
Private Client Services Manager
NMLS: 4532859
2390 Nowhere Street
Toronto, ON
Tel: 234-567-8900
Fax Number: 123-456-5678

Figure 2. Sample phishing email

Phase 1—Infiltration via the Internet

In this phase, an email is sent to an

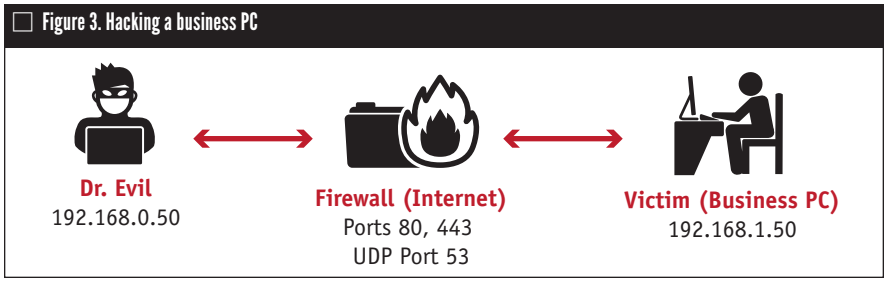


Figure 3. Hacking a business PC

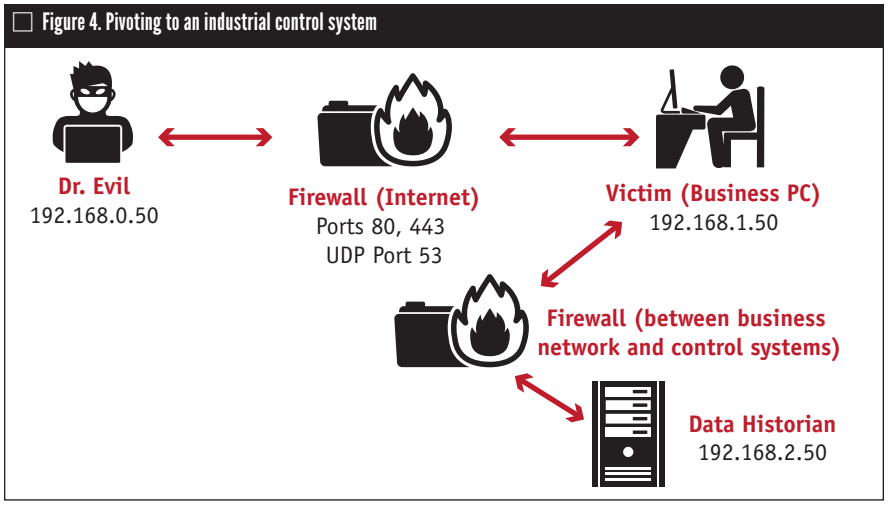


Figure 4. Pivoting to an industrial control system

unsuspecting employee at a target organization. Such emails use a wide variety of ruses including the one in Figure 2.

Once unsuspecting victims click on a link or open an attachment, they are connected to a website that automatically downloads and runs malicious code. Once the code has run, the hacker has complete control of the victim's PC (Figure 3).

Many people would wonder if a properly configured firewall would block this attack. Most likely, it would not because the attacker (hacker) has convinced the victim to click a link. The connection to the Internet (and to the hacker's computer) was initiated by the victim from a trusted internal network (the victim's company). The firewall usually won't block the traffic because it originated from a trusted source and was on a port (in this case TCP 443) used for virtually all encrypted Internet connections.

Also, because the connection between the victim's PC and the hacker is encrypted, any security systems, including intrusion detection systems or firewalls, are blind to the contents of the communication. Therefore, those systems cannot detect malicious code or activity within the conversation.

The result of phase 1 is that the hacker now "owns" a computer on the internal trusted business network of the target victim company.

Phase 2—Pivoting toward an industrial control system

If the ultimate purpose is to find and assume command of the control system of the target company, once an adversary has taken control of a business PC, he or she likely will look for ways to compromise other systems. In hacking terms, this is referred to as "pivoting."

In this particular example, the hacker notices the victim PC is connected to a system named "Data Historian," which might provide information concerning activity within the control system environment. This would make it an obvious juicy target, so our hacker uses the victim business PC to attack and take over control of the Data Historian computer (Figure 4).

Phase 3—Pivoting to a human management interface or HMI (an operator's console)

With only a basic knowledge of control systems, our attacker can easily determine that the Data Historian computer is an intermediary that receives historian data from a control system computer and provides it to computers (such as our victim PC) on the business network. Consequently, with a little digging around, he determines that the Data Historian computer is connected to a computer within the control system environment named HMI PC.

Using his existing control over the Data Historian computer and the fact it already has a connection to the HMI PC, the attacker then connects to and takes control over the HMI PC.

Once the hacker has control of the HMI PC, it is very likely that he or she can wreak havoc on the connected control system (Figure 5).

The more technically savvy may be

able to identify ways to defend against this type of attack. Still, the methodology is realistic in that many systems could be successfully compromised using this method. Of course, if any of the steps in this method fails, an experienced attacker would simply try other avenues until he or she achieved success.

COMBATING THE THREAT

As awareness of threats has grown, the number of resources allocated to deal with the issues has increased exponentially. Unfortunately, simply putting more money into the problem does not guarantee a corresponding stronger defense. According to Art Gilliland, HP enterprise security, "We're spending something like $46 billion a year on cybersecurity but the percentage of breaches is increasing by 20% per year, and the cost of those breaches is increasing by 30%[6]."

The key to an effective cybersecurity program lies in a methodical and systematic lifecycle approach. That approach might look like Figure 6 with these steps:

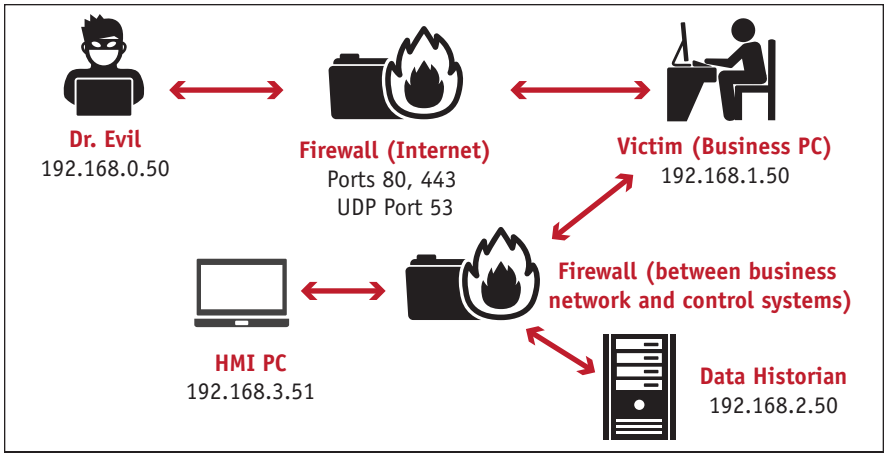


Figure 5. Pivoting to an HMI

Phase 1—Conduct assessments and define standards.
The development of a comprehensive and effective cybersecurity program requires knowing where a company is and where it's going. Site assessments show the strengths and weaknesses of the current cybersecurity stance and help to identify opportunities for improvement. Development of cybersecurity standards and a common architecture provide a concrete framework to use to move toward a target cybersecurity stance.

Phase 2—Conduct training and raise awareness/funding.
To develop and maintain a strong cybersecurity stance requires a technical team that understands and practices good cybersecurity throughout the environment. Good cybersecurity is simply not possible without proper funding. Therefore, it is imperative to get key stakeholders' support.

Phase 3—Deploy cybersecurity solutions to mitigate risk.
Two important points need to be made for this phase: First, effective cybersecurity is always about one thing—mitigating risk to the success and well-being of the business. Second, good risk mitigation is about both preventative and detective cybersecurity measures. According to Gartner research, "too much information security spending has focused on the prevention of attacks and not enough has gone into security monitoring and response capabilities."[7] A balanced approach includes both preventative and detective measures.

Phase 4—Operate and maintain.
Good cybersecurity is a continuous, iterative process that is incorporated or "baked in" to all related processing, including design and system configuration development and deployment, configuration management and lifecycle management. Periodic penetration testing is necessary to validate that the company is still on the right track and that no new vulnerabilities have been introduced into the environment.

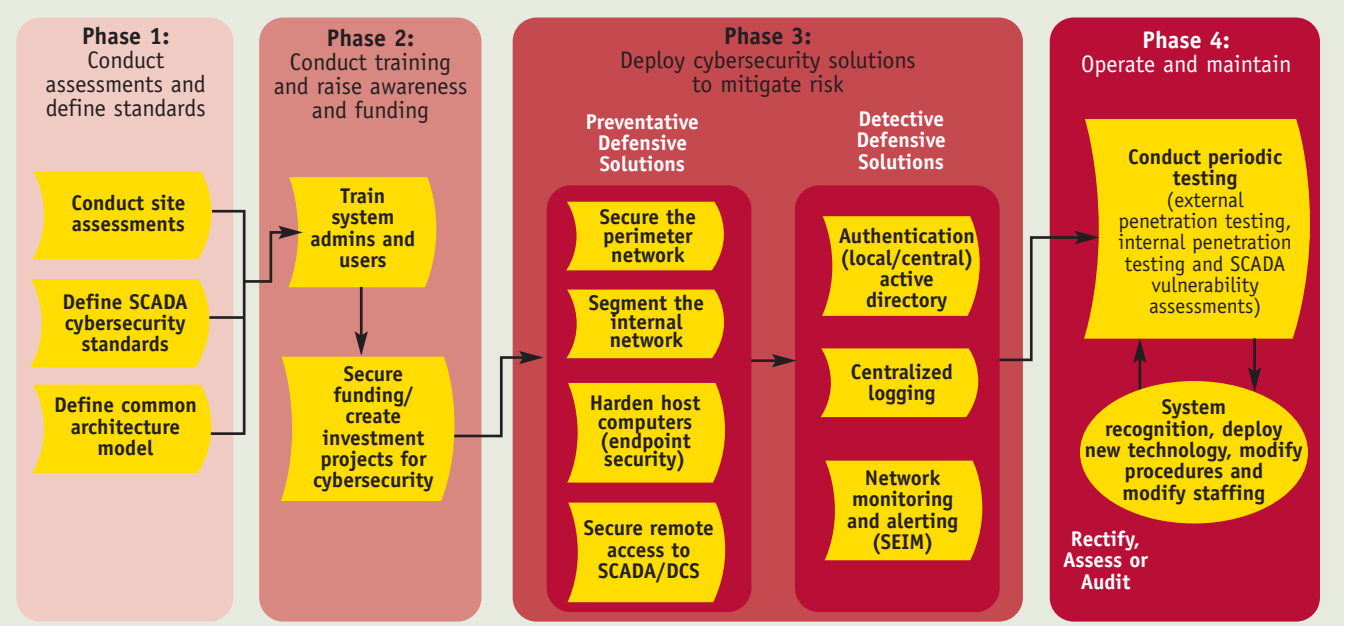


Figure 6. Mature approach to effective cybersecurity

CONCLUSION

Modern industrial control systems are increasingly connected—either directly or indirectly—to the Internet. More than ever, adversaries have sufficient knowledge, funding and resources to devote the necessary time and effort to successfully attack and compromise controls systems.

HMS says that: "The national effort to strengthen critical infrastructure security and resilience depends on the ability of public and private critical infrastructure owners and operators to make risk-informed decisions when allocating limited resources in both steady-state and crisis operations[8]."

Armed with the information in this article and with a systematic approach to effective cybersecurity, companies can make appropriate decisions on how to mitigate risk in control system environments. VM

Chris Shipp is chief information security officer, Fluor Federal Petroleum Operations, a contractor to the U.S. Department of Energy. Shipp is working within the cybersecurity community to develop and implement better information security within industrial control system environments. Reach him at cshipp@bluenight.us.

Jonathan Pollet is the founder and executive director of Red Tiger Security (www.redtigersecurity.com). He was one of the first to publish white papers that exposed the need for security for SCADA/Industrial Control Systems technology and has led security teams on over 250 assessments, penetration test and red team physical breaches. Reach him at jpollet@redtigersecurity.com.

REFERENCES

1. http://threatpost.com/cyberattacks-most-imminent-threat-to-u-s-economy/109039
2. www.securityfocus.com/news/6767
3. edition.cnn.com/2007/US/09/26/power.at.risk/index.html
4. www.scmagazine.com/rsa-2013-symantec-shows-proof-that-stuxnet-has-been-striking-since-at-least-2007/article/281979/
5. www.bloomberg.com/news/2014-06-13/ugly-gorilla-hack-of-u-s-utility-exposes-cyberwar-threat.html
6. www.smh.com.au/it-pro/security-it/billions-spent-on-cybersecurity-and-much-of-it-wasted-20140403-zqprb.html
7. Prevention Is Futile in 2020: Protect Information Via Pervasive Monitoring and Collective Intelligence, MacDonald, Gartner G00252476
8. NIPP 2013, Partnering for Critical Infrastructure Security and Resilience, DHS, p. 1

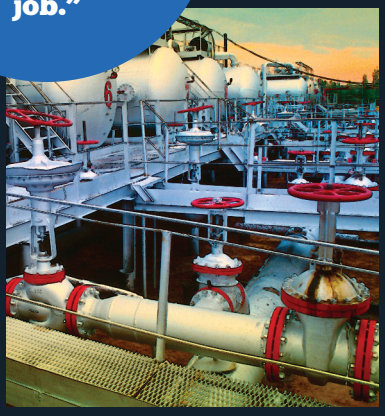
VALVE BASICS

Seminar & Exhibits 2015

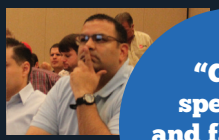
EXPANDED 3-DAY PROGRAM!

May 12-14
Hilton University Place
Charlotte, NC

"The material covered has really made me more confident in my everyday job."



"Excellent course! Petting zoo was the best! It really helped to see how everything really works."



"Great speakers and fantastic content."

REGISTRATION NOW OPEN

Includes an ALL-NEW day of "201-level" courses to further your educational experience!

TUESDAY, MAY 12*

Valves & Actuators 101

- Introduction to the Industry
- Multi-turn Valves
- Check Valves
- Quarter-turn Valves
- Pressure Relief Valves
- Actuators—Pneumatic, Hydraulic and Electric

WEDNESDAY, MAY 13*

Controls & Accessories 101

- Control Valves
- Solenoids
- Actuator Accessories
- ***PLUS:*** The Valve Petting Zoo

THURSDAY, MAY 14

Valves 201

- Standards
- Packings & Emissions
- Materials
- Critical Service Applications & Valves
- Valve Data, Feedback & Asset Monitoring
- Valve Repair

**Exhibits are open during late afternoon reception on Day 1 and during breakfast hours on Day 2*

VALVE {Ed}

www.vma.org?ValveBasics

WHO SHOULD ATTEND?

- Entry-level industry personnel or those seeking a refresher or overview of the industry and its products
- Previous Valve Basics course attendees who would benefit from the new curriculum
- End users; EPC and AEC personnel; valve and actuator manufacturers and distributors; industry suppliers; and senior-level Mechanical Engineering students

WHAT ARE THE COSTS?

3-day program (May 12-13-14)

- First registrant - $1,000
- Additional registrants - $955

2-day program (May 12-13)

- First registrant - $725
- Additional registrants - $690

1-day program (May 14)

- First registrant - $450
- Additional registrants - $425

Above registration fees include breakfast, lunch and breaks each day, a Wine & Beer Reception on Day 1, printed seminar materials and a VMA Certificate of Completion.

WHO SHOULD EXHIBIT?

U.S. or Canadian-based companies that sell or provide products or services to end-users, EPC firms or valve manufacturers*

HOW CAN I GET ADDITIONAL INFORMATION?

VMA.org > Meetings > Basics Seminar, or email abrown@vma.org

Drilling in a shale field

Regulators versus Control Valves: What's the Best Fit?

BY KEITH ERSKINE AND VINCE MEZZANO

The combination of North American shale fields that continue to fuel high levels of new domestic oil and gas projects and ongoing global efforts means the need for efficiency in instrumentation selection has never been higher. To drive efficient work processes with a younger, less experienced workforce requires an understanding of regulator and control valve functionality, an understanding that will lead to optimal selection in minimal time. This article is intended to address these issues.

THE DIFFERENCES

Regulators and control valves are different in function and the way they operate in a few ways.

The design of a typical control loop allows control valves to manipulate a range of process variables depending on which variable is measured for control. Examples of this include valves with capabilities for control of flow, level, temperature and pressure. The process control variable is measured by a sensor/transmitter and then communicated to a host control system, which is typically a distributed control system (DCS). The DCS interprets how the valve should respond to a deviation from the predetermined set-point value, then communicates a signal back to the DCS controller reporting the extent to which it needs to open or close to return to

Executive Summary

SUBJECT: For today's up and coming engineers and plant designers, understanding the differences between what regulators can do and what control valves can do will be critical to making the best choices.

KEY POINTS:

- How they differ
- What each does
- How they work for certain uses

TAKE-AWAY: There are applications where both might be cost effective and others where the wrong choice could not only cost money, but create major problems. The key is knowledge of how each works.

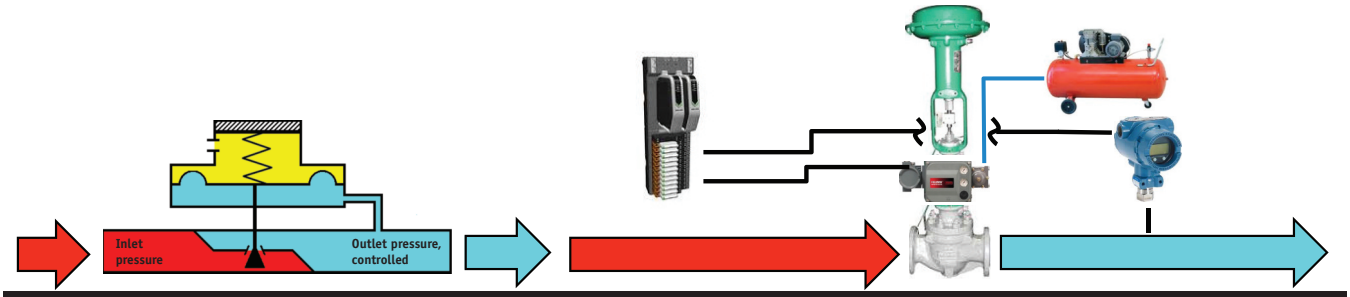


Figure 1. Design of a regulator (left) as opposed to a control valve (right)

the predetermined setpoint. The DCS controller receives that signal and then sends a signal to the valve's positioner, which then converts the electronic signal to a pneumatic signal, thereby physically making the change in the valve's throttling position.

The main operational difference between a control valve and a regulator is that, contrary to the control loop design mentioned above, regulators are process-powered valves without the need for an external power or instrument air source to operate. A regulator typically applies the pressure of the controlled process fluid against a diaphragm. This diaphragm then opposes a compressed spring to achieve force balance with the diaphragm at a given set pressure. Any change in the controlled pressure causes the diaphragm to move, which causes the flow area of the regulator to change, allowing more or less process fluid through the regulator. A simple example of a pressure-reducing, direct-operated regulator design compared to a control valve in a control loop is shown in Figure 1.

Because of the use of process fluid pressure as a means for control, regulators are functional as pressure control valves.

As a process-powered device, the controlled pressure must change to modify the flow rate through the regulator. An example is a pressure-reducing regulator that controls fuel gas pressure for a compressor engine. If the rate of fuel gas consumption for the compressor engine increases, gas pressure in the line between the regulator and compressor engine will decrease. This reduced pressure, acting on the diaphragm, will cause spring force to overcome the force generated by the diaphragm. The diaphragm is connected to the regulator's valve plug, and when spring force moves that diaphragm, the regulator's valve plug opens further, allowing additional fuel gas through an expanded flow area. As long as this increased consumption rate is maintained, the regulator will hold downstream pressure constant at a value slightly below the set pressure. This concept is referred to as droop or offset. It is the allowable deviation from set pressure to meet downstream consumption.

Another difference is related to the design pressure rating of the regulator's body. While a control valve can handle the same pressures on the inlet side as the outlet side of a valve, a regulator may have a lower pressure rating on the control pressure side of the regulator. This is because the process fluid pressure is applied directly to the internal components of the diaphragm casing. It would be similar to applying process pressure directly to the actuator portion of a control valve assembly instead of the controlled instrument air supply pressure. While a few exceptions to this rule exist among high-pressure, pilot-operated regulators, both the inlet and outlet side design pressures need to be considered in selecting a regulator.

Another difference is that the speed of response is faster for regulators compared to control valves. Regulators respond instantly to any change in the controlled pressure. They are also easier to maintain, and without a packing box, they have no volatile emissions.

On the other hand, control valves are available in much larger sizes and higher pressure classes than regulators. They can handle any process fluid by selecting compatible metallic trim materials. Regulators, in almost every case, will have at least one elastomeric material in contact with the process fluid, which means limited use in some highly corrosive applications.

Figure 2 depicts typical advantages of regulators and control valves.

DIRECT-OPERATED AND PILOT-OPERATED

To reduce droop and maximize accuracy, a pilot-operated regulator can be used. These regulators require only 1–3% droop or deviance from setpoint to achieve full capacity. Direct-operated regulators need 10–20% droop. Pilot-operated types achieve this accuracy by adding a small, direct-operated regulator (the "pilot") to the main regulator, which introduces gain to the system and increases sensitivity to changes in the controlled pressure. Pilot-operated regulators have much larger orifices as well, which allows higher capacities as well as heightened accuracy compared to self-operated regulators.

CRITERIA OTHER THAN USE

When choosing between a regulator and a control valve, design considera-

Figure 2. Comparisons

Regulator Advantages	Control Valve Advantages
■ Self Contained	■ Larger Sizes
■ Fastest Speed of Response	■ ANSI 900+
■ No Volatile Emissions (no packing)	■ Severe Service Trim Options
■ Less Complex	■ Fluid Versatility
■ Lower Installed Cost	■ Remote Feedback
■ Ease of Maintenance	■ Diagnostics Capabilities
■ Process Powered	■ Externally Powered

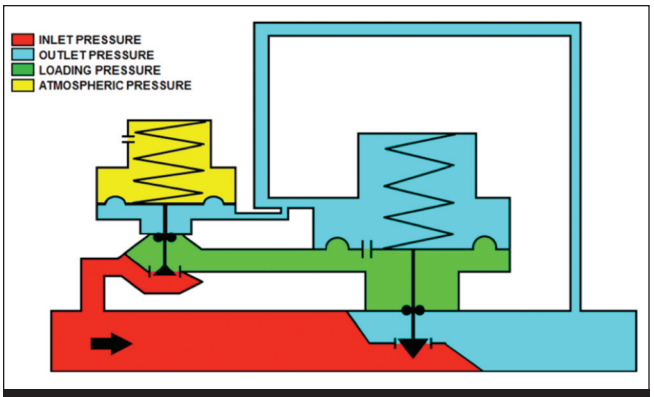


Figure 3. Loading style pilot-operated regulator schematic

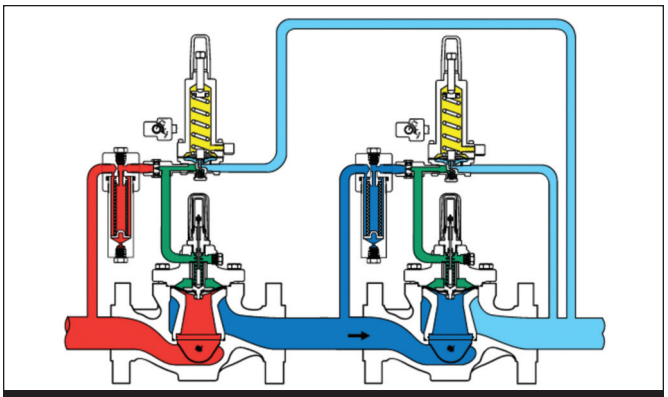


Figure 4. Plant feed gas supply

tions outside of the process data itself need to be considered.

For example, if diagnostic monitoring or predictive maintenance feedback are required, only a control valve that can communicate diagnostic data to a control system should be considered. On the other hand, if the valve's operation is critical to the facility, a regulator would be the more appropriate choice because auxiliary power is not required to maintain its functionality.

While maintenance and total installed costs are typically lower for regulators, project specifications or site standards may require a control valve. Also, certain applications mean technical advantages for either a control valve or a regulator and other applications create conditions where one or the other should be avoided altogether. Here are five example applications:

BLANKET GAS CONTROL

Blanket gas control, or tank blanketing, is the process of maintaining the pressure of a mass of inert gas, typically nitrogen, at the top of a tank or vessel, thereby preventing exposure to, or release of, a liquid product to the atmosphere. For a utility header line, for example, nitrogen, which is typically 50 psig to 200 psig, is reduced to a pressure of just inches of water column. This is done to maintain the gas blanket for when liquid product is pumped out of the tank or when environmental temperature changes cause a pressure change inside the tank. Similarly, a pressure control device might be used to relieve gas from the tank or vessel in the event pressure rises when loading liquid product.

Regulators most commonly are used for both the pressure-reducing valve and back pressure regulator (which would be a non-ASME relief valve). This is because the regulators can monitor the tank pressure directly and respond more quickly to changes in blanket gas pressure, preventing overpressure or underpressure from occurring on the tank.

There may be instances for which the tank design pressure is higher than the design pressure of the regulator on the side maintaining low-pressure control. The regulator design for tank blanketing applications typically includes large diaphragms that are very sensitive to changes in low pressures and can be damaged by pressures well above the setpoint. In these cases, setting a safety relief valve to a pressure below the design pressure of the regulator is important. If this action is not possible, it may be necessary to use a control valve even for tank blanketing applications.

PLANT FEED GAS SUPPLY

To avoid unplanned outages in plants, plant feed gas supply is critical for operation whether that feed goes to the entire facility or just a single process unit. Regulators are typically implemented to control pressure in these applications so that gas supply is ensured regardless of control signal or instrument air disruptions. Furthermore, to maintain a supply in the event of an instrument failure, two regulators are typically used in series. One regulator is used as a "worker," controlling the outlet gas pressure, and the other is used as a "monitor." The monitor will be set at a pressure slightly higher than the worker pressure. Should the worker fail open, the monitor would take control of the pressure at the slightly higher setpoint to ensure continuous gas flow as well as to ensure the downstream equipment does not suffer overpressure. An example of this system is shown in Figure 4, which has both worker and monitor control lines measuring pressure downstream of the system.

Figure 4 is an example of a wide open monitor, where the pressure between the two regulators is not controlled. A working monitor arrangement would add a second pilot to the monitor, which would control the intermediate pressure between the two regulators. This would provide a means to prove the monitor regulator is operational and capable of throttling pressure if the worker ever failed to open.

SEVERE SERVICE

The term severe service is typically applied to valve applications where excessive noise, cavitation or flashing occur from excessive pressure drop across the valve. For gas applications that predict high noise levels, instead of adding insulation or another path treatment noise-masking method, source treatment can be applied to attenuate the noise within the valve itself. A small number of regulators have trim types capable of noise attenuation, but attenuating control valve trims are more widely available. These can be customized to shift the sound frequency out of both the audible and the vibration-inducing range, thus avoiding damage to the valve, piping and downstream equipment.

In liquid applications when vena contracta pressure falls below the fluid

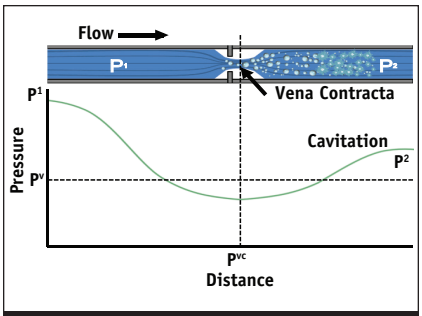


Figure 5. Cavitation phenomenon

vapor pressure then recovers, cavitation occurs (Figure 5). When vena contracta pressure falls below the fluid vapor pressure and stays below vapor pressure, flashing will occur. Regulators should be avoided in all applications where cavitation or flashing with even moderate pressure drops are expected. Control valves have trim designs available to stage pressure drops and eliminate the possibility of damage from cavitation. For flashing applications, control valve body type and material selections also can be made to avoid damage, whereas a regulator would quickly be damaged and incapable of functioning correctly.

DIFFERENTIAL PRESSURE CONTROL

Differential pressure control applications in oil and gas production are designed to maintain production pressure from the wellhead outlet at a point above the pressure of the pipeline into which the fluid will be loaded for transmission. Differential pressure control is needed because wellhead pressure is constantly varying, and a positive differential pressure from the pipeline must be maintained without overpressuring the line. These wells are typically in remote areas without access to instrument air or other actuator power supplies, which eliminates control valves from consideration. Regulators are capable of maintaining differential pressure between a reference point such as the pipeline pressure, and outlet pressure from the regulator. Direct-operated regulators are commonly used in these applications because they provide the fastest speed of response to pressure fluctuations or changes.

HEATER OR BOILER FUEL GAS CONTROL

Boiler and heater fuel gas control is an application that commonly uses a control valve and regulator in tandem. This application takes fuel gas from a header line in the 100-psig to 150-psig range and reduces pressure to less than 1 psig while keeping up with fuel demand for the boiler or the heaters. During normal operation, a large volume of fuel gas is required, which typically results in using a high-capacity ball valve for control. In this system, a very-low-flow condition occurs when the heaters/burners are not fired, but the boiler or heater pilot lines must be maintained. A pilot-operated regulator is typically installed parallel to the control valve for very accurate low flow and pressure control (Figure 6).

CONCLUSION

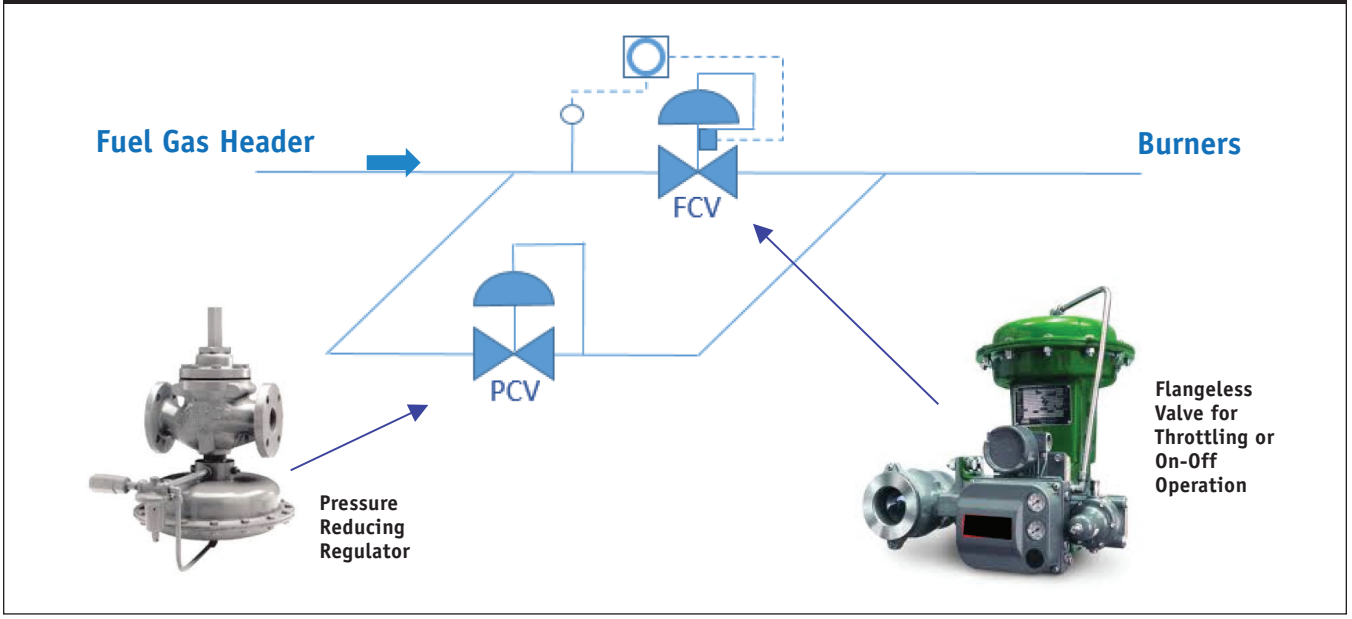
Pressure control valve selection will always be a critical aspect of facility design and maintenance. By understanding the capabilities and functionalities of both control valves and regulators, engineers tasked with selecting control valves or regulators can start with an optimal solution in mind or reduce rework for their pressure control applications. VM

KEITH ERSKINE is regulator business manager at Puffer-Sweiven, Emerson's local business partner in South Texas and Latin America. Most of his career has been focused on control valve and regulator applications at engineering contractors with a diverse scope of upstream oil and gas, refining and chemicals projects. Reach him at Keith.Erskine@puffer.com.

VINCENT E. MEZZANO is a Fluor Fellow and Fluor's subject matter expert in control valves, on/off valves, actuators and relief valves. Mezzano is chairman of ISA SP96 Valve Actuator Committee, ISA SP 75.05 Control Valve Terminology and ISA SP 75.24 Control Valve Actuator Sizing and Selection, a member of ISA Standards and Practices Board, and a voting member of ISA SP 75 Control Valves. He is also an active member of the PIP Process Control Team. Reach him at vince.mezzano@fluor.com.

This article is based in part on a presentation on differentiation of capabilities and proper applications of control valves versus regulators delivered at the 2014 Emerson Global Users Exchange.

Figure 6. Heater/boiler gas control



Understanding Generational Differences

BY GENILEE PARENTE

A universal issue that comes up at almost any event today is the need to attract new people with the right skills into the specialized, technical fields where valves and control devices are made and used. But to solve that problem requires something that many of those doing the hiring and training don't have: an understanding of the differences between the generations of yesterday and those of tomorrow.

Marilyn Moats Kennedy, a workforce issues specialist and speaker at VMA events, uses this story to illustrate the problem:

"One of the worst things I ever saw happened at an insurance company new employee orientation. This guy got up before a group of young people and announced: '17 years ago, I sat where you are sitting now,'" Kennedy explains. That might have flown many years ago when the speaker was a young man, she says, but: "What he didn't know was that his audience members were saying to themselves: 'Oh my. Couldn't he get a decent job?'"

The problem was that the speaker came from the baby boomer generation, but his audience was part of the millennial and younger generations, which have an entirely different set of values.

Executive Summary

SUBJECT: Today's companies are more challenged than ever to find and keep the skilled labor they need to run tomorrow's successful companies. One place to begin meeting that challenge is to realize the differences between the different generations of workers and how bridges can be constructed so that they can work together smoothly.

KEY CONCEPTS:

- Generational makeup
- The difference between old and young
- How to appeal to new employees
- How to keep good employees

TAKE-AWAY: Each generation has strengths and weaknesses. Understanding them is key to success.

"He had no understanding that you don't talk longevity to people who live in the moment," Kennedy says. "If the worst thing you've experienced to date is a bad hangover from a long night or if you're still living in your parents' house, longevity in a job is not your goal," she says.

THE GENERATIONS

For purposes of illustrating her point and explaining how different generations came to be, Kennedy uses these four groups as reference points for most of the workforce:

- Baby Boomers born in 1946 to 1959 (ages 55-68—about 38% of the population)
- Cuspers born 1960-1968 (ages 46-54—11%)
- Busters born 1969 (ages 36-45—20%)
- Millennials born 1978-1990 (ages 24-36—15%)

One of the major differences between the oldest and youngest of these groups is that when baby boomers were entering the workforce, they were driven by the need to make money or, like with the speaker at the insurance company, have a career. Millennials are driven by principles and the need for self-satisfaction.

"Boomers are focused on upward mobility and buying more things because that is the model of post-World War II America," Kennedy explains. Younger generations "just want to be able to cover their costs. They do not want more things. One of their major goals is to see that their children graduate college debt-free and that they save for retirement," she says.

When it comes to the workplace, the two are very different in how they view getting things done. Boomers, for example, have been taught to take a team approach.

This is because their upbringing was influenced by parents who went through World War II—parents who looked to the U.S. military as an example of how to get things done.

"What we forget, however, is the amount of training military forces have for making teamwork operate—much more than anyone in private industry could afford," Kennedy comments.

Even baby boomers today have learned there are flaws in the idea that everything is best done through teamwork.

They've learned over time that "each of the members of a team will not do the same amount of work," she says, and they have learned to put systems into place for accountability.

Meanwhile, when today's young people were children, teachers and coaches presented them with the idea that "everyone gets the same ribbon" for participating in a sport or academic challenge, Kennedy explains. Such thinking "diminishes what you do as an individual." As a result, they now have the attitude that "I'm going to be responsible for my own work. I want to do the job on my own and be evaluated on my own," she explains.

Another great difference is how important personal values and the freedom to express those values are in the workplace.

Older workers tend to participate in community service for its social and professional benefits so they join organizations such as the local Rotary or professional organizations, she says. Younger workers believe it's important

Table 1. Motivation Across Age Cohorts

Boomer 1946-1959	Cusper 1960-1968	Buster 1969-1978	Millennials 1978-1990
More Money	Do well by doing good	Time off	Time off
Promotion	Meeting organizational goals	Mentoring	Mentoring
Public recognition	Boss's recognition	Meeting own goals	Portable skills training
Peer recognition	Bonuses	Boss's recognition	Meeting own goals
Desire for subordinates	Mentoring others	Skills training	Bonuses
Control	—	Bonuses	Prep for self-employment
Loyalty to self	—	Latest technology	Sales training

for the company itself to be cause-oriented.

When they are deciding where they want to work, "They want to know what the owner truly values. Does he or she support the Salvation Army, participate in Big Brothers and Sisters, or stand up for environmental causes? The younger generation may not pick a job based on those causes, but they want to know the boss occasionally thinks about something other than the bottom line," Kennedy says.

HOW IT TRANSLATES

The larger question today is not so much what each generation represents but how the different generations interact. This is because the boomers are the ones retiring or about to retire and the older generations are also the ones doing the hiring and promoting. The younger people are choosing a field or deciding whether to stay with a job and seek upward mobility or go to another employer.

To get the needed fresh blood for industry will require the older people to understand what appeals to today's youth, Kennedy explains.

She suggests the industry start by appealing at the junior high level. "Early and repeated exposure to your industry is important, and I'm amazed that more valve and industrial company professionals don't go into the schools, bring a pizza, sit down and tell these young people the advantages of what they do," she says.

They need to start early because young people need to see how a professional can get from Point A to Point B with a career in industry or manufacturing.

"Think about how many people go into medical school because they have high scores on the MCATS [Medical College Admission Test]. It's not that they want to treat people initially—they just get on a track that begins with doing well on a test," she points out.

The valve industry also should be reaching out to the nation's technical schools to find candidates who may have a real interest in technical fields.

She suggests that for technical school students, companies sponsor regular "day on the job" tours of plants.

"Here's a big conflict that comes with talking to today's youth," she explains. "When you're dealing with someone who is 18 or younger, you have to realize that the one thing he or she is not eager to do is to get a white collar job and die at a desk."

Kennedy also says that too often, she sees industry technical professionals who are talking to young people who almost apologize because the work is hard or repetitive.

"They are putting ideas in young people's minds that are negative when they should be talking about outcomes—not about making widgets. It would be so much better to

ASCO EXPRESS™

Because time matters, ASCO Express delivers the great products you need, when you need them. Just place your order by 3:00 P.M. EST and ASCO ships same day.

2, 3, & 4-Way Solenoid Valves | Air Operated Valves | Combustion Products | Miniature Valves

SAMEDAY | Guaranteed same day shipment or ASCO pays the freight. Over 2000 of ASCO's most popular products qualify for the ASCO Express guarantee. ASCO Express includes our most popular valves, valve rebuild kits, and accessories.

5DAY | As part of our continued drive for customer service, we expanded the ASCO Express program with over 50,000 products that can be shipped within five business days.

ASCO® Right. Now.™

EMERSON™ Industrial Automation

800-972-ASCO (2726) | e-mail: info-valve@asco.com | www.ascovalve.com/express

start with a tour of a facility and show them exactly what the job looks like and what the product does," she says.

To appeal to the millennial generation, for example, they need to show how those widgets meet specific needs because that generation loves to solve problems.

Not many people know how vital valves are in the infrastructure of the nation—how they are in everything from pipelines to building operations.

"Your websites and your presentations should be telling people what valves are, who uses valves and what that means to the world," she says. "Don't assume they know, because they don't."

What is not needed in dealing with today's younger generations is to tell them: "'Someday you'll be owner of a company.' That is not what they want to hear. They want to know what they might be doing in three weeks, then three months, then three years," she says.

They also want assurance that what they will be doing will be useful and effective.

Kennedy pointed to the paint industry as a place where certain companies have been effective in doing just that by linking painting to sustainability.

"Some of the companies have been able to show how vital painting can be to the environment and how working for the right paint company can make a difference because of it," she says.

Industries trying to appeal to the young today have to relate what they do to the good of the nation, to the economy, to the environment, she explains.

The boomers are a good source for teaching these lessons because they have seen the industry as it's evolved, and they've personally been on the tracks of movement that can occur within manufacturing companies, she adds.

"Young people want a story from someone believable, so don't send young people out to recruit other young people. The younger generations want people to tell them personal tales of what the industry did for them. Send those garrulous boomers proud of what they've done. Every alumnae group in the country has learned to use this technique and you should, too," she says.

Table 2. Age Cohorts: Workplace Characteristics

Boomer 1946-1959	Cusper 1960-1968	Buster 1969-1978	Millennials 1978-1990
Money/work ethic	Money/principle	Principle/ satisfaction	Principle/ satisfaction
Work first	Some of both	Lifestyle first	Lifestyle first
Expected to lead	Lead and follow	No need to lead	Lead if necessary
Loyal to employer	Some of both	Loyal to skills	Loyal to skills
Care deeply what others think	Some of both	Don't care what others think	Care selectively what others think
Want others to work with them	Want others to work with them	Prefer to work alone	Like small groups
Technically challenged	Technically challenged	Technically savvy	State of the art
Lip service to mission	Care about mission	Must have mission	Must have mission
Chain of command	Mixed	Individual first	Individual first
I win, you lose	Want to win	I win, you win	I win, you win

THE MIDDLE GENERATIONS

Beyond the challenges of bringing in new people are the challenges of retaining and encouraging different generations so that they will move up through the ranks of management. Here, too, the interaction between the generations is key, Kennedy says.

For example, while the upper ranks of boomers and even some cuspers are "technically challenged," the younger generations have not only embraced technology, but made it a daily

requirement.

"Companies have to learn to invest in the best today because if you want to appeal to the world's youth, you can't even have a whiff of obsolescence. It spooks people," Kennedy says.

Boomers also need to realize that to appeal to generations not motivated by money requires facing the fact that "forever after no longer exists. If someone is doing a wonderful job after a couple of years, you need to start asking what else he or she would like to learn," she says.

Those generations moving up the ranks want to know what else they can accomplish in the job. For some, that may mean that the international travel increasingly necessary in the business world may appeal.

It's also vital to face the reality that the issue of "having it all" that feminism first struggled with is still around, however, and that it's expanded to include both genders.

"With younger generations focused heavily on lifestyle as vital to their lives as career mobility, both men and women are looking for ways to make their personal lives work," she says.

The balance issue is a major one at all levels of employment today and companies that can find a way to provide flexibility will retain their workforce best she says.

"The assumption used to be that if you recruited the best and the brightest, they would stay forever. Today, I often tell companies that the competition for good employees is not so much between different companies that steal each other's talent. The competition is self-employment," she says.

"There is such a backlash against working in offices today that everyone under the age of 40 wants to work at home," she adds.

While that can't possibly happen, "maybe we can look at what that really means. We can concentrate on things they don't like about the office such as office politics and constant meetings and find ways to give them what they want, such as the chance to participate in social causes and flexibility with family situations," she says.

She also points out that the youngest generation (those born after 1990) are a different breed, but says that may offer an advantage in the technical fields. Young people have an extreme interest in science and in mechanical things.

"They care about using their hands and making things," she adds.

Meanwhile, "save your biggest paychecks for the baby boomers" because they'll need it both for retirement and because that generation was not taught to be frugal. Many were encouraged to use their homes as ATMs, have revamped retirement plans and plan to work until 75 or so. Many did not or could not save what they'll need to be comfortable in old age or lost significant amounts during the latest recession.

Overall, Kennedy concludes, the companies that give people the means to make their lifestyles work, convince them the company stands for something beyond making money and show them the job and what the company makes is useful to the world, "stand a much better chance of finding and keeping the talent they need." VM

Genilee Parente is managing editor of VALVE Magazine. Reach her at gparente@vma.org.

SPOTLIGHT ON THE OFFSHORE MARKET

As the world looks to increasingly remote locations and harsher environments for new sources of oil and gas, the challenges have grown at the same time easily extracted reserves have shrunk. One place new reserves are being tapped is the deep sea and more remote offshore areas.

While keeping employees and the environment safe has always been a priority in the oil and gas field, the risks when tapping these new sources have become more complicated.

Companies that supply to or make products for the field have responded with new technology and tools designed to ensure risks are minimized while access to resources is maximized even in harsh environments such as deep water drilling. VALVE Magazine has compiled a few of the newer products designed to increase access and decrease risk.

CONVERSATION WITH... EDGEN MURRAY'S JOHN NICHOLAS

Edgen Murray in Baton Rouge, LA, is one of VMA's new distributor members. The company is heavily involved in project management and supplies a variety of valves and related products for exploration and production in the offshore market, so we talked with John Nicholas, vice president of valves, about the unique challenges to the materials and systems used in the harsh environment of remote deep water production facilities.

Q: HAS THE MACONDO INCIDENT CHANGED THE WAY OPERATORS PURCHASE VALVES?

A: Since the explosion and sinking of BP's Deepwater Horizon in 2010, offshore operators have been especially diligent to use only top-quality valves from well-respected manufacturers. Maybe in the past they would have considered using some newer suppliers, but now they're going only to the brand names, with a good reputation and a solid history.

Q: WHAT KINDS OF VALVES ARE USED ON OFFSHORE PLATFORMS?

A: They use basically the same kinds of valves, no matter the operator, including: ball valves, both trunnion and floating, although the majority are trunnion; high-pressure wafer check valves; and occasionally full body swing checks and a very few butterflies. What changes is the ANSI rating, according to the pressure coming into the platform, which can be rated anywhere from pressure class 600 to 1500. There are always plenty of automated valve packages as well. Much of the actuation is pneumatic, although occasionally there will be hydraulic, and mostly spring return.

Q: ARE THERE NEW VALVE OR SEALING MATERIALS BEING USED NOW IN OFFSHORE APPLICATIONS?

A: There hasn't been a lot of change over the last few years when it comes to what is generally accepted and used offshore in the Gulf of Mexico, although in some other countries, they are starting to see some different alloys.

Q: HOW IS THE OIL PRICE SLUMP AFFECTING OFFSHORE PROJECTS?

A: These projects are not affected by short-term changes in the same way that shale oil would be. Remember, these big offshore, deep water platforms in the Gulf of Mexico take a very long time to develop. From the time they start the engineering, the feed study and then the more detailed engineering, to the time they buy materials like valves, and then the construction of the platform, we're talking two- to two-and-a-half years of work. There is no way to know the price of oil two or three years down the road. What we've seen with these projects is that since they are already in that process, there is plenty of time for prices to recover. I don't believe the low oil prices will impact much unless they stay down for a very long period of time.

Nobody is anticipating any political reason for an oil shortage and people in the industry are figuring it will be 18 months to come back near the $80 range. Of course a big skirmish somewhere could change that. The trick to riding it out is to be good business managers. Control what you can internally so that you're ready when the market turns around.

Compare this to the onshore shale plays, which can be turned on and off fairly quickly. Once they start drilling, normally it's about 60 to 90 days, they're getting a return on their investment. But if the prices are really low, they can just literally shut those off, and then turn them back on fairly quickly. So the shale plays will likely be affected more by the price drop. VM

OFFSHORE PRODUCTS

AWARD-WINNING PREDICTIVE TECHNOLOGY

GE Oil & Gas won a Spotlight on New Technology award at the Offshore Technology Conference in 2014 for its SeaLytics BOP [blowout preventer] Advisor tool. The tool is a monitoring and predictive maintenance solution that allows drilling contractors to monitor the performance of BOPs and plant maintenance using predictive analytics based on actual component performance data.

BOPs can cost significant amounts of money and disruptions in scheduling when they are brought offline for unplanned service. GE's tool reduces unnecessary maintenance and maximizes uptime, which leads to better cost forecasting. The technology communicates beyond the drilling operator's cockpit, which allows the rig to share its status with operations leaders located onshore or with drilling teams on other vessels. Because SeaLytics BOP Advisor can identify components that may need service in advance, the contractor can service equipment when scheduling opportunities arise.

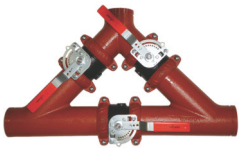
The tool was the first product to be developed at GE's new Software Center of Excellence in San Ramon, CA.

STAINLESS-STEEL SPOOL VALVE

ASCO Numatics has introduced the ASCO 364 Series spool valve for control panel applications in both the onshore and offshore oil and gas industry. The new valve combines compact construction with low-power options that feature higher operating pressures and temperature ratings than competitive models. The valve combines 316L stainless-steel construction with the company's solenoid valve technology for top-level corrosion resistance and high reliability in harsh upstream exploration and production environments. The valves are designed for drop-in replacement and compatibility with most existing control panel applications.

The 364 Series valve line includes low-power (1.4 watt and 1.8 watt) solenoid options that consume less energy. They also are available with higher operating pressures (150 psi) and temperature ratings (200°F or 93°C). The valve is offered in a wide range of manual, pneumatic and solenoid options.

ASSEMBLY FOR OFFSHORE PIPING



Victaulic has introduced the Style DLY Delta-Y assembly, a combination of preassembled Victaulic cast grooved fittings, rigid couplings and butterfly valves. The assembly is designed specifically for bulk cement/barite systems on offshore oil platforms and is ideal for drilling mud and other associated systems. It offers quick and simple installation, space and weight savings, efficient operation and reduced maintenance downtime. Each pre-assembled unit is delivered complete with all fittings and valves oriented according to the specific system design. The unit is joined to the piping system with three Style 107 QuickVic rigid couplings, which eases installation. At less than half the weight of lug butterfly valves with flanges, Vic-300 MasterSeal butterfly valves provide considerable weight reduction. Also, the Delta-Y can reduce the overall delta length by 1 foot (300 millimeters).

The offset disc within the valves provides a larger flow area for more efficient flow, low operating torque and leak-tight sealing. The fittings maintain full wall thickness and have a smooth inner flow path to minimize abrasion and blockages. The assembly can reduce maintenance downtime by up to 50%, as each coupling serves as a union for rapid valve and fitting replacement.

NEW ELECTRO-HYDRAULIC OPERATOR

Emerson Process Management has added a new electro-hydraulic operator to its line with the release of the Bettis EHO actuator. The actuator is ideal for a diverse range of applications that affect the oil and gas industries in situations where operational upsets might cause safety and environmental hazards and costly production losses. That includes a wide range of places, from topsides valve automation on offshore platforms to remote pipelines.

The EHO is available in either spring-return or double-acting configuration. Torque outputs can handle valve sizes from 6-60 inches. It operates on utility electrical power or optional solar power for remote areas where electric power is not available or not reliable. The actuator can operate in temperatures ranging from -40°F to over 140°F (-40°C to over 60°C). Its fail-safe capability is reliable with fast close or open stroke times, suitable for emergency shutdown in oil or gas service.

MORE ON OFFSHORE

Many VMA members manufacture products and provide services for the offshore oil and gas sector. We regularly include news headlines, products and in-depth articles about this industry. Use the "search" functions on www.VALVEmagazine.com and www.VALVEmagazine-digital.com to find topics of interest, or start with the following articles:

- Offshore High Pressure Relief Valve (posted April 19, 2013)
- Triple Offset Valves in Upstream Applications (Spring 2012)
- Materials Selection for Deepwater Gate Valves (Spring 2011)
- In the Ocean's Depths, Valves Face Unique Challenges (Spring 2010)
- Severe Service Control Valves for Offshore Platforms (Spring 2009)

Cost Implications for Throttling Electric Actuators in Pipeline Systems

BY CLAYTON CARROLL

A few years ago, a major U.S. liquid pipeline company revamped one of its existing refined products pipelines. The pipeline provided a main supply of gasoline, jet and diesel fuel to many growing cities along the route as well as to two military bases. The project was designed to increase both throughput and reliability.

The existing control valves used for the line were ball-type, reduced-port, with old-style electro-hydraulic actuators that had become obsolete. These actuators were difficult to maintain because of parts availability and were prone to external hydraulic leaks. If the hydraulic fluid reached the ground, such leaks became recordable incidents in the field. The decision was made early in the revamping project to purchase new control valves and actuators for the entire project. Newer types of throttling electric actuators fit the requirements of the project. Here's why:

APPLICATIONS

The required applications for the control valves included back pressure control for the pumps, station inlet pressure control (required because of large elevation changes between some stations) and tank delivery pressure control. These applications were determined to have fail-last as the desired fail action for the actuators (a loss of 4-20 mA DC control signal or loss of power). Stroke time requirements were 3-5 seconds per inch of the nominal bore size of the control valve. The control valves selected had a required run torque range of 52,000 inch-pounds (in-lbs) (5,875 Nm) for the smaller ball valves to over 115,000 in-lbs (12,993 Nm) for the larger severe service ball valves.

TECHNOLOGY CONSIDERATIONS

The project team considered two different types of actuation technology: modern electro-hydraulic actuators and throttling electric actuators. Because they had been used in the past, the project team initially leaned toward electro-hydraulic actuators. However, based on the number of actuators required and resulting cost savings, the throttling electric actuators were chosen and ordered from the valve OEM.

INSTALLATION AND STARTUP

The initial installation and set-up of the throttling electric actuators in the field proceeded smoothly partly because the field technicians were already familiar with the technology—multiple motor-operated valves (MOVs) were already in place up and down the same pipeline. Hook-ups between standard MOVs and throttling electric actuators are the same except for the 4-20 mA DC control (as opposed to a discrete on/off control signal).

Everything operated smoothly until the pipeline's start-up. A couple of weeks after that startup, the motor thermals began to trip out on half of the actuators. Since this was not a desired result, an investigation began.

STARTUP DISCOVERIES

The actuators tripping motor thermals had setpoint changes more than 3,600 times in an hour (twice the actuator rating). This was due to several factors including:

- The proportional-integral-derivative (PID) control scheme
- The pipeline system response time
- The special nature of the severe service control valve in use

The initial setup of the control system was to monitor and change setpoint when required every 20 milliseconds. A throttling electric actuator could not keep up with the setpoint changes, which meant the actuator was continually hunting for its setpoint, and thus overheating.

Since the distance between pump stations was more than 100 miles long, the pipeline needed time to stabilize from process changes. This reality had to be considered for the control scheme. The customer collected data points and determined the process on different pipeline runs took from 4-7 seconds for the pipeline to stabilize from a setpoint change (referred to in Figure 1 as ΔT). Once the control valve was given a setpoint change, the pipeline would react like a degrading sinusoidal wave with an amplitude of 3-6 psig on small step changes.

The special hyperbolic nature of the severe service control valve used also presented PID challenges.

Figure 2 compares a hyperbolic Cv curve to an equal percentage (EQ%) curve and linear curve.

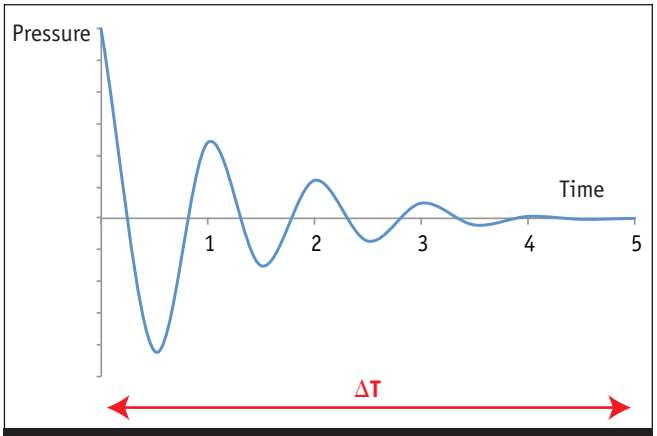
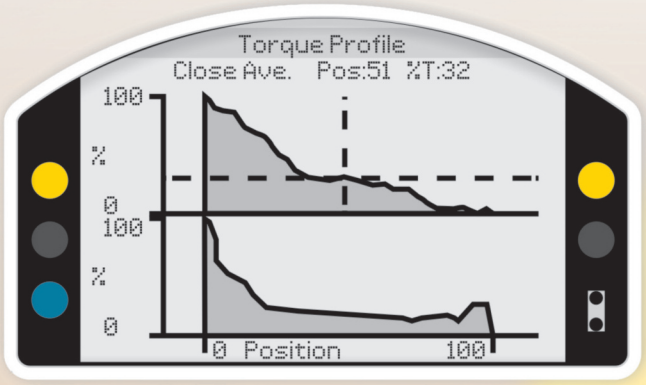


Figure 1

The 3rd Generation of IQ Intelligent Valve Actuators is Now Available



Providing a clear window into your process

With the third-generation IQ you get unparalleled data analysis of the condition and operational status of the valve, at the valve. The data is displayed on a revolutionary new screen that enables field operations and maintenance personnel to view accurate asset management data in real time.
Rotork innovation at its best.

IQ3

Visit www.**iqactuator**.com for more information about the new **IQ3** actuator and its many advanced features.

Rotork Controls, Inc.
675 Mile Crossing Blvd.
Rochester, NY 14624

phone: 585 247 2304
email: info@rotork.com

rotork®

www.rotork.com

Redefining Flow Control

SOLUTION

Taking the newly discovered information into account, it was determined changes were needed in the control scheme. The first change involved taking 100 raw pressure scans and averaging them out over the determined ΔT time period. This new time-weighted and averaged pressure reading was used to determine if the pipeline was operating within its desired pressure setpoint.

A second change placed software travel limits on the hyperbolic control valves to maintain a range in which movement of the valve actually made a difference on the process pressure (Figure 3).

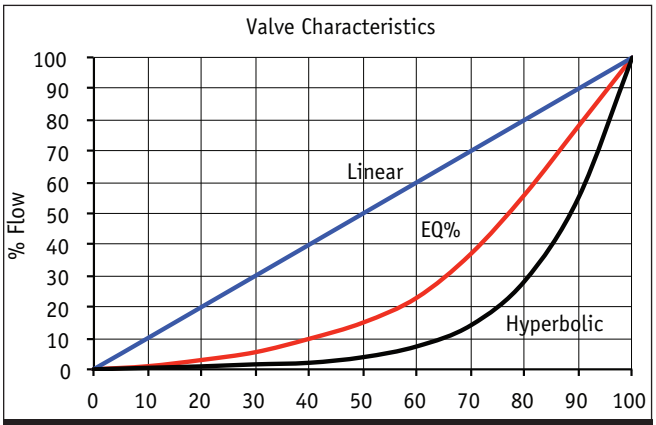


Figure 2

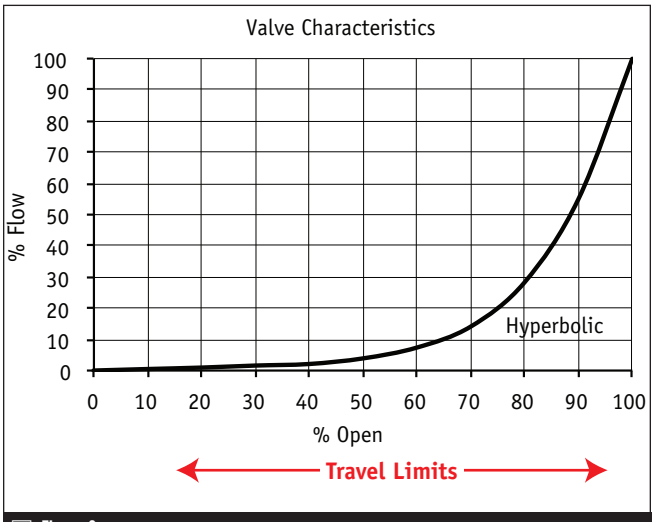


Figure 3

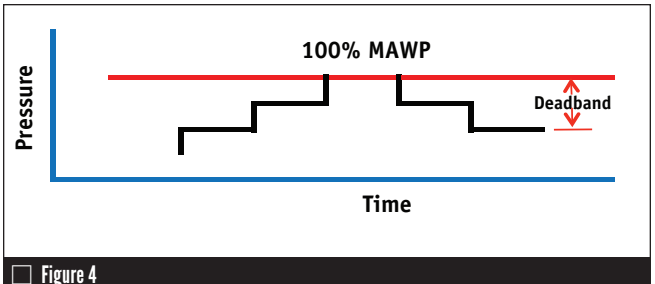


Figure 4

One last challenge to the control scheme was that the station outlets were run at maximum allowable working pressure (MAWP). Every 14.7 psi of pressure consumption equaled an 8% cost to the pipeline.

To maintain the pipeline's design parameters, a decision was made that when the station's outlet hit MAWP, the control system would bump the control valve setpoint down 2 psig below MAWP (Figure 4).

RESULTS

Changes to the PID control scheme meant the pipeline operator could run the pipeline within 0.5% accuracy on pressure control, which was far better than the old-style electro-hydraulic actuators. The process went from 3,600 setpoint changes per hour to 30, which eliminated overheating of the actuators. Meanwhile, maintenance of the actuators to date has been much more cost effective, almost disappearing.

Given the cost savings and performance achieved in this first project, throttling electric actuators have become a new standard for the pipeline company involved in this case study.

CONCLUSION

Electric throttling actuators are a part of many successful process control environments. When used properly, and when fail-last on loss of power supply is acceptable, throttling electric actuators can offer a significant cost savings for new projects. VM

RECOMMENDATIONS

The following are the authors' recommendation for liquid pipeline control valve throttling electric actuators:

1. No actuator should stroke faster than 15 seconds. A good rule of thumb would be from 3-6 seconds per nominal valve size (inches).
2. Make sure the conditions under which control valve run torques are based upon throttling are known; these can easily exceed valve break torques. Actuator sizing must take this into account.
3. Actuators should be selected with a generous safety factor when used on throttling ball valves. As throttling ball valves wear over time, especially in non-lubricating refined product lines, the valve torque will increase. Actuator sizing should take this into account.
4. Make sure the reaction time of the pipeline is considered for any PID control scheme.

CLAYTON CARROLL is national sales manager, Valve Automation–High Pressure Pipeline Products, Emerson Process Management. Reach him at Clayton.Carroll@Emerson.com.

We Can Help You Cope With Fugitive Emissions Issues

Fugitive Emissions Testing | **Fugitive Emissions Re-Packing** | **"Low E" Repaired Valves** | **Packing Systems Evaluation**

United Valve offers a variety of testing capabilities and valve upgrade services to help meet your fugitive emissions compliance goals.

United Valve has one of the largest and most comprehensive fugitive emissions testing facilities in North America. The facilities are housed in a new 45,000 sq. ft. 40-ton crane-served engineering testing and valve repair building annex. We offer quick turnaround on FE tests with four large testing units that can handle valves up through 12″ class 1500 and 24″ class 150 and five smaller test units for API 602 valves. All tests are operated and monitored via our proprietary control system hardware and software. The United Valve engineering testing department is actively supervised by two staff engineers.

United can perform fugitive emissions tests per API 622, API 624, ISO 15848-1, 15848-2 or any custom or end-user test specification. In addition to the actual testing, we can provide complete metrological analysis of valve components before or after testing. Our staff can also assist your company with valve packing selection assistance, packing performance evaluation, and propose corrective actions if required.

We provide "Low-E" valve repacking services on both new and repaired valves of all sizes and pressure classes. In addition to installing a certified low emissions packing, we monitor and record all key dimensions to insure that the valve and packing will work together to provide a low emissions solution. If required, production tests with Methane or Helium can be performed on these valves as well.

United Valve
The Valve Service Specialists

9916 Gulf Freeway, Houston, Texas 77034-1045
Phone 713/944-9852 888/715-5093 Fax 713/944-5964

Visit us online at: www.unitedvalve.com

Tightening Bolts Can Help Tighten Budgets

BY CHUCK GRAY

In highly-corrosive chemical and refining applications where in-line and atmospheric sealing is critical, sleeved plug valves provide essential defense against leaks and fugitive emissions. Because they typically face harsh conditions, repair or replacement is an important consideration. However, before those steps have to be taken, there's a simple step to make them last longer: tightening the bolts.

CRITICAL VALVES

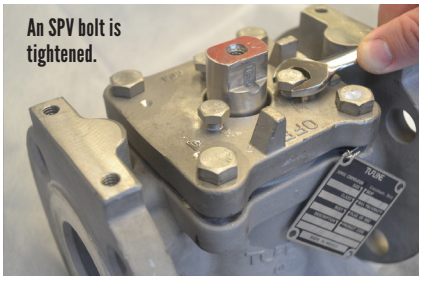
Sleeved plug valves are non-lubricated quarter-turn valves characterized by a compressible sleeve that provides a large, circumferential sealing surface from port to port. Whether a valve is open, closed or in rotation, the inert PTFE sleeve ensures a superior level of sealing.

While sleeved plug valves in many applications can operate for decades virtually maintenance free, these valves are constantly exposed to demanding processes with temperatures ranging from -20°F (-29°C) to 600°F (316°C). Over time, this harsh environment exerts great stress and may eventually cause a valve to leak.

Body and plug materials, which are manufactured using a variety of materials (from ductile iron and stainless steel to the most exotic alloys) are highly susceptible to erosion and corrosion, two primary causes of sleeved plug valve wear. Add to that the impact of high cycling, and the performance of any valve can quickly deteriorate. That's why maintenance, repair or replacement is so important.

EASY ADJUSTMENTS

When a valve begins to show the effects of excessive wear through seepage at the plug stem or downstream, end users may be tempted to replace valve components or even the entire valve. However, in many cases, a few simple adjustments can eliminate the leak, resulting in many additional years of service.



An SPV bolt is tightened.

If a brief inspection shows no significant damage or defects, the valve likely can be restored to leak-free functionality easily by merely tightening the bolts while the valve remains inline.

To complete this repair, tighten each adjustment bolt or screw by a quarter turn (depending on the model). After the bolts are tightened, operate and check the valve again for leakage. Repeat this process as necessary to stop seepage.

Consult a product's specific maintenance and repair manual before any type of valve maintenance is performed. Take care not to over-torque adjustment bolts. While different valve manufacturers require different adjustment techniques, consider this simple tightening/checking solution before opting to replace more costly valve parts.

Also, because excessive tightening of a valve's adjustment bolts will cause valve stem torque to increase, torque adjustments may need to be made after taking steps to eliminate seat leakage. Since the initial breakaway torque normally reduces with usage and temperature, operate the valve under service conditions for at least 12 hours before adjustments are made.

WHEN ADJUSTMENTS AREN'T ENOUGH

Although leaking sleeved plug valves often can be fixed with these minor adjustments, certain circumstances require the valve be repaired or replaced. For example, the need for frequent adjustment of the bolts or multiple adjustment turns indicate that seals are worn beyond repair and must be replaced.

A valve that continues to leak despite adjustments to the bolts must be removed from service, disassembled and thoroughly inspected. Before inspection occurs, however, the valve and pipeline must be depressurized and cleaned, and any remaining media must be neutralized.

During inspection, make sure the valve's critical sealing elements receive careful attention, including the seal surface of the plug stem, the plug surface, the seal surface on the cover, the body seal surface that mates with the cover and the sleeve. Keep these surfaces free from defects typically caused by corrosion, erosion, improper handling and incorrect storage of a disassembled valve. Replace valves with any of this damage rather than repair them.

In general, weigh the benefits of field repair against the advantages of removing the valve from service and returning it to the manufacturer for repair or to purchase a new valve altogether. Also, valves repaired in an authorized facility are tested to the same specifications as new valves, and they may carry the same standard warranty as that new valve.

CONCLUSION

Chemical and other processors rely on the exceptional sealing performance and fugitive emissions protection delivered by sleeved plug valves. When properly installed, adjusted and operated, these valves require minimal attention from users and have a long and problem-free service life. Sometimes, a simple turn of the top adjustment bolts keeps the sleeve sealing tight and the valve in service even longer while avoiding the need for costly repair and replacement. VM

CHUCK GRAY is the service center manager for Crane ChemPharma & Energy. Reach him at cgray@cranechempharma.com.

The AUMA SQ.2 Part-Turn Electric Actuator is one of many valve actuator options that can bring unfailing reliability and unsurpassed *precision* to your plant operation. Our innovative engineering optimizes modulating solutions…Superb craftsmanship enhances torque output capabilities… Creative components simplify commissioning and service…

Futuristic design enables identical operation concept to generation .2 multi-turn actuators…Convenient features allow electrical connection via the AUMA plug and socket connector. A wide range of AUMA actuator models provides tomorrow's breakthrough technology today for diverse customer applications worldwide.

auma®

Solutions for a world in motion

AUMA Actuators, Inc.
100 Southpointe Blvd.
Canonsburg, PA 15317 USA
Phone: (724) 743-AUMA (2862)
Fax: (724) 743-4711
E-Mail: mailbox@auma-usa.com
Please visit us at our website: www.auma-usa.com

Forgings: Higher Quality with a Cost

BY GREG JOHNSON

A small valve body is forged.

While the words "cast" and "steel" often go together in the valve world, so do "forged" and "steel." Forged steel valves are a cornerstone of the world's valve inventory. In fact, industrial plants around the world have many more forged steel valves than cast steel valves. The quality of forged steel bodies and other pressure containment parts is almost always better than the same parts when cast. So why aren't all valves forged instead of cast?

Because of the cost.

Before we talk about the specifics of cast vs. forged, we need to discuss forgings, the forging process itself and how it differs from casting.

THE PROCESS

Steel or alloy castings require a specific recipe of materials be combined and melted at ultra-high temperatures. This molten metal is poured into molds for a variety of items including valve bodies, bonnets and caps.

Other cast items include billets and bars—solid, round, square or rectangular pieces of steel often re-processed into smaller strips and sheets.

Such bars and billets are also used as the base material for forging valve components. The forging process begins with a piece of previously "cast" then rolled steel. This initial rolling or forming process realigns the grain structure of the initial molten metallic mixture into a more linear pattern.

For forging, billet or bar pieces are cut to length and then heated to the plastic or forging temperature of the

Table 1. Common valve materials in order of increasing forging difficulty

MATERIAL	FORGING TEMPERATURE RANGE (°F)
Carbon & low alloy steels	1560-2100
Martensitic stainless steels	2010-2280
Austenitic stainless steels	2010-2280
Nickel alloys	1830-2100
Iron-base superalloys	1920-2160
Cobalt-base superalloys	2160-2280
Nickel-base superalloys	1920-2190

Note: Most difficult to forge at bottom

specific metal or steel alloy. The piece is then placed into a press, where tons—and sometimes tens of thousands of tons—of force are used to mash the soft billet or bar into the void of the casting dies.

Two types of dies are used in the valve component forging process. The first is "open-die," for which the forging process yields a part close to the desired shape and geometry. The second is "closed-die," which can yield parts that require minimal machining. The closed-die process yields a part with some exterior flash around its periphery that needs to be removed in a second pressing operation. After the part has been forged and the flash removed, it is ready for post-weld heat treatment, if required, and then final machining to shape.

The forging process is ideally suited to smaller valve components because of the cost of the dies as well as the cost of the forging process itself. Dies have to be machined from very hard materials that have a plastic temperature range well above that of the preheated forging billet or bar. Because the pressing operation is so violent, the dies have a short life-span and must be either repaired or replaced at regular intervals.

MATERIALS AND TYPES

So if castings and forgings both begin with molten steel, why do forgings have higher integrity and fewer defects? The answer lies in the grain structure of the steel. When a metallic item is cast, the metal grains slowly cool in random directions. During the cooling process, trapped gases can cause porosity and imperfect directional solidification, which can lead to shrinkage or cracks. The initial forming process of rolling a bar or billet into shape helps to eliminate most of these imperfections. The secondary heating and stamping operation of the forge press adds further grain structure realignment, creating an even higher integrity part.

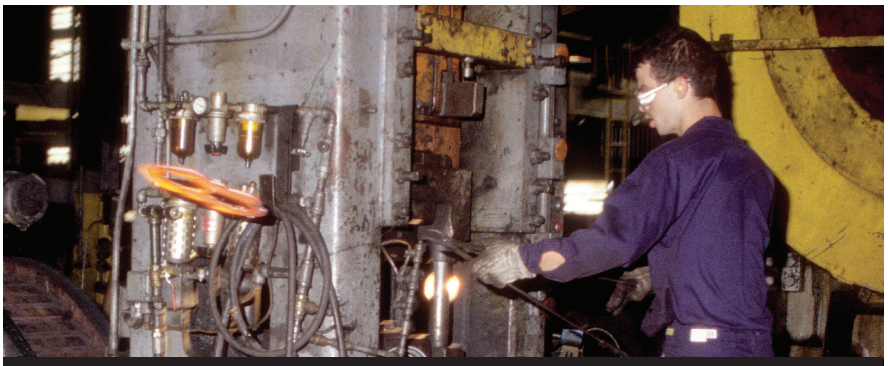
While some super-large forging presses can accommodate large valve components up to NPS 24, these machines are rare, and the cost to produce high-quality, open-die valve forgings on them is very high. Therefore, most forged steel valves fall in the NPS 2 and below range. For the most part, forgings of this size are more cost effective than castings.

These billets have been pre-heated in preparation for forging.

The most popular forged-steel valves are the compact gate, globe and check valves built to the American Petroleum Institute (API) standard 602, Steel Gate, Globe and Check Valves for Sizes NPS 4 and Smaller for the Petroleum and Natural Gas Industries.

API 602 valves are found in virtually every refinery and petrochemical plant around the world. They also are found in power plants, and to a lesser degree, in chemical plants. The reason they aren't often used in some chemical processes is cost. While forging bars and billets are readily available at moderate prices in carbon steel, low-alloy steels and many stainless steels, their availability in exotic alloys is limited and costly, and the forging operation is more difficult.

Since manufacturing runs of these alloys usually are shorter, it often is quicker and cheaper to use castings for



Flash is removed during the forging.

small valve components of Monel, Hastelloy, Inconel and other exotic materials. Also, some of these alloys are much harder than plain carbon and low-alloy steels. Forging dies for them can be extremely expensive to make. Instead, short runs of API 602 valves of these materials are often made of castings.

Although forgings are generally chosen because they are free of defects, castings might be chosen over forgings because of the extra machining processes required in finishing out a forged component. Because forgings are generally solid metallic components (without cavities or holes), all the flow-ways and internal openings have to be machined into the forging. With castings, they can have these ports, passageways and voids created in the cast component through the use of cores, which yield open space in the finished part. Because of this, the cost of removing large amounts of metal by machining in larger forged valve components has to be taken into consideration as well.

In some cases, manufacturers have resorted to exotic forging and piercing press operations for large-size forged valve bodies. These processes create the bulk of the valve passageway areas during the hot pressing process, eliminating much of the gross machining costs to remove this unwanted metal.

Some applications make using larger forged steel valve bodies an excellent choice. When an extremely high-integrity valve body is required, the large forged component sometimes comes out cheaper despite its requisite costs. This is because a casting requires much welding repair to bring it up to the same level of quality. For example, hydrogen service, with its need for the highest integrity valve bodies, is a perfect example where the large forged body is an excellent choice.

COMPONENT STANDARDS

While defects in forged steel valve components are rare, they occasionally occur, so specific nondestructive testing procedures are designed to detect those defects. These tests include magnetic particle examination and dye penetrant examination for the detection of surface defects and ultrasonic inspection for the detection of volumetric (internal) flaws. Most often, minute, very shallow cracks and laps are the surface defects found. Meanwhile, the interior defect most frequently seen is a flow-through crack or seam resulting from a defect in the original bar or billet.

Table 2. Component Standards

ASTM STANDARD	NOMINAL CHEMISTRY
A105	Low-carbon steel
A350	Low-temperature, low-carbon steel
A182	Low-alloy (Cr/Mo) steels
A182	Stainless steels
B164 & F467	Monels
B446	Inconel 625
B462	Alloy 20
B574	Hastelloy-C

CONCLUSION

If money was not an object in valve procurement, forging would probably be chosen over casting because of the much higher quality. However, castings and forgings both have a place in the world of valve component manufacturing. Also, many times a valve will contain both castings and forgings. For small valves, the choice of which process to choose, forging or casting, is usually an economic one. Yet sometimes the cost analysis is a toss-up, leaving the amount of production time required for each process as the determining factor in choosing a casting over a forging. VM

This is part two of a two-part primer on casting/forging. Part one appeared in the Fall 2014 VALVE Magazine.

A 1927 valve shop used steam forging equipment.

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

PROTECT TOMORROW. TODAY.

API624-COMPLIANT VALVES.

Valve Performance + Global Service + ROI = Powell

Our commitment to environmental responsibility is anchored in our belief that we should be a leader in developing cutting-edge technology. As we strive for zero emissions through research and initiatives, we want to ensure that we are a responsible employer, business partner and neighbor. We put sustainability in motion through an integrated approach across all our products, processes and people.

NextGen Powell Engineering is all about environmental stewardship. Using Chesterton's award-winning1622 Low E Packing, our valves will perform at the latest EPA requirement of 100 ppm or less for fugitive emissions. We back it up with a warranty on the Eco624 valve packing against leaks in excess of 100 ppm for five years.

With Powell Valves, you can:

- Meet the new API 624 standards and comply with the conditions of an EPA consent decree.
- Reduce your leak detection and repair (LDAR) monitoring for valves.
- Lower your costs by reducing product loss.

Our valves exceed emissions requirements for the refining, chemical and petrochemical industries. That's what you'd expect from a company committed to making our planet a better place to live.

2503 Spring Grove Avenue
Cincinnati, OH 45214
www.PowellValves.com

Contact your Powell Representative at 513.852.2000

CHESTERTON
Global Solutions, Local Service.

POWELL VALVES

Q: I've heard that ASTM A194 Grade 4 nuts are being discontinued. Is this true, and if so, why?

BY DON BUSH

A: It is true, and the reasoning behind the move is somewhat complicated.

A good place to begin is to discuss where these nuts have mainly been used. Most of the time when customers specify Grade 4 nuts, it is in conjunction with using ASTM A320 Grade L7 studs for low-temperature service. Section 10 of ASTM A320, Alloy/Steel Bolting Materials for Low-Temperature Service, specifies that either ASTM A194 Grade 4 or Grade 7 nuts must be used with L7 studs (as well as with other less common stud grades). It also specifies that the nut material is subject to the same impact testing requirements as the bolt or stud grade for which the nut will be used.

Table 1 shows the ASTM A194-2014 compositions for Grade 4 and Grade 7 nuts.

Note that the overall alloy content of Grade 4 is lower than that of Grade 7. Grade 4 doesn't require any chromium, whereas Grade 7 requires about 1% chromium. The logical conclusion would be that Grade 4 nuts are less expensive than Grade 7 nuts. Since ASTM A320 allows the use of either of these grades with Grade L7 studs, using Grade 4 nuts should be the less costly option.

Unfortunately, although that reasoning seems logical, it doesn't work that way. In reality, the composition of Grade 4 nuts is unusual. It doesn't match up with the material used to make any bolt/stud grade in ASTM A193 or ASTM A320. Meanwhile, the material used to make Grade 7 nuts, AISI 4140 alloy steel, is also used to make ASTM A193 B7 and B7M studs, ASTM A320 Grade L7 and L7M studs, and ASTM A194 Grade 7M nuts. Because of this, fastener manufacturers are buying AISI 4140 in very large quantities. For them, the material used to make Grade 4 nuts is an anomaly.

If you look even closer at this issue, you will discover that most

Table 1: ASTM A194-2014 Composition Requirements for Grade 4 and 7

Element	Grade 4	Grade 7	Grade Overlap
C (Carbon)	0.40-0.50	0.38-0.48	0.40-0.48
Mn (Manganese)	0.70-0.90	0.75-1.0	0.75-0.90
P (Phosphorus)	0.035 max	0.35 max	0.35 max
S (Sulfur)	0.040 max	0.04 max	0.040 max
Si (Silicon)	0.15-0.35	0.15-0.35	0.15-0.35
Cr (Chromium)	...	0.80-1.10	0.80-1.10
Mo (Molybdenum)	0.20-0.30	0.15-0.25	0.20-0.25

heats of AISI 4140 steel will also meet the compositional requirements of Grade 4. Recall that an ellipsis (…) in the composition table in an ASTM standard does not mean an element is prohibited; rather, that it is not controlled. Therefore, the 0.80-1.10% chromium that is required for Grade 7 nuts is also allowed for Grade 4 nuts. The underlined values in Table 1 indicate the limits for the Grade 7 material that must be monitored and controlled to a degree for the 4140 material also to be acceptable for Grade 4 nuts. Fastener manufacturers have taken advantage of this reality to use the AISI 4140 they purchase in large quantities to make Grade 4 nuts. The fact that all of the heat treatment and mechanical testing requirements for Grade 4 are the same as those for Grade 7 makes this even easier. As long as the purchased AISI 4140 material meets the slightly tighter composition listed above as "Grade Overlap," a manufacturer can make Grade 7 nuts, and mark some of them Grade 7 and some of them Grade 4.

The rationale for eliminating Grade 4 nuts from ASTM A194 is documented in ASTM Subcommittee A01.22 Work Item WK39987:

> *Withdrawal of Grade 4 nuts from ASTM A194. Investigation has shown that the majority of ASTM A194 Grade 4 nuts are made from material conforming to ASTM 4194 Grade 7. This is worldwide practice. Since Grade 7 nuts meet all mechanical and physical requirements of Grade 4 nuts, it is recommended that Grade 4 nuts are removed from future revisions of ASTM A194.*

In a nutshell, essentially all Grade 4 nuts being sold are actually Grade 7 marked as Grade 4, so there is no point continuing to sell them as Grade 4.

This proposal was balloted and approved in 2013 and published in the 2014 revision of ASTM A194. In that revision, there is a footnote on the Grade 4 composition that reads as follows:

> *Grade 4 is expected to be withdrawn within approximately 2 years. Grade 7 is an acceptable substitute for Grade 4. See 7.2.*

Paragraph 7.2 reads:

> *Grade 7 may be substituted for Grade 4. When such substitution is made, the nuts shall be marked as Grade 7.*

Again, note that even if Grade 4 nuts are specified and ordered, ASTM A194 allows the supplier to deliver either Grade 4 or Grade 7. In addition, even if the certified material test report states that the nuts are Grade 4, and even if the nuts are marked as Grade 4, most likely they are actually Grade 7. Therefore, specifying Grade 4 nuts provides no cost or availability benefit vs. simply specifying Grade 7. VM

Don Bush is a principal materials engineer at Emerson Process Management–Fisher Valve Division (www.emersonprocess.com). Reach him at don.bush@emerson.com.

REFERENCE

ASTM A194/A194M-2014, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both (West Conshohocken, PA: ASTM).

Allagash International
Portland, ME
www.allagashinternational.com
- **Allagash Valves & Controls**
  www.allagashvalve.com
- **Nor' East Controls**
  www.noreastcontrols.com

American Valve, Inc.
Greensboro, NC
www.americanvalve.com

Apollo Valves - Conbraco Industries, Inc.
Matthews, NC
www.apollovalves.com

ARI Armaturen USA L.P.
Houston
www.ari-armaturenusa.com

ASCO Valve, Inc. - Emerson Industrial Automation
Florham Park, NJ
www.ascovalve.com

A-T Controls
Cincinnati, OH
www.a-tcontrols.com

AUMA Actuators, Inc.
Canonsburg, PA
www.auma-usa.com

Automation Technology, Inc.
Houston
www.atiactuators.com

Babbitt Steam Specialty Company
New Bedford, MA
www.babbittsteam.com

Harold Beck & Sons, Inc.
Newtown, PA
www.haroldbeck.com

Bernard Controls, Inc.
Houston
www.bernardcontrols.com

Cameron
Houston
www.c-a-m.com
- **Flow Control**
  Houston
- **Valves & Measurement**
  Houston

Check-All Valve Mfg. Co.
Des Moines, IA
www.checkall.com

ChemValve, Inc.
Tomball, TX
www.chemvalve.com

Colfax Fluid Handling
Warren, MA
www.colfaxcorp.com

Continental Disc Corporation
Liberty, MO
www.contdisc.com
- **Groth Corporation**
  Stafford, TX
  www.grothcorp.com
- **LaMOT Brand Products**
  Liberty, MO
  www.lamot.com

Conval, Inc.
Somers, CT
www.conval.com

Cornerstone Valve
Houston
www.cornerstonevalve.com

Crane Co.
Stamford, CT
www.craneco.com/business/crane_valves.cfm
- **Crane Energy Flow Solutions**
  The Woodlands, TX
  www.craneenergy.com
- **Crane ChemPharma Flow Solutions**
  Cincinnati
  www.xomox.com
  www.resistoflex.com
  www.saundersvalve.com

Curtiss-Wright Valve Group - Industrial Division
www.cw-industrial.com
- **Enertech**
  Brea, CA
- **Exlar**
  Chanhassen, MN
- **Farris Engineering**
  Brecksville, OH
- **Target Rock**
  East Farmingdale, NY

Derbyshire Machine & Tool
Philadelphia
www.derbyshiremachine.com

DeZURIK
Sartell, MN
www.dezurik.com
- **APCO Willamette**
  Schaumburg, IL
  www.apcovalves.com
- **Hilton Valve**
  Redmond, MN
  www.hiltonvalve.com

DFT Inc.
Exton, PA
www.dft-valves.com

Elliott Manufacturing
Binghamton, NY
www.elliottsafeoperator.com

Emerson Process Management
Marshalltown, IA
- **EIM Company, Inc.**
  Missouri City, TX
  www.eim-co.com
- **Fisher Controls**
  Marshalltown, IA
  www.fisher.com
- **TopWorx**
  Louisville, KY
  www.topworx.com
- **Valve Automation Division**
  St. Louis
  www.emersonprocess.com/valveautomation

Everlasting Valve Company, Inc.
South Plainfield, NJ
www.everlastingvalveusa.com

Flowserve Corp.
Irving, TX
www.flowserve.com
- **Flowserve, Cookeville**
  Cookeville, TN
- **Flowserve, Springville**
  Springville, UT
- **Flowserve, Raleigh**
  Raleigh, NC
  www.edwardvogt.com
- **Flowserve, Lynchburg**
  Lynchburg, VA
  www.limitorque.com
- **Flowserve, Sulphur Springs**
  Sulphur Springs, TX
  www.nordstromaudco.com

Forum Energy Technologies - Valve Solutions
Stafford, TX
www.f-e-t.com

Franklin Valve LP
Houston
www.franklinvalve.com

GE Oil & Gas
Houston
www.ge.com
- **Consolidated Safety and Safety Relief Valves**
  Alexandria, LA
- **Masoneilan Control Valves**
  Avon, MA
- **Regulation and Control**
  Houston

Indelac Controls, Inc.
Florence, KY
www.indelac.com

ITT Engineered Valves
Lancaster, PA
www.engvalves.com

Kinetrol USA, Inc.
Plano, TX
www.kinetrolusa.com

Kingston Valves
Torrance, CA
www.kingstonvalves.com

Kitz Corporation of America
Stafford, TX
www.kitz.com

Ladish Valves
Houston
www.ladishvalves.com

Lined Valve Company, Inc.
Woodland, WA
www.knifegatevalves.com

Mastergear, Division of Regal-Beloit Corporation
Clinton, WI
www.mastergearworldwide.com

Metso Automation USA Inc.
Shrewsbury, MA
www.metso.com

Moog Flo-Tork, Inc.
Orrville, OH
www.flo-tork.com

Mueller Water Products
Atlanta
www.muellerwaterproducts.com
- **Anvil International**
  Portsmouth, NH
  www.anvilintl.com
- **Henry Pratt Company**
  Aurora, IL
  www.henrypratt.com
- **Hydro Gate, Henry Pratt Co.**
  Denver
  www.hydrogate.com
- **Milliken Valve Company**
  Bethlehem, PA
  www.millikenvalve.com
- **Mueller Co.**
  Chattanooga, TN
  www.muellercompany.com

PBM, Inc.
Irwin, PA
www.pbmvalve.com

Pentair Valves & Controls
Houston
us.valves.pentair.com/valves

The Wm. Powell Company
Cincinnati
www.powellvalves.com

Process Development & Control, Inc.
Coraopolis, PA
www.pdcvalve.com

QTRCO, Inc.
Tomball, TX
www.qtrco.com

REXA
West Bridgewater, MA
www.rexa.com

Richards Industries-Valve Group, Inc.
Cincinnati
www.jordanvalve.com

Roto Hammer Industries, Inc.
Tulsa, OK
www.rotohammerinc.com

Rotork Controls, Inc.
Rochester, NY
www.rotork.com
- **Centork**
  Winston-Salem, NC
  www.centork.com
- **Flow-Quip, Inc.**
  Tulsa, OK
  www.flowquip.com
- **K-TORK Actuators & Controls**
  Dallas, TX
  www.rotork.com
- **Remote Control**
  N. Kingstown, RI
  www.rciactuators.com
- **Rotork Controls Canada Ltd.**
  Calgary, Alberta, Canada
  www.rotork.com
- **Rotork Controls Canada Ltd.**
  Mississauga, Ontario, Canada
  www.rotork.com
- **Rotork Gears**
  Houston
  www.rotork.com
- **Rotork Instruments**
  Winston-Salem, NC
  www.rotork.com
- **Rotork Process Controls**
  Milwaukee
  www.rotork.com
- **Valvekits**
  Broken Arrow, OK
  www.renfroassociates.com

R.S.V.P. Actuators & Controls
Hempstead, TX
www.rsvpactuators.com

Rupture Pin Technology
Oklahoma City
www.rupturepin.com

Samson Controls, Inc.
Baytown, TX
www.samsoncontrols.com

Spirax Sarco, Inc.
Blythewood, SC
www.spiraxsarco-usa.com
- **Spirax Sarco Canada Ltd.**
  Concord, Ontario, Canada

Total Valve Systems
Broken Arrow, OK
www.totalvalve.com

Townley Engineering & Manufacturing Company, Inc.
Candler, FL
www.townley.net

UniTorq Actuators & Controls
Duluth, GA
www.unitorque.com

Val-Matic Valve and Mfg. Corp.
Elmhurst, IL
www.valmatic.com

ValvTechnologies, Inc.
Houston
www.valv.com

Velan Valve Corporation
Montreal, Quebec, Canada
www.velan.com

Victaulic
Easton, PA
www.victaulic.com

Weir Valves & Controls-USA
Ipswich, MA
www.weirvalveusa.com

Western Valve, Inc.
Bakersfield, CA
www.westernvalve.com

WEY Valve
Nettleton, MS
www.weyvalve.com

ASSOCIATE MEMBERS

DISTRIBUTOR/CHANNEL PARTNERS

AIV, LP
Houston
www.aivinc.com

Ci Valves & Actuators
Houston
www.ciactuation.com

Classic Controls
Lakeland, FL
www.classiccontrols.com

DistributionNOW
Houston
www.distributionnow.com

Edgen Murray Corporation
Houston
www.edgenmurray.com

FCX Performance, Inc.
Columbus, OH
www.fcxperformance.com

MRC Global, Inc.
Houston
www.mrcglobal.com

RES Energy Solutions
Houston
www.res-co.com

Setpoint Integrated Systems
Baton Rouge, LA
www.setpointis.com

Sunbelt Supply Co.
Houston
www.sunbeltsupply.com

Wolseley Industrial Group
Newport News, VA
www.wolseleyindustrialgroup.com

SUPPLIERS

A.W. Chesterton
Groveland, MA
www.chesterton.com

All-Pro Fasteners, Inc.
Arlington, TX
www.all-profasteners.com

American Foundry Group
Bixby, OK
www.americanfoundry.com

Auge Industrial Fasteners
Houston
www.augeusa.com

AVK Carbo-Bond/Bi-Torq Inc.
LaFox, IL
www.bitorq.com

Balluff, Inc.
Florence, KY
www.balluff.us

BelleFlex Technologies, LLC
Freeport, PA
www.belleflex.com

Bradken-Engineered Products
Chehalis, WA
www.bradkenamericas.com

Delta Centrifugal Corp.
Temple, TX
www.deltacentrifugal.com

DuPont-Krytox Lubricants
Wilmington, DE
www.krytox.com

EGC Enterprises, Inc.
Chardon, OH
www.egcflexiblegraphitesolutions.com

Engis Corporation
Wheeling, IL
www.engis.com

The Flexitallic Group, Inc.
Houston
www.flexitallic.com

Garlock Sealing Technologies
Palmyra, NY
www.garlock.com

Highland Foundry Limited
Surrey, British Columbia, Canada
www.highlandfoundry.com

Houston Plating & Coatings, LLC
South Houston, TX
www.houstonplating.com

Kennametal Inc.
Belleville, Ontario, Canada
www.kennametal.com/stellite

Key Bellevilles, Inc.
Leechburg, PA
www.keybellevilles.com

Matrix Metals LLC
Richmond, TX
www.matrixmetalsllc.com

MW Industries, Inc.
Rosemont, IL
www.mw-ind.com

Quaker City Castings
Salem, OH
www.qccast.com

Saint-Gobain Seals
Garden Grove, CA
www.seals.saint-gobain.com

Scientific Linings & Coatings
San Antonio
www.weathercap.com

Siemens Industry, Inc.
Spring House, PA
www.usa.siemens.com

Solon Manufacturing Co.
Chardon, OH
www.solonmfg.com

Stainless Foundry & Engineering Inc.
Milwaukee, WI
www.stainlessfoundry.com

Teadit North America
Pasadena, TX
www.teadit-na.com

Technetics Group
Columbia, SC
www.technetics.com

VanAire, Inc.
Gladstone, MI
www.vanaireinc.com

Watson Grinding & Mfg.
Houston
www.watsongrinding.com

For information on joining the Valve Manufacturers Association, contact Bill Sandler at 202.331.8105 (wsandler@vma.org).

MEMBERS OF THE VALVE REPAIR COUNCIL

An affiliate of the Valve Manufacturers Association of America

Allagash International
Portland, ME
www.allagashinternational.com

Allied Valve
Chicago
www.alliedvalveinc.com

AVP Valve, Inc.
Lakeland, FL
www.avpvalve.com

Bay Valve Service, Inc.
Seattle
www.bay-valve.com

Cameron
Houston
www.c-a-m.com

CFM/VR-TESCO LLC
Elgin, IL
www.globalfield.net

Chalmers & Kubeck North
Westfield, MA
www.candknorth.com

Classics Controls, Inc.
Lakeland, FL
www.classiccontrols.com

Cleveland Valve & Gauge/ Renew Valve & Machine Co.
Cleveland/Carleton, MI
www.clevelandvalve.com
www.renewvalve.com

CWFC Farris Engineering
Brecksville, OH
www.cwfc.com

Dayton Precision Services
Dayton, OH
www.daytonprecisionservices.com

Dowco Valve Company
Hastings, MN
www.dowcovalve.com

Eastern Controls, Inc.
Philadelphia
www.easterncontrols.com

ECI/ICE Valve and Instrument Services
Monessen, PA
www.service-solution.com

Emerson Process Management - Fisher
Marshalltown, IA
www.fisher.com

Flotech, Inc.
Jacksonville, FL
www.flotechinc.com

Flowserve Corporation
Houston
www.flowserve.com

Formosa Plastics USA
Point Comfort, TX
www.fpcusa.com

Furmanite
Houston
www.furmanite.com

GE Oil & Gas
Houston
www.ge.com

- **Consolidated and Masoneilan Aftermarket and Field Service**
  Deer Park, TX
- **Consolidated Safety and Safety Relief Valves**
  Alexandria, LA
- **Masoneilan Control Valves**
  Avon, MA

Gulf Coast Modification, LP
Houston
www.gulfcoastmod.com

Gulf Coast Valve, Inc.
Corpus Christi, TX
www.gulfcoastvalve.net

J&S Machine and Valve, Inc.
Nowata, OK
www.jsmachineandvalve.com

Kirksey Machine
Houston
www.kirkseymachine.com

Metso Automation
Shrewsbury, MA
www.metso.com

Midwest Valve Services, Inc.
Minooka, IL
www.mwvalve.com

NWS Technologies
Spartanburg, SC
www.nwstechnologies.com

Pentair Valves and Controls
Stafford, TX
us.valves.pentair.com/valves

Pioneer Industrial Corporation
St. Louis, MO
www.pioneerindustrial.com

The Wm. Powell Company
Cincinnati
www.powellvalves.com

Precision Fitting and Gauge
Tulsa, OK
www.pfandg.com

Precision Pump & Valve Service
Charleston, WV
www.ppvs.com

Setpoint Integrated Solutions
Baton Rouge, LA
www.SetpointIS.com

Southeast Valve Inc.
Charlotte, NC
www.sevalve.com

Southern Valve Service, Inc.
Baton Rouge, LA
www.southernvalve.com

Thorco, Inc.
Tulsa, OK
www.thorcoinc.com

United Valve
South Houston, TX
www.unitedvalve.com

Universe Machine Corporation
Edmonton, AB Canada
www.umcorp.com

Valve Reconditioning Service Co.
Melvindale, MI
www.vrsinc.net

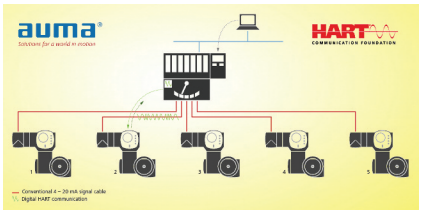
Wal-Tech Inc.
Mobile, AL
www.wal-tech.com

Watson Valve Services
Houston
www.watsonvalve.com

VRC ASSOCIATE MEMBER

Quality Valve
Mobile, AL
www.qualityvalves.com

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



AUMA offers a HART interface option for the company's AC .2 and ACExC .2 controls. In compliance with the IEC 61158 standard, the HART communication protocol retains the 4 20 mA standard signal for analog data transmission, while allowing for digital communication modulated as an additional signal to the analog signal. This facilitates reading additional parameters and diagnostic data from field devices, such as actuators, using the existing 4–20 mA infrastructure.

Electronic Device Descriptions for AC .2 controls with HART interface will be available shortly from AUMA for integration with Siemens Simatic PDM, Emerson AMS and Emerson 475 Field Communicator.

SPIRAX SARCO has released the BCV43 series blowdown control valves in line sizes ¾ inch and 1½ inch. This new range of BCV43 blowdown control valves is based on the SPIRATROL platform and designed to maintain the TDS at an optimum level, keeping blowdown to a minimum. This maintains a healthy steam and condensate system and conserves water and energy. The BCV43 blowdown control valves are suitable for a wide variety of applications where boilers are operated unsupervised for 24- to 72-hour periods.

The BCV43 blowdown control valve range has been engineered to minimize seat erosion ensuring consistent tight shutoff. No special tools are required, which means easier maintenance and reduced downtime.

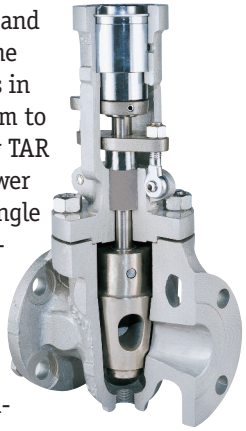
DeZURIK/APCO/HILTON introduces the APCO ASU Combination Air Valve, a single-body combination valve featuring a patented air release and air/vacuum mechanism specifically designed to deal with media containing grit, solids and grease.

A large-diameter air/vacuum disc provides high-volume air flow for rapid venting during pipeline filling and allows high volumes of air to enter the pipeline during draining. During normal pipeline flow conditions, the dual-range air release design prevents air buildup and resultant flow restrictions under changing conditions and through the full flow range.

The valve is a universal design that allows application on a wide range of flow conditions with effective sealing and operation from 2 psi to 150 psi as standard. Available in sizes 1-4 inches with all stainless-steel construction, the ASU valve meets the performance requirements of AWWA C512 standard.

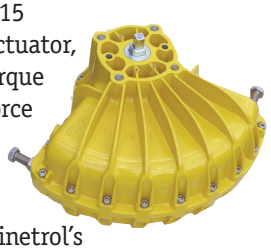
CRANE CHEMPHARMA & ENERGY has expanded its Pacific Valves Wedgeplug line. Featuring a unique Wedgetorque operator, these valves are specifically engineered to address challenges in severe service applications. Now available in ½-inch to 36-inch sizes, the range has been expanded to increase the breadth of solutions in the refining, petrochemical and power generation industries.

When not actuating, these valves consume no steam. Inline decoking and service means the valve body stays in the piping system to deliver a shorter TAR schedule and lower trade costs. A single valve offers double block-and-bleed capability, reducing upstream and downstream concerns and enabling users to purge and gauge the valve body for safety permissive.



The valves are designed to ASME B16.34, API Standard 599 and API Standard 600. Testing is to API Standard 598.

KINETROL Model 15 pneumatic vane actuator, with an output torque of 20337 pound force inch (lbf.in.) (@100 psi), fills the gap in torque output between Kinetrol's Model 14 (12000 lbf.in.) and Model 16 (27000 lbf.in.) Prior to the Model 15 introduction, a valve or damper requiring more than 12000 lbf.in. required use of the larger Model 16, resulting in higher cost, greater air consumption and larger physical size. The availability of the Model 15 rounds out the line to a total of 16 sizes of actuators and allows more precise valve-to-actuator sizing, lowers consumption of air by 30% and provides a smaller overall package. The Model 15 is internally ported for NAMUR solenoid valve mounting, and allows for direct mounting of Kinetrol positioners and limit switches.



SAINT-GOBAIN SEALS developed a new single-stem sealing solution targeted to lower fugitive emissions in on/off valves for the oil and gas industry.

Saint-Gobain's new sealing solution poses an opportunity for reducing fugitive emissions and meeting increasingly stringent requirements. Manufacturers benefit not only environmentally but also by promoting operating efficiency and safer, productive workplaces.

Saint-Gobain began developing its sealing process a long time ago with the development of its low-fugitive emission seals. The objective was to develop a single stem sealing solution for on/off valves that passed leakage tightness of Class BH and endurance class C01 (500 cycles) from -58°F (-50°C) to 320°F (160°C), according to the ISO 15848 quality standard.

CONTINUED ON PAGE 48

"Is my company eligible to join the Valve Manufacturers Association of America?"

VMA is the only association that exclusively supports and represents the interests of the U.S. and Canadian industrial valve, actuator and controls industry.

We offer four types of membership for companies based in the U.S. or Canada, and that meet other criteria.*

- **FULL MEMBERSHIP** U.S. and Canadian manufacturers of valves, actuators and controls
- **ASSOCIATE – SUPPLIERS** Companies that supply products and services to U.S. and Canadian manufacturers of valves, actuators and controls
- **ASSOCIATE – DISTRIBUTORS/CHANNEL PARTNERS** Companies that take title to and stock valves, actuators and controls manufactured by at least one VMA member
- **VALVE REPAIR COUNCIL** OEM-certified service, repair and maintenance firms for U.S. and Canadian manufactured valves, actuators and controls

If your company does qualify, here are some of the benefits you will enjoy:

- **Significant discount off of advertising in VALVE Magazine**, on VALVEMagazine.com, VALVE eNews and other VMA publications!
- **Free listing in VMA's Product Finders** (located on VMA.org).
- **Invitations to an array of VMA meetings and networking events** open only to members, including the VMA/VRC Annual Meeting, Valve Industry Leadership Forum, Market Outlook Workshop and Manufacturers Workshop. Plus, reduced rates for exhibits at the Valve Basics and Technical seminars, and the biennial Valve Repair Conference.
- **VMA's popular members-only newsletter, QuickRead**, delivered to your computer every Friday!
- **Participation in VMA's statistical and economic programs**, providing you with data not available anywhere else.

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

Join today and you'll find out why 95% of VMA members renew each year!

**To determine if you qualify to join VMA, go to: VMA.org > About VMA > Qualifications.*
To determine eligibility for the Valve Repair Council, go to: VMA.org > Valve Repair Council.

CONTINUED FROM PAGE 46

SIEMENS Integral Volume Booster is designed for pneumatic actuators that require high flow for fast stroking times. The unit reproduces pneumatic signals in a 1:1 ratio for applications that demand increased flow capacity and a reduction in piping, all while maintaining small step accuracy.

The volume booster couples with a SIPART PS2 valve positioner and directs a high-volume air supply to the actuator. This feature eliminates the complex piping and additional fittings required with external volume booster devices, reducing material and labor costs as much as 60%. Together, the PS2 and this volume booster can decrease total cost of ownership.

VICTAULIC introduces the Series 727 Ball Valve, a high-pressure, enhanced port, NACE-compliant valve with grooved ends for upstream oil applications. Featuring grooved ends, the new valve is joined using Victaulic couplings, enabling quicker and easier installation and maintenance than flanged valves.

The two-piece valve features a floating ball for lower torque requirements and is offered with manual handles with an integral tamper-resistant lock/seal. It is designed for full open or shut-off service.

The valves can accommodate pressures of up to 1,500 psi (10,350 kPa) and are available in sizes ranging from 2-6 inches (50 to 150 millimeters).

STATEMENT OF OWNERSHIP, MANAGEMENT, AND QUARTERLY CIRCULATION OF VALVE MAGAZINE

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

HEADQUARTERS OF PUBLISHER, EDITOR AND PUBLICATION:
1050 17th Street NW, Suite 280, Washington, DC 20036

STOCKHOLDERS; BONDHOLDERS; MORTGAGE; OTHER SECURITY HOLDERS: None

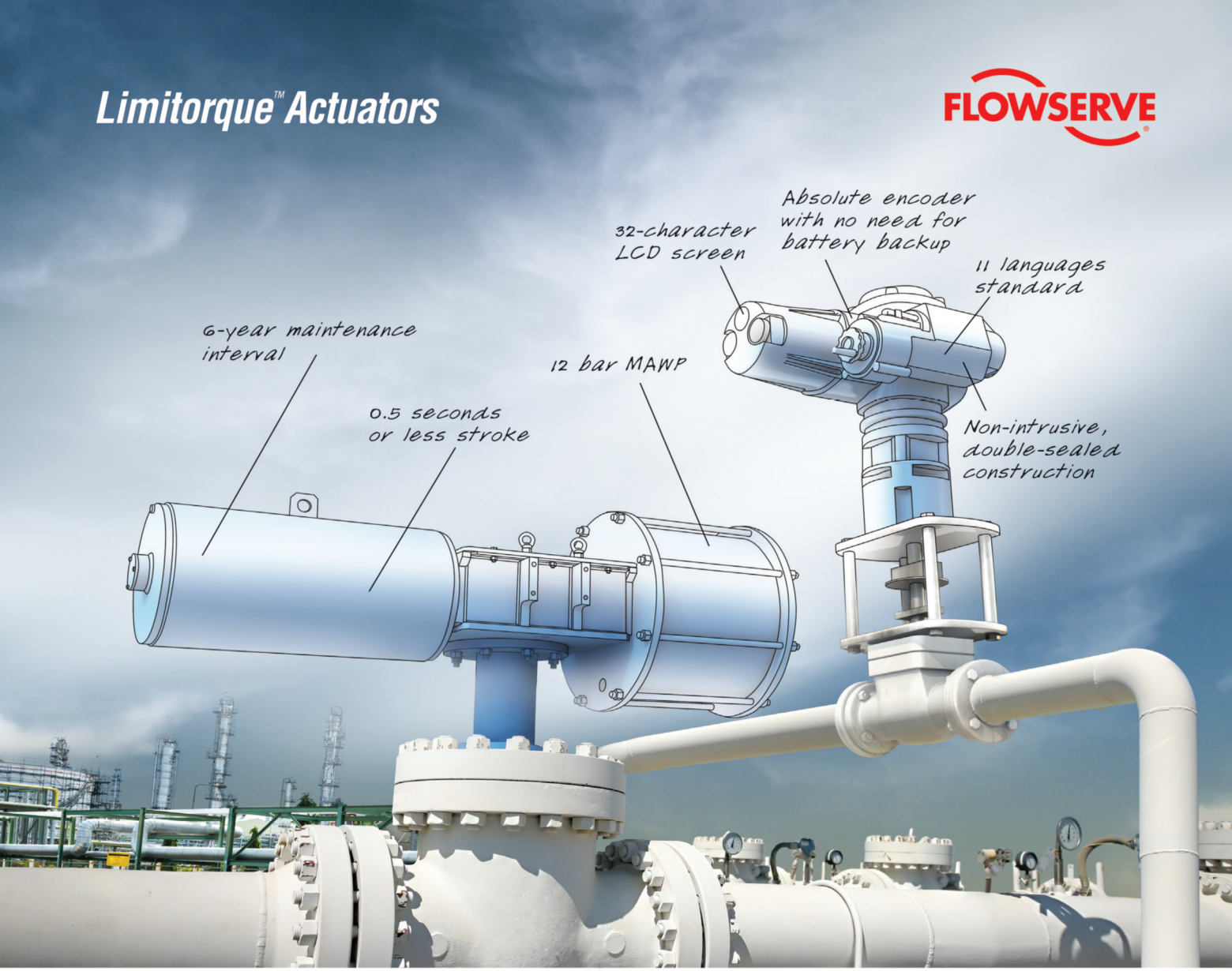
Summer 2014	Avg. No. Copies Each Issue Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
A. TOTAL COPIES PRINTED (Net Press Run)	22,508	22,597
B. Paid/Circulation		
(1) Outside County	15,601	14,411
(2) In County	0	0
(3) Outside the Mail	704	509
(4) Other Classes Mailed through USPS	0	0
C. Total Paid and/or Requested Circulation	16,305	14,920
D. Nonrequested Distribution by Mail		
(1) Outside County	5,673	6,923
(2) In County	0	0
(3) Other Classes Mailed through USPS	0	0
(4) Outside the Mail	344	425
E. Total Nonrequested Distribution	5,673	6,923
F. Total Distribution	21,978	21,843
G. Copies Not Distributed	530	754
H. Total	22,508	21,597
I. Percent Paid and/or Requested Circulation	74.2%	68.3%

Date of Filing: Oct. 1, 2014

ADVERTISER Index

Limitorque™ Actuators

FLOWSERVE



PUSHING THE LIMITS.

At Limitorque, we are used to pushing the limits. It's the philosophy that drives big ideas that make actuation a smarter, higher-performing part of the world's infrastructure. We see limitless opportunities to help plants perform better, processes run more efficiently, pipelines operate more safely, and valves function more intelligently and reliably. So when you're working with Limitorque, you'll get fresh perspectives and new thinking that push the limits beyond typical approaches. See how at Flowserve.com/NoLimits.

Electric and fluid-powered actuators for the toughest requirements.

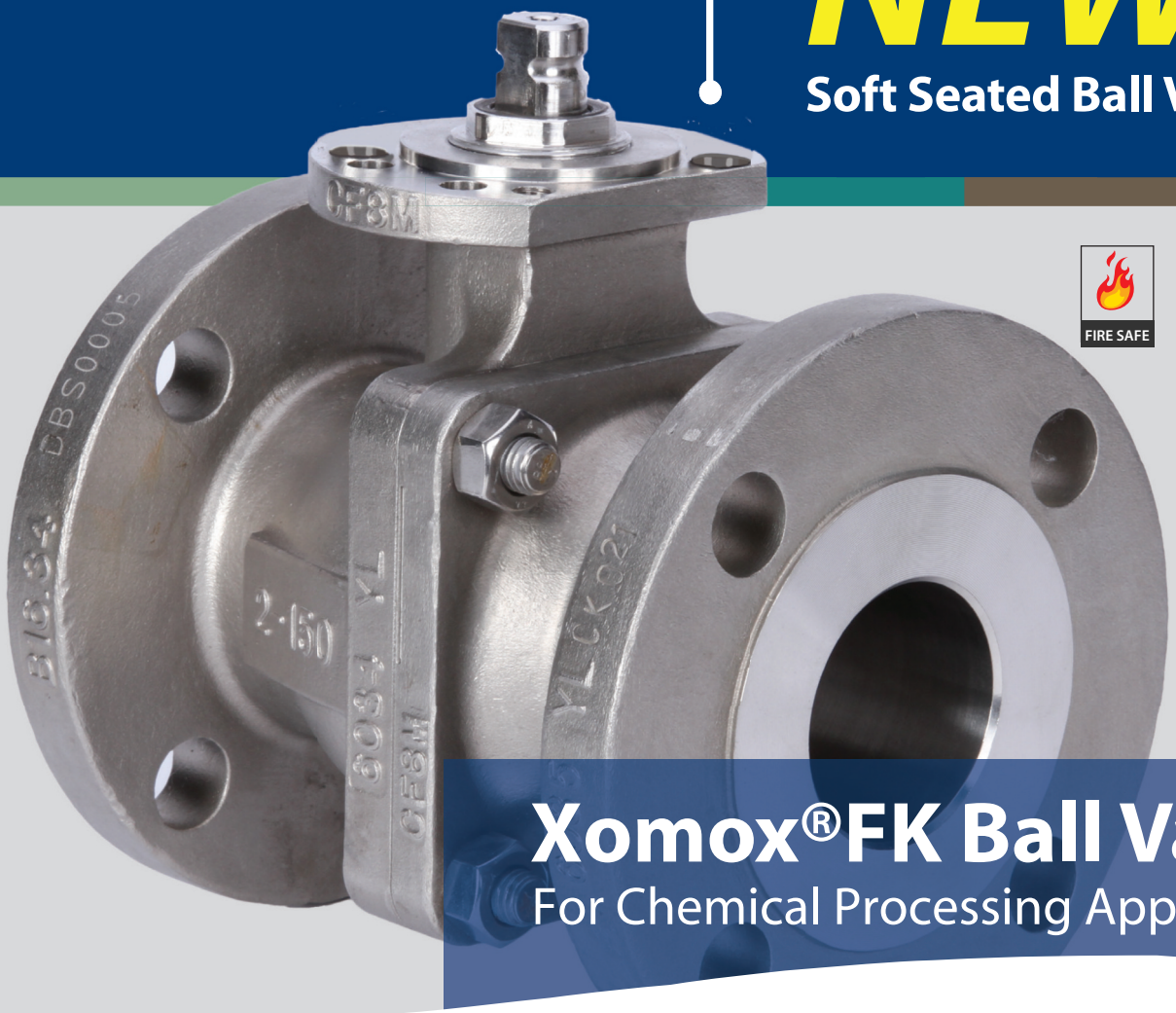
Experience In Motion

flowserve.com

XOMOX®

NEW!

Soft Seated Ball Valve



FIRE SAFE

Fire tested as standard per API 607-6th edition & ISO 10497:2010

Xomox®FK Ball Valves

For Chemical Processing Applications

1. Three independent stem seals offer superior fugitive emissions control, certified to the following standards: EPA Method-21, ISO-15848, and TA-Luft according to VDI 2440.

2. Self-relieving seats permit relief of excess pressure to protect the integrity of the valve, while maintaining bi-directional operation.

3. Patented SX ball-stem design provides high maximum stem torque capability and built-in side load resistance for extended valve life under severe conditions including thermal-cycling.

CRANE®

www.cranecpe.com

DEPA® ELRO® PSI® RESISTOFLEX® RESISTOPURE® REVO® SAUNDERS® WTA® XOMOX®
ALOYCO® CENTER LINE® CRANE® DUO-CHEK® FLOWSEAL® JENKINS® KROMBACH® NOZ-CHEK® PACIFIC VALVES® STOCKHAM® TRIANGLE®