

THREE-DAY BASICS PROGRAM FILLS NEED FOR MORE TRAINING

VALVE

MAGAZINE
SUMMER 2015
VOL. 27, NO. 3

Critical Service

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EFFECTS OF
FLASHING/
CAVITATION

HOW COATINGS
PROTECT IN
WASTEWATER
APPS

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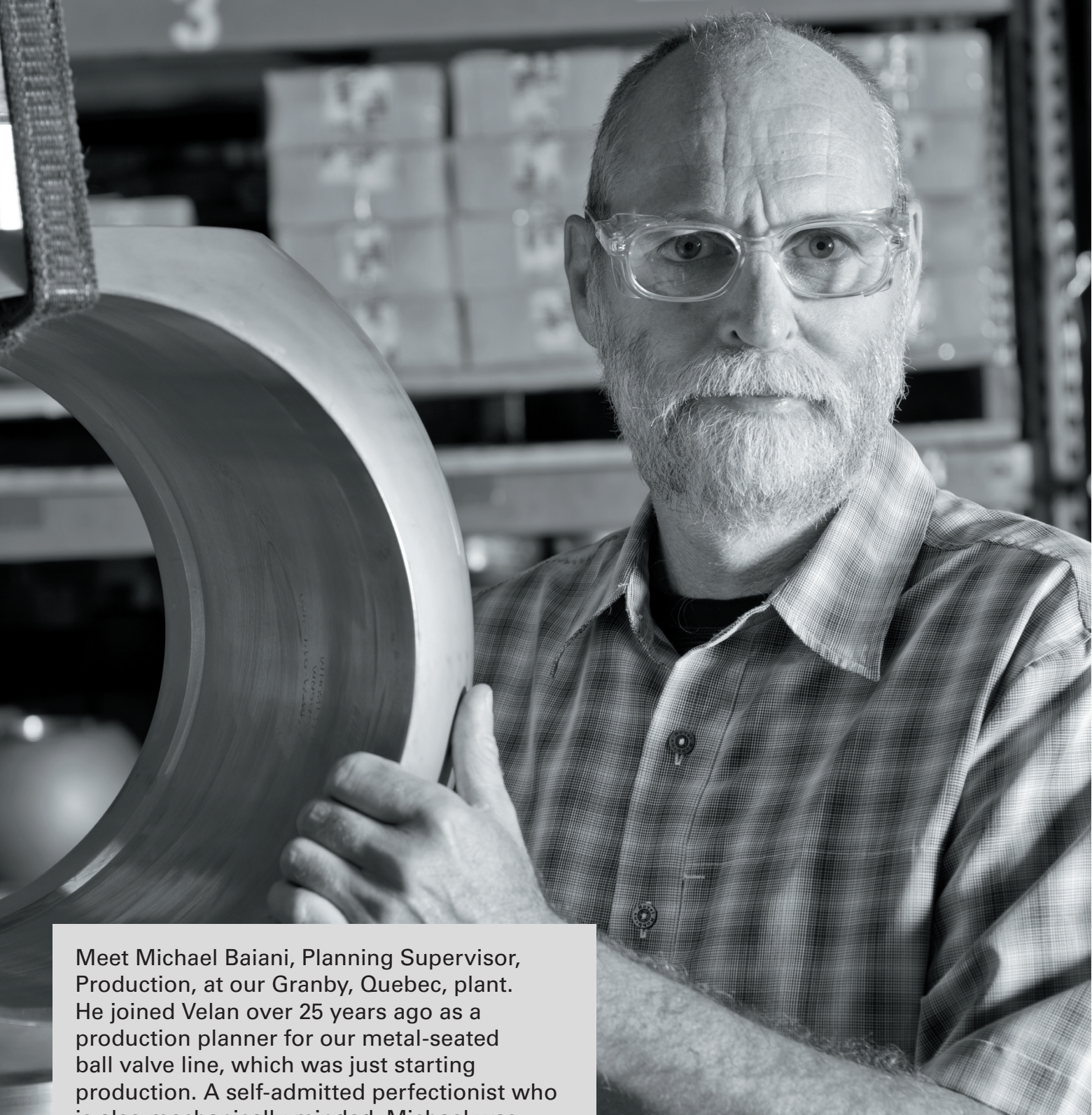
We provide “Low-E” valve repacking services on both new and repaired valves of all sizes and pressure classes. In addition to installing a certified low emissions packing, we monitor and record all key dimensions to insure that the valve and packing will work together to provide a low emissions solution.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



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Meet Michael Baiani, Planning Supervisor, Production, at our Granby, Quebec, plant. He joined Velan over 25 years ago as a production planner for our metal-seated ball valve line, which was just starting production. A self-admitted perfectionist who is also mechanically minded, Michael was immediately drawn to the precision of the valve's design and its efficiency of operation.

What you might not know about Michael is that he's remarkably multi-talented: When he's not tinkering with his beloved 1991 Westfalia Volkswagen van, you'll find him composing original music on his acoustic guitar.

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VELAN

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BY GREG JOHNSON

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Both these events can cause significant damage to valves and related equipment. By understanding how each works, strategies for decreasing their impact can be put into place.

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Flexible Graphite in Fluid Sealing Applications

Because of the ability of flexible graphite to micro-seal a surface, the material provides an alternative to metal for pressure seal applications.

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- » Perspectives on Automated Valve Procurement
- » CAD Modeling Tools for Pneumatics
- » Field Studies and Modeling Improve Reliability
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Attracting New Talent— A Worldwide Initiative



I just returned from the annual CEIR Congress, The European Association for the Taps and Valves Industry, and one reality I saw there is that the valve industries' quest for finding skilled staff is a worldwide challenge.

CEIR was held this year in Harrogate, United Kingdom where over 70 valve industry representatives, guests and speakers from 10 European nations and the U.S. gathered. VMA was represented by David Moser, president, DFT Inc., who is our liaison to CEIR, and me, along with our spouses. Presentations covered a range of topics relating to sanitary and industrial valves.

VMA was asked again to make a presentation at the General Assembly Meeting, and this year I highlighted the significance of VMA's new Career Initiative. I explained that we've had great success with offering basics training to individuals throughout industries that make and use valves, but we needed to move even further into the area of finding talent: attracting new and high-quality employees and encouraging mentoring environments. I also reported that we have begun a program to educate college and school counselors and students (from high school through technical schools to four-year and advanced degrees), as well as government officials and legislators, about employment opportunities in the valve industry. Lastly, I explained some other ideas we are pursuing including:

- Creation of ValveCareers.com to provide information and create connections between young job-seekers and VMA members
- Selection of "YVPs" (Young Valve Professionals) who can provide testimonials about the benefits of careers in the valve industry
- Attendance at Career Fairs to speak directly with today's youth about the numerous career paths in our industry
- Providing printed materials for schools to use in their career centers and for VMA and members to hand out
- Developing a presence on social media to engage Millennials in the environment where they spend so much time.

Lastly, I told them about two of our upcoming "members-only" programs addressing our career initiative:

- Sept. 30–Oct. 2—VMA Annual Meeting, Naples, FL
- Nov. 12–13—VMA Human Resources Seminar, Arlington, VA

One of the most significant take-aways I got from giving that speech is that in discussions following my presentation, I realized almost all attendees had similar concerns within their nations. This showed me that attracting and retaining talent is not an issue just for North America: It is definitely a worldwide concern. **VM**

Bill Sandler

President, Valve Manufacturers Association of America

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MERGERS, SALES & ACQUISITIONS

Curtiss-Wright Sells Downstream Oil and Gas Businesses

Curtiss-Wright Corporation has sold substantially all of the assets and liabilities of its downstream oil and gas businesses, including the DeltaValve, TapcoEnpro International and Groquip business units, to affiliates of Sun Capital Partners Group.

Emerson Process Management Acquires Energy Solutions International

Emerson has acquired Energy Solutions International Holdings, Inc. (ESI), a global supplier of decision support software and services. The acquisition expands Emer-

son's automation and operations management capability throughout the oil and gas transportation industry.

ESI will join Emerson Process Management and become part of the Remote Automation Solutions group, which provides oil and gas supervisory control and data acquisition and fiscal measurement solutions.

Victaulic Announces Joint Business Venture

Victaulic entered a joint business venture with Bermad, a global producer of hydraulic water and air valve technologies. The new business partnership, called Victaulic Bermad Technologies, will be based in Houston and will focus on select markets and applications, including commercial fire protection, expanding the

Victaulic valve and device offering in the U.S. and Canadian regions.

Curtiss-Wright's Enertech Representing ITT Brand

ITT's Conoflow brand has appointed Enertech, a business unit of Curtiss-Wright Nuclear Division, as the exclusive nuclear industry representative for its valve and regulator products globally.

In this partnership, Enertech will be the point of contact for technical inquiries, quotations and order entry/status, while Conoflow will retain its nuclear quality assurance program, along with certifications and documentation.

Spirax-Sarco Acquires Asepco

Spirax-Sarco Engineering plc has acquired the entire issued share capital of

Asepco Corporation for \$10.7 million. Asepco will operate as part of Spirax-Sarco's Watson-Marlow Fluid Technology Group. Asepco president, Steve Joy, will continue in his role.

Based in Mountain View, CA, Asepco specializes in the design and manufacture of high-purity aseptic valves and magnetic mixers for the biopharmaceutical industry.

NEW CONTRACTS

OneSubsea Awarded \$330 Million North African Contract

OneSubsea, a Cameron and Schlumberger company, has been awarded a subsea production systems contract of more than \$330 million for a gas project offshore of North Africa.

The scope of supply for

PEOPLE IN THE NEWS

VICTAULIC... Christian Sundberg joined Victaulic as a large diameter piping technologist. Sundberg will be involved in water, wastewater and infrastructure projects at the company. He serves in leadership positions on national technical committees for the American Water Works Association and American Society of Civil Engineers and is a member of the American Welding Society. Before this new position, Sundberg spent 37 years as a structural engineering consultant at CH2M Hill.

VALVTECHNOLOGIES... named Ricky Ford upstream oil and gas industry director. Ford will have global management responsibility for ValvTechnologies' upstream oil and gas group and activities worldwide as well as long-term vision strategies for development and growth in the upstream severe service market.

Ford was president of American Energy Services, where he provided engineered valve solutions for offshore production and pipeline applications. Ford also served in several roles during his 17 years with Curtiss-Wright.

VELAN... announced that A.K. Velan is retiring as executive chairman of the board of directors after 65 years of devoted service to the company. He has been appointed to the honorary position of founder and chairman emeritus. Tom Velan has been appointed chairman of the board and



Ricky Ford

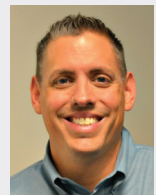
CEO, and William Sheffield has been appointed to the new position of lead director.

AUTOMATION TECHNOLOGY INC. (ATI)... has announced that Bart Dunaway has joined the sales team as regional sales manager. His responsibilities will include developing outside sales and building customer relations.

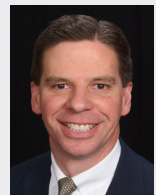
Dunaway was promoted from his previous role as manufacturing manager at ATI's two Texas facilities.

FCX PERFORMANCE... hired Jeff Caswell as vice president, corporate development. He will take a leadership role on the company's ongoing acquisition strategy. Caswell has over a decade of experience in corporate development, most recently as the CFO of the Hamilton Parker Company in Columbus.

BALLUFF... announced the appointment of Tony Canonaco as president effective May 1, 2015 and CEO effective Aug. 1, 2015. Kent Howard, previous president and CEO, is transitioning into retirement and will move into the role of advisor to the president and Board of Directors. Canonaco joins Balluff with over 25 years of sales and leadership experience in industrial automa-



Bart Dunaway



Tony Canonaco

the 13-well development includes subsea production equipment, tooling, and installation and commissioning services. Deliveries are expected to begin in the third quarter of 2016.

Metso Supplying Valves for Stora Enso

Metso will supply hundreds of valves for Stora Enso's conversion of the Varkaus Mill fine paper machine in Finland to lightweight containerboard. In addition, Metso has carried out an installed base audit of its valves in the recycled fiber plant.

The rebuilt containerboard machine is scheduled to start up during the fourth quarter of 2015.

Velan Awarded Major Chinese Nuclear Valve Contract

Velan has been awarded contracts for the supply of nuclear class valves to China Nuclear Power Engineering Corporation, China Nuclear Power Engineering Co. Ltd., China Nuclear Energy Industry Corporation, CHINERGY and HUANENG. These nuclear valve orders represent a sales value of about \$34 million. The valves are scheduled for delivery from 2016 through 2018.

MRC Awarded 3-Year Integrated Supply Agreement

MRC Global Inc. announced that its U.S. subsidiary, McJunkin Red Man Corporation (MRC), has been awarded a three-year integrated supply agreement with the largest combined oil and gas producer in California. This agreement covers all project requirements, maintenance, repair and operations supplies and the managing of all materials

located at the largest oil and gas warehouse facility in the San Joaquin Basin.

Emerson Automates Indian Supercritical Power-Generating Unit

Emerson Process Management has completed automating a new 800-megawatt, supercritical thermal power-generating unit in India owned by APPDCL, a special purpose entity of APGENCO, the Andhra Pradesh state government power generation utility. This is the first state-owned supercritical power station being built in that country. Located in Krishnapatnam, the Sri Damodaram Sanjeevaiah Thermal Power Station is a \$2 billion investment that will provide new, low-emissions generation capacity to support the region's rapid economic growth.

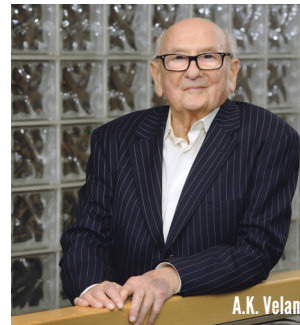
The new power station uses supercritical boiler/turbine technology that operates at a higher temperature than traditional coal-fired units, boosting the efficiency of electricity generation while reducing carbon and other emissions.

AWARDS

Saint-Gobain Receives Energy Award for Seventh Year

Saint-Gobain has been awarded the ENERGY STAR Partner of the Year Sustained Excellence Award by the Environmental Protection Agency (EPA). This award is presented to recognize organizations that contribute to reducing greenhouse gas emissions through superior energy-efficiency achievements. It is the seventh consecutive

year Saint-Gobain and its North American subsidiaries have been recognized.



A.K. Velan Receives Gold Medal from Engineers Canada

A.K. Velan, founder and chairman emeritus of Velan, has been awarded the 2015 Gold Medal by Engineers Canada, adding to a long list of career honorariums.

This award is presented to an engineer who has stood out for his contributions to the profession, and is a top distinction given out by Engineers Canada.

Exlar Corporation Earns Governor's Safety Award

Curtiss-Wright Corporation announced that its Exlar business in Chanhassen, MN was recognized for superior performance in workplace safety and health at the Minnesota Governor's Safety Awards luncheon on Thursday, May 7 at the Minneapolis Convention Center. Exlar is one of 267 employers to be honored through the program, which is coordinated by the Minnesota Safety Council.

Spirax Sarco Awarded Safety Commendation

Spirax Sarco was recently presented a Commendation of Excellence award by the South Carolina Chamber of Commerce for exemplary top safety records at its two sites in Blythewood, SC.

2015

AUGUST

6-7 VMA Market Outlook Workshop*

Chicago
www.vma.org

SEPTEMBER

26-30 WEFTEC-The Water Quality Event

Chicago
www.weftec.org

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

DECEMBER

8-10 Power-Gen International

Las Vegas
www.power-gen.com

2016

MARCH

9-11 VMA Technical Seminar & Exhibits

New Orleans
www.vma.org

APRIL

17-19 VMA Valve Basics Seminar & Exhibits

Rosemont (Chicago), IL
www.vma.org

*For VMA and VRC members only

If you are interested in learning whether your company qualifies for membership in the Valve Manufacturers Association or Valve Repair Council, please visit www.vma.org > About VMA.

VALVE MAGAZINE

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gparente@vma.org.

The awards were given to companies and organizations that achieve a commendable lost workday case rate during the 2014 calendar year. This includes any occupational injury or illness that results in an employee being unable to work a full assigned work shift.

Edison Awards Honors Victaulic Pipe-Joining Advancement

Victaulic has been selected as the 2015 Edison Awards Industrial Design bronze award winner for the Style 177N QuickVic Installation-Ready Coupling.

Named after Thomas Alva Edison, the Edison



Awards recognize technologies and products that make a positive impact on our daily lives.

OTHER NEWS

Powell Valves Keeps Inner-City Youth Playing Baseball

When the West End Reds/TS Bulls, an inner-city youth baseball club near downtown Cincinnati, was threatened by lack of money, Powell Valves went to bat for the boys and girls.

Through its William Powell Company Foundation, Powell Valves made a donation to help sustain the club, which consists of six baseball teams for boys and girls ages 4-13.

The club's plight was

detailed in a Cincinnati Enquirer story in late April. While the Cincinnati Reds Community Fund provides a majority of the club's support, the organization was short last year and falling further behind this year.

A GoFundMe campaign raised some of the money for the club in April and May, but Powell, whose corporate offices are close to the club's home turf, decided to provide a large donation outside of the campaign to ensure the club's future.

Chesterton Begins Facility Expansion

On April 22, The A.W. Chesterton Company broke ground on an extensive expansion project at its Groveland, MA facility. The expansion will incorporate new corporate offices as well as a customer and employee training facility and large service center covering the New England area. Once completed, this will be the first time in over 115 years that the Massachusetts employees will be under the same roof. **VM**



□ Powell Valves donated its support to inner city playing teams.

MARKET FOCUS: POWER PLANT UPKEEP

Severe service valves likely will see a lucrative market from the need for constant repair in power-generating plants. A new combined-cycle generating plant, for example, will require multiple starts, varying load conditions and a grid affected by the load swings of renewable energy.

In its latest forecast, Industrial Info Resources (IIR) predicted that overall maintenance spending will remain strong in the natural gas- and coal-fired power generation sector: pipe, valve and fitting products for MRO are forecast to rise to \$3.76 billion by 2018 from \$3.59 billion in 2015. The market for MRO valves will grow to \$1.16 billion from \$1.09 billion.

IIR pointed out that in the combined-cycle generating plants, severe service



valves—which control turbines, boilers and balance-of-plant systems—will face the wear and tear on equipment and valves that comes from plant cycling operations. To remain functional and safe, valves designed for severe service need to be maintained, inspected, tested and operated throughout their service lives.

For more information on severe service valves in power generation, see "Where Valves are Used: Critical Service Valves and Applications," page 32.

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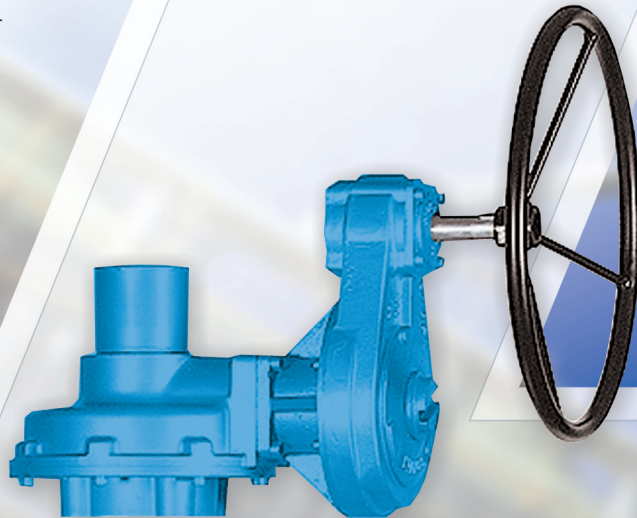
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Valve Basics Meets Deeply Felt Industry Need

Leafing through comments made by those who attended the most recent Valve Basics event quickly reveals why these courses are vital to the industry.

"I started off with almost no knowledge about valves and actuators," wrote Rekul Upadhyay, a master's degree student from UNC-Charlotte. He was one of 60 people who attended the May 12 to 14 event in Charlotte, NC.

"Within three days I got to know so many new and interesting things, I am now considering working in this field," he continued.

The student, who is from India, attended the event based on a suggestion from his advisor.

His thoughts illustrate one aspect of why the courses are needed: to find saw to pass skills on in an industry as highly technical as valves and actuators.

The most recent course saw one of the youngest groups attend: The majority fit into the category of two or less years of experience while the next biggest group had two to five years.

The basics courses also fulfill another great need in the industry, one not based on number of years of experience: the need for practical, hands-on teaching—the stuff that can't be read in books or online. That's where the Valve Petting Zoo and tabletop exhibits come in handy. The zoo sessions allow attendees to see valves and actuators and how they work up close so they understand what they are being taught.

"Visualizing and putting



"Visualizing and putting your hands on the equipment can easily be worth two or three presentations."

—Douglas Eicher, technological specialist at DTE Energy

your hands on the equipment can easily be worth two or three presentations," said Douglas Eicher, technological specialist at DTE Energy. "And the smaller group allows for good interaction and knowledge sharing."

The other most frequent comment about the Basics Course from those who attended in Charlotte centered on the fact it has gone from the base level of teaching to a deeper level—that's why the 201 level of classes was added, as well as the extra day. The new 201 lessons included sessions on materials, casting and forging, fugitive emissions and packing, and basic valve repair. Valve Basic 101 classes cover topics such as the different types of valves and actuators and the types of applications where they are used.

The numbers back up support for the expanded course: Of those who registered, 85% signed up for all three days. They also show the word is spreading

to other potential attendees: Of those who responded to a request for comments, 38 of 39 said they'd be passing along the recommendation to attend to their colleagues.

Some suggested a need exists for even more teaching. "Can VMA provide 300

and 400 level seminars?" one person asked.

The next 3-day Valve Basics event is Oct. 21-23 at the Hyatt Regency Riverwalk in San Antonio. Contact Abby Brown (abrown@vma.org) with questions about Valve Basics programs. **VM**

NEW MEMBERS

During the past quarter, VMA has added three new members, bringing the total of new members in 2015 to eight.

Champion Valves Inc. of Wilmington, NC, has 50-plus years of combined application and installation experience. The company engineers, tests, supports and supplies check valves for a variety of applications. Learn more about Champion Valves at www.wafercheck.com.

Climax Calder Testing Systems, Newberg, OR, is one of two new associate members. The company provides hydrostatic and pneumatic test systems to industries such as oil, gas and petrochemical, and power generation. Visit them at www.climaxportable.com.

Another new associate member is Houston-based **Precision Polymer Engineering, Inc.** (PPE LLC). The company designs, develops and manufactures high-performance molded rubber seals (elastomer seals), rubber gaskets and rubber components for industries around the world. Visit www.prepol.com for more information.

See the ad on page 13 to learn if your company is eligible to join the Valve Manufacturers Association, or visit www.VMA.org.



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Gate & Globe, Bolted Bonnet, Forged Steel Designs

- Gate Valves Over 2,000 Cycles
- Globe Valves Over 5,000 Cycles

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Chicago Hosts WEFTEC 2015

The world's largest water quality event occurs Sept. 26-30 when WEFTEC 15 takes place at McCormick Place, Chicago. This is the 88th year of the conference, which drew well over 20,000 attendees last year.

WEFTEC, which is put on by the Water Environment Federation, brings together all the various water sectors from water plant professionals and water officials to conservation experts and stormwater specialists. Keynote speaker at this year's event is Rob Stewart, an award-winning biologist, photographer, conservationist, filmmaker and author who will discuss his film *Revolution*, which is about efforts to save life on Earth.



There also will be 135 technical sessions, 31 workshops and 1,000 presentations, as well as eight local facility tours and an exhibit hall featuring the wares of 1,000 companies. There are

increased opportunities for attendees to interact directly with global water experts through mobile sessions, product demonstrations, an innovations showcase and more than a dozen special-

ty pavilions.

Co-locating with the WEFTEC conference is the Stormwater Congress, which has its own focused program.

For information, go to www.weftec.org. WM

Event Addresses Safety and Standards for Oil and Gas Pipelines

At the API Tanks, Valves, and Piping Conference & Expo Oct. 12-15, Las Vegas, attendees get a chance to learn about industry codes and standards as well as emerging trends in the upstream, downstream and midstream oil and gas industries. Three conference tracks offer 65 sessions designed to educate professionals that are involved in production systems, pipelines, terminals, refining and chemical manufacturing, and storage facilities.

Meeting attendees include tank, valve and piping professionals as well as refinery and terminal owners, senior design and construction people and representatives of oil and petrochemical refineries, utilities pipelines, cleaning firms, inspectors and other people interested in safe operation of equipment.

Sessions cover topics such as fire protection, equipment issues, reasons for failures, how to design for reliability, coatings and other protections, emissions and inspection technologies, updates of API Valves and Piping and API

Fugitive Emissions Standards and much more.

In addition, vendors to the industry will exhibit their wares on the expo floor.

VRC member Greg Johnson, president of United Valve, is chairing this year's event, which is being held at the Aria Hotel.

Information is available at www.api.org, "events and training." WM





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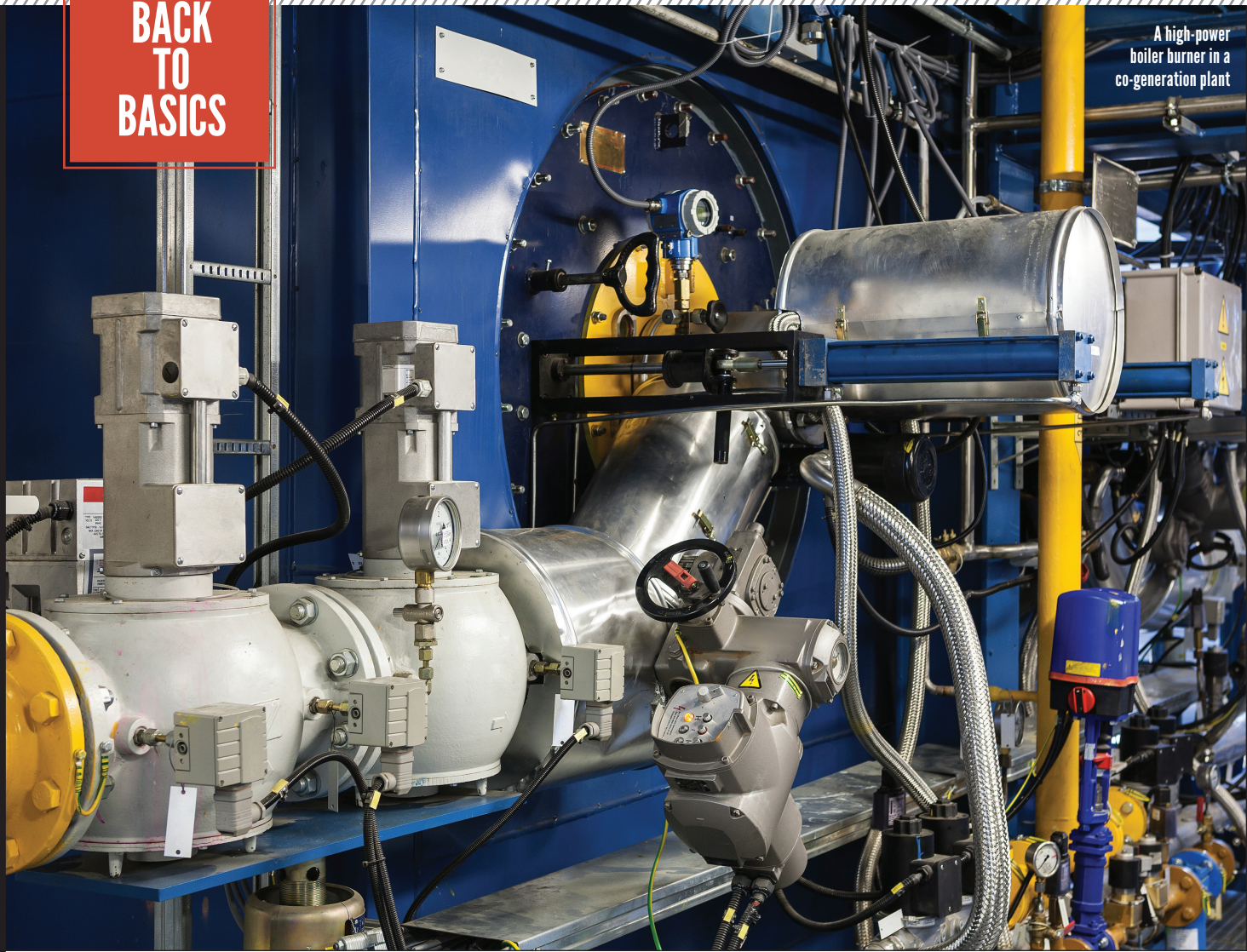
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Flashing and Cavitation

BY BERT EVANS
AND RICHARD L.
RITTER III

Some of the following questions may seem unrelated, but they all involve key concepts that explain the sometimes-misunderstood phenomena of flashing and cavitation:

- How can relatively clean and clear water damage a valve?
- Why does it take longer to hard boil an egg in Denver than in Los Angeles?
- Why does water squirt farther out of a garden hose when I place my thumb over the end?
- How can the gas in my liquid propane grill last so long?
- What is that noise I hear in a pump when I fail to charge the downstream line?
- Can I prevent flashing and cavitation? If not, can I minimize the damage they cause to valves?

Executive Summary

SUBJECT:

Although flashing and cavitation are often discussed together, there are differences between the two and how they occur. Both can cause significant damage to valves and related equipment.

KEY CONCEPTS:

- The key distinctions
- How each condition occurs
- Strategies for protecting valves

TAKE-AWAY:

The different strategies can help to prevent or eliminate what happens. They also can be combined.



Figure 1. Normal post-guided plug (left) and flashing-damaged post-guided plug (right)

Flashing and cavitation is the answer to that very first question because it can occur with very clean and clear water—with the potential to cause severe erosion damage to valves, piping and other equipment—even without any erosive solids in the water. Figure 1 shows an undamaged post-guided control valve plug (left) and a damaged identical plug that has been severely eroded by flashing (right). Note how the damaged surfaces of the plug on the right appear shiny and scalloped—and how the beveled seating surface (i.e., the geometry that allows the valve to shut off) is completely missing. This illustrates how severe flashing damage can be despite the pureness of the medium.

Figure 2 shows a plug and cage damaged by cavitation. Notice the very different appearance: The plug is dull, dark and grainy (e.g., it looks similar to pumice or lava rock).

These two figures show that, while cavitation damage looks very different compared to flashing, the result is the same: loss of throttling and shut-off capability. Both kinds of damage are the result of related, but very different, processes.



Figure 2. Cavitation damaged plug and cage

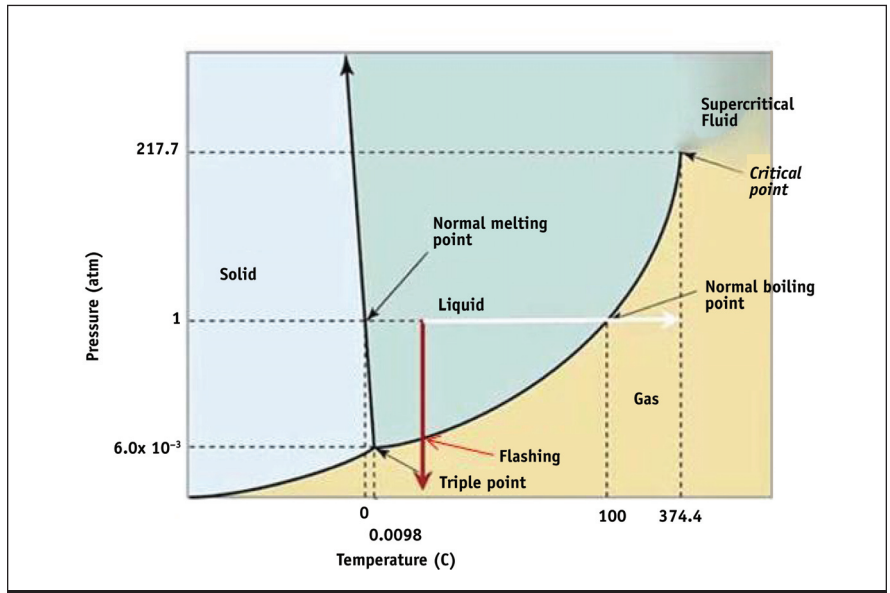


Figure 3. Phase diagram showing boiling and flashing (Machado, 2009)

PROCESS PRESSURE AND VAPOR PRESSURE

The place to begin in understanding the differences is by exploring what the terms “flashing” and “cavitation” actually mean. But to get to that point, we should first discuss another term: “vapor pressure.” The vapor pressure (PV) of a fluid is the pressure at which a liquid will begin the thermodynamic process of changing to vapor.

Figure 3 shows a phase diagram of a single component process fluid such as water and graphically depicts the difference between flashing and boiling. Under a condition of constant temperature, a change in pressure can result in transition from one phase to another. When the local pressure ($P_{process}$) is reduced below the fluid PV, for example, vaporization will begin. In the process industry, if $P_{process}$ does not

recover above PV, the fluid will remain in the vapor phase. This process is flashing.

Similarly, under a condition of constant pressure, a change in temperature can also result in a phase change. PV of a fluid increases as the fluid temperature increases. If the fluid temperature is increased to the point where PV exceeds the local pressure (which is often the atmospheric pressure), vaporization will occur. This process is boiling.

In other words, flashing occurs when we lower the pressure at a constant temperature, and boiling occurs when we raise the temperature at a constant pressure. (This ties back to our egg example: It can take a bit longer to boil an egg in Denver than Los Angeles because the average atmospheric pressure is slightly lower

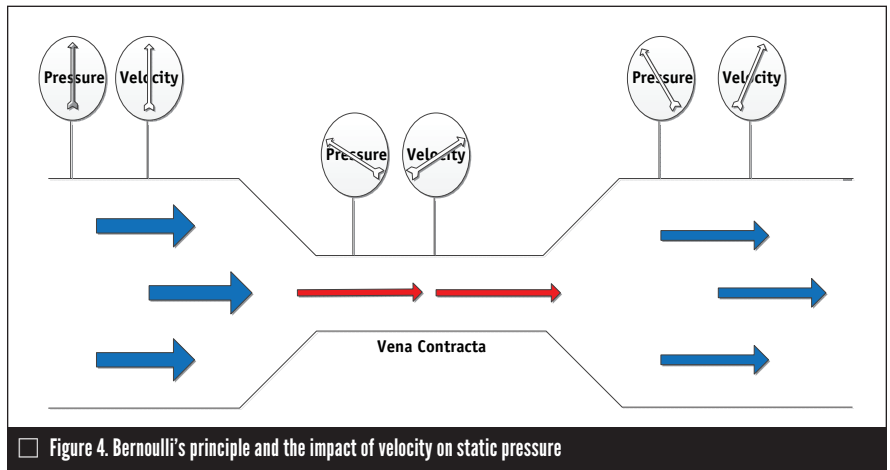


Figure 4. Bernoulli's principle and the impact of velocity on static pressure

in the “Mile-high” city of Denver—water boils at a slightly lower temperature there than it does near sea level.)

Next we look at why flashing happens in industrial processes and piping systems.

When a liquid is flowing through a conduit, such as a pipe or a garden hose, and it encounters a restriction, such as a valve (or your thumb on the end of the hose), it accelerates to a higher velocity. Why does this happen? It occurs because, when a liquid encounters a smaller flow area, the liquid must accelerate to maintain continuity—that is, to retain a relatively constant volumetric flow rate. This is much the same as the way a river tends to meander and run slowly when

it’s flowing through a wide plain, but becomes fast-moving rapids or white-water when the river encounters a narrow canyon. Boyle’s law, Bernoulli’s principle and Euler’s formula show us that the pressure in a restricted flow area (such as a valve) will be lower than in a larger pipe section.

These ideas are shown graphically in Figure 4.

FLASHING

If the local pressure within the restricted flow area drops below the vapor pressure of the liquid, which is a condition called the “vena contracta,” vaporization occurs (i.e., vapor bubbles would form in the liquid). If the downstream pressure remains below

the vapor pressure, the process is said to be a flashing service, and the outlet stream will be predominantly in a vapor phase. When this flow impinges on valve components, it can cause the kind of erosive damage shown in Figure 1. This erosion can be severe and may occur even when no abrasive solids are present in the liquid.

Figure 5 shows an example of flashing that occurs when using a liquid propane (LP) gas grill. At temperatures above -44°F (-42°C), the vapor pressure of propane is greater than atmospheric pressure. However, the tank that contains the LP is typically pressurized to greater than 10 psig so the propane remains as a liquid within the tank. As the liquid passes through the tank-mounted valve and pressure regulator, fluid pressure drops well below its vapor pressure, causing the LP to flash entirely to a vapor. For typical conditions, propane has almost 300 times greater volume as a gas at standard atmospheric pressure (known as 1 atmosphere) than as a liquid within a pressurized tank. That is why the relatively small volume LP tank can last so long on a gas grill.

The gas grill example would be called an “open system,” because it ultimately vents to the atmosphere and can exchange matter and energy with that much larger system (our atmosphere). When a liquid flows through a piping system, it often is considered a “closed system,” because it can exchange energy but not exchange matter with an external system such as the atmosphere. In closed systems, all process conditions need close consideration to determine whether flashing may occur.

CAVITATION

Figure 6 depicts the pressure profile of a process fluid moving from left to right in a closed system. If the PV of the fluid is below the upstream pressure (P_1), above the vena contracta pressure (P_{VC}) and below the downstream pressure (P_2), vapor bubbles can form as pressure drops. In this case the bubbles can suddenly collapse or implode as the pressure recovers, a condition known as cavitation. Cavitation is often energetic, and it has great potential to damage

Figure 5. Pressure profile showing vaporization (flashing) of liquid propane, similar to the LP tank on a gas grill

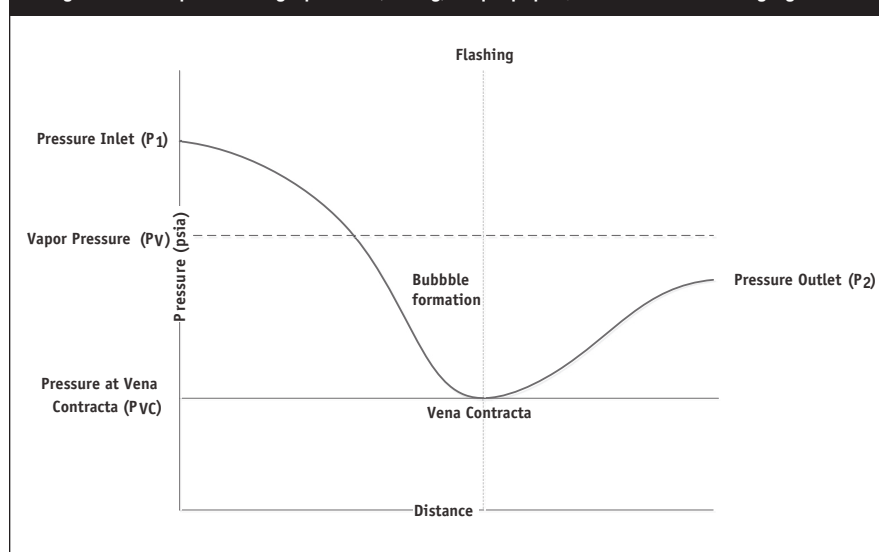
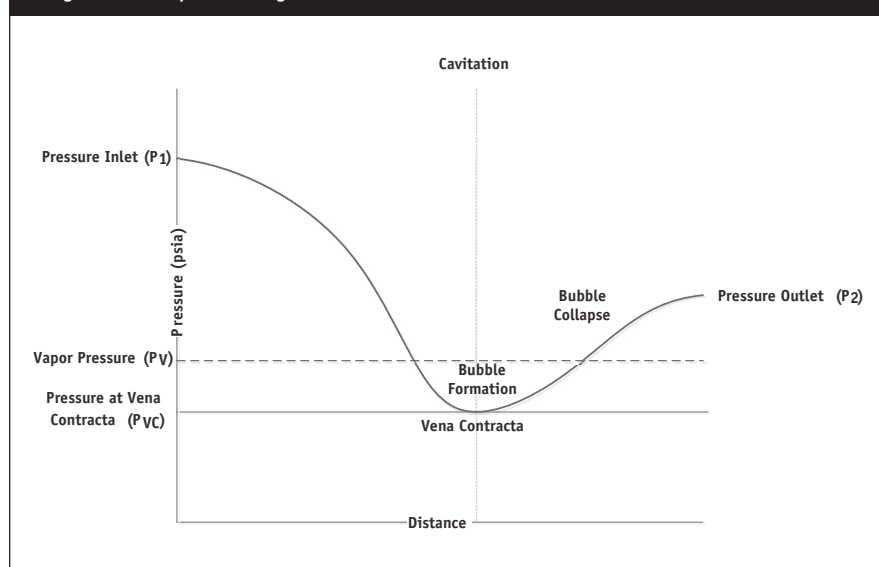
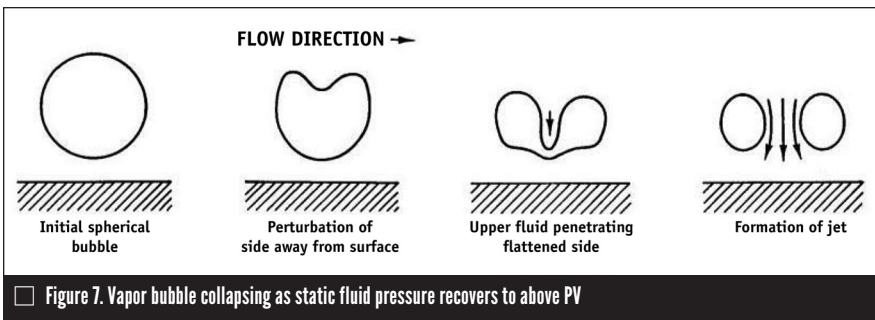


Figure 6. Pressure profile showing how cavitation occurs





valves in a manner similar to what is illustrated in Figure 2.

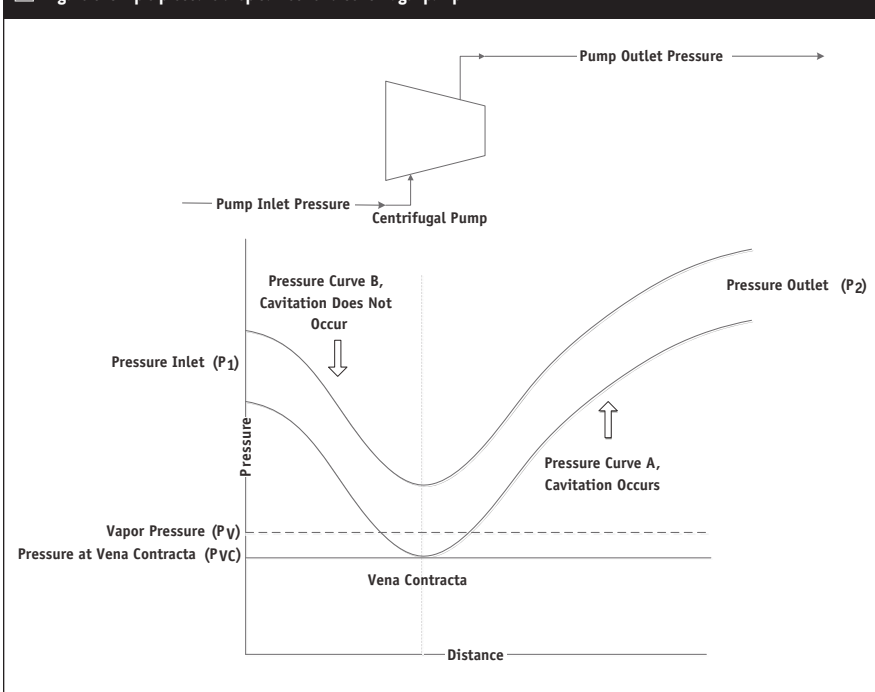
The bubble implosions create “micro-jets” of fluid that can impinge on valve component surfaces at high velocities. The bubble collapse can also create shock waves of up to 100,000 psi. Figure 7 shows a schematic of a single vapor bubble collapsing as the surrounding fluid pressure recovers to above the vapor pressure.

When shock waves from local bubble implosion impact against valve component surfaces, typical materials of construction for industrial valves can be work-hardened and fatigued. As the surfaces become brittle and less resistant to local fracture, they also are subjected to liquid micro-jets that essentially deteriorate the material with time. This process creates the grainy appearance unique to cavitation damage.

Figure 8 shows how cavitation

occurs in a centrifugal pump. If the pressure at the eye of the pump impeller drops below PV as shown in curve A, vapor bubbles form, then subsequently collapse downstream when system pressure recovers to above PV. A centrifugal pump requires that pressure, temperature and velocity be maintained within the pump design specifications to prevent cavitation. This prevention is essential because cavitation can cause significant damage to the pump impeller, extreme vibration and high noise levels. Ensuring a pump is operated within conditions for which it was selected will ensure the pump does not cavitate, as shown in curve B. In this case, the pressure at the eye of the impeller still drops below the inlet suction pressure of the pump, but the pressure of the liquid at the eye of the impeller remains above the liquid vapor pressure so no cavitation occurs.

Figure 8. Simple pressure drop curves for a centrifugal pump



Valve Live Loading

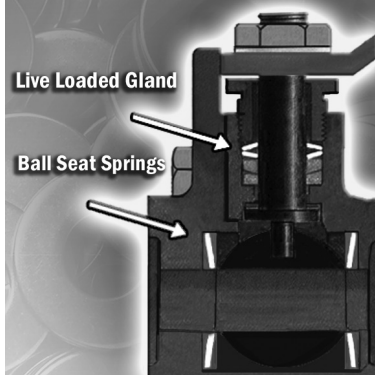
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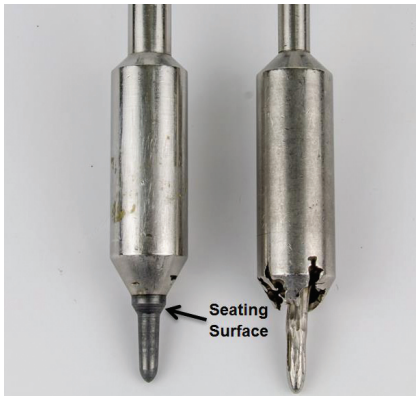


Figure 9. The valve plug on the left has a very hard Alloy 6 tip; the valve plug on the right is made of a softer alloy. Both plugs were exposed to similar flashing conditions for similar durations.

PROTECTING VALVES FROM DAMAGE

Generally speaking, valve manufacturers use one or more design strategies to protect valves from the potentially detrimental effects of flashing and cavitation. These strategies can be described as “resistance,” “isolation” or “elimination.”

Resistance strategies use materials that are very hard, that have a high fracture toughness or fatigue strength or that are less vulnerable to erosion damage through other means. Isolation design strategies involve designing flow paths that minimize the impingement of flashing or cavitation onto critical valve surfaces. Elimination strategies include using tortuous paths or true engineered staging of pressure drops across the valve. They also include adding a valve or orifice plate to split the pressure drop across multiple devices; this creates a greater P_2 at the first device, reducing the potential for cavitation. Aspirating atmospheric air or injecting higher-pressure air into a valve is a third example of an elimination strategy. Manufacturers may also combine these strategies for heightened protection against damage.

Resistance

Materials of construction should be chosen to resist both mechanical attack and chemical attack. Mechanical attack occurs in two forms: erosion (including abrasive, flashing and/or cavitation) and material deformation and subsequent failure. After a period of mechanical attack, many of the pro-

tective coatings of a material (films, oxides, etc.) are physically removed, making the base material more vulnerable to chemical attack. Figure 9 shows two valve plugs exposed to similar flashing conditions for similar durations.

Isolation

Generally, internal wetted valve components (often called trim) are subject to the highest flow velocities as they control the flow and pressure drop across the valve. These high velocities accelerate abrasive or erosive wear so that wear is a function of duration of exposure and proximity to high-velocity flow regions.

Isolation means directing the flow path in a way that prevents or minimizes impingement of the process fluid onto critical surfaces. Figure 10 shows cross-sectional views of angle body valve designs. Angle valves, when oriented so that the flow passes through the valve as shown in this figure (commonly called a flow-down orientation), allow flashing or cavitation to primarily occur after the fluid has passed through the trim. Ideally, most energy—and potential for damage—associated with flashing or cavitation will then dissipate in the flow stream rather than come in contact with the trim or other valve flow passages.

Also, hardened materials can be used as liners to protect the outlet of the valve as shown in the figure. This is a way to combine the resistance and isolation strategies.

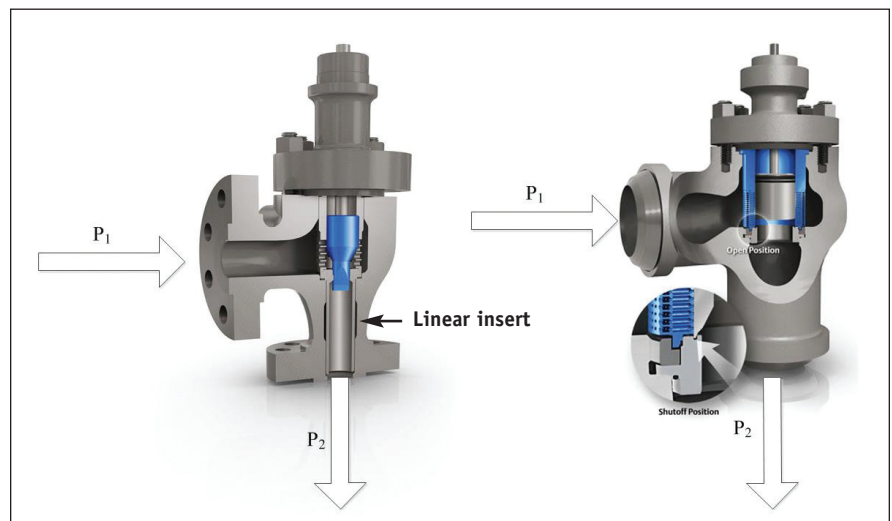


Figure 10. Angle body cutaways

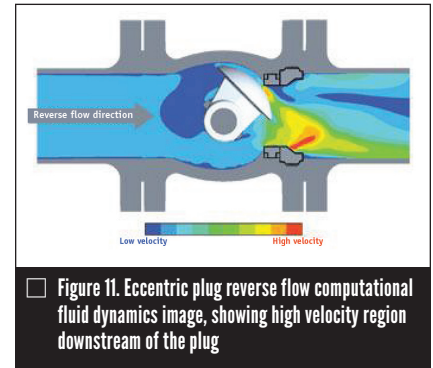


Figure 11. Eccentric plug reverse flow computational fluid dynamics image, showing high velocity region downstream of the plug

Figure 11 shows a computational fluid dynamics model of an eccentric plug rotary valve, specifically designed for erosive service, in a reverse flow orientation. The high-velocity region of the flow, where the vena contracta actually occurs downstream of the valve plug, actually occurs past the plug at the valve outlet. Again, isolation and resistance strategies can be combined by flowing in this reverse orientation and using wear-resistant materials for the seat and outlet liner.

Elimination

An elimination strategy also can be used in combination with other strategies, including both resistance and isolation, to treat cavitation. Cavitation can be eliminated by creating more back pressure locally within the valve. However, this approach will not eliminate flashing because the downstream pressure will never recover above the fluid vapor pressure. In rare circumstances, the entire system pressure can be raised above the fluid

vapor pressure for all process conditions. (This will eliminate flashing, but may introduce cavitation.) Still, it is much more common to use a design-based elimination strategy to minimize or prevent damaging cavitation.

Drilled hole cages, tortuous paths and other trim designs are used by valve manufacturers to carefully manage the internal vena contracta pressure so it is always above the fluid vapor pressure. This minimizes or prevents the bubble formation altogether, which eliminates the cavitation as well. Figure 12 shows a drilled hole cage (left) that combines all three design strategies: resistance (hard materials), isolation (flow down) and elimination (pressure staging). If carefully designed, the hole geometry, diameter and spacing also help to isolate the individual jets as the flow passes through the cage.

A more severe cavitating service may require additional design strategies, such as those shown on the right of Figure 12. This design uses all of the approaches previously discussed with the addition of axial pressure staging as the flow passes through the valve trim. This particular design is capable of handling up to 6,000 psid pressure drops while minimizing or eliminating cavitation and associated damage.

CONCLUSION

Flashing and cavitation are thermodynamic processes resulting from process fluid properties and process conditions. It is important to know both the fluid properties (such as vapor pressure) and the system properties (such as process pressure and temperature) to understand whether cavitation or flashing are potential issues to address in valve selection and application. Flashing and cavitation can cause significant valve

REFERENCES

1. Fisher Controls International LLC. (2011). Control Valve Source Book Pulp & Paper. In F. C. LLC, Control Valve Source Book Pulp & Paper (pp. 4-6, 4-7). U.S.A.: <http://www.documentation.emerson-process.com/groups/public/documents/book/d103540x012.pdf>.
2. Machado, G. (2009, 08 01). Polymeric Solution for Pump Cavitation. Retrieved 05 07, 2015, from Electric Power: <http://www.powermag.com/polymeric-solution-for-pump-cavitation/>

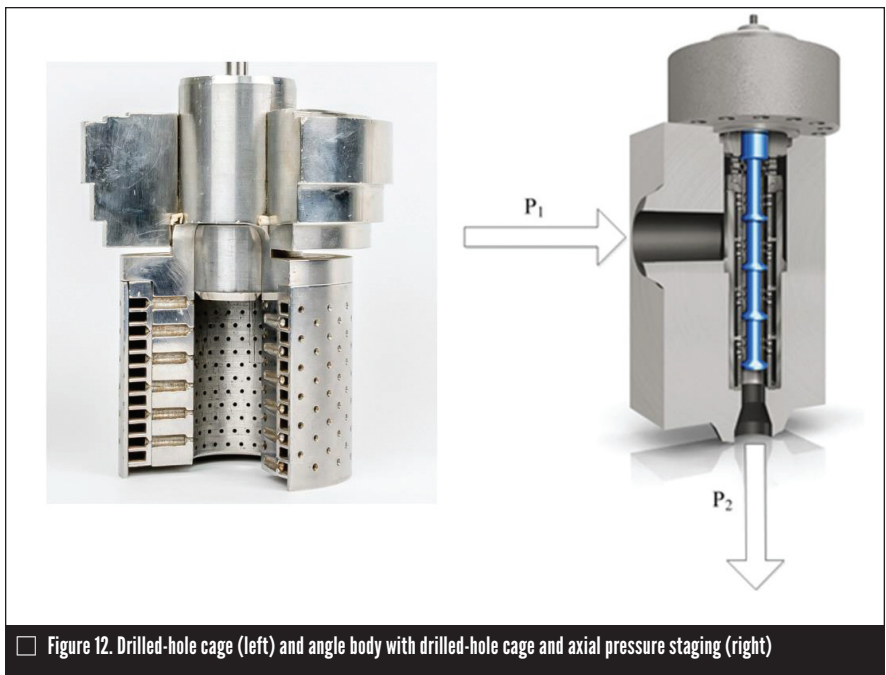


Figure 12. Drilled-hole cage (left) and angle body with drilled-hole cage and axial pressure staging (right)

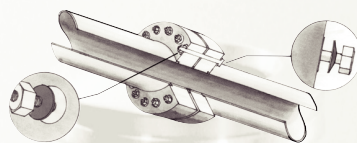
damage, even with clean fluids that do not contain any solids. Many valve design approaches will handle flashing and cavitation, but they generally can be categorized as using resistance, isolation and elimination. Understanding these three general principles can help

in selecting the ideal valve design for tough applications. ❧

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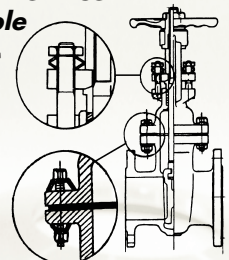
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Repair on sewer systems can expose workers to undesirable conditions.

Coatings can Make a Difference in Wastewater

BY JOHN V. BALLUN, P. E.

In Episode 23 of the Discovery Channel's "Dirty Jobs," Mike Rowe had the task of pulling a submersible wastewater pump from a lift station for inspection and cleaning. His exposure to fumes, sewage and sludge while accomplishing this task undeniably demonstrated the need to reduce maintenance and repair in the wastewater industry wherever possible. The images conveyed showed how messy wastewater equipment can get and why costly downtime occurs in this industry.

Those realities were behind a three-year field experiment conducted using wastewater air valves to evaluate the effectiveness of various types of internal coatings, an experiment that showed how those coatings can reduce downtime.

For this experiment, the valves were installed on the outlet of raw sewage lift pumps. This meant they were subjected to raw sewage, which provided quantitative data about the clogging and functionality of equipment in severe wastewater service. Included in the evaluation were bare cast iron, fusion-bonded epoxy, two-part liquid epoxy and fused polytetrafluoroethylene (PTFE). The results demonstrated the relative effectiveness of various coatings in preventing clogging.

Executive Summary

SUBJECT: To gather details on whether coatings can cut down the need for maintenance in the dirty business of wastewater, an experiment was conducted on the internal parts of air valves.

KEY CONCEPTS:

- Why the test was needed
- What was done
- The results and how they apply

TAKE-AWAY: Different coatings have different levels of effectiveness.

THE SITUATION

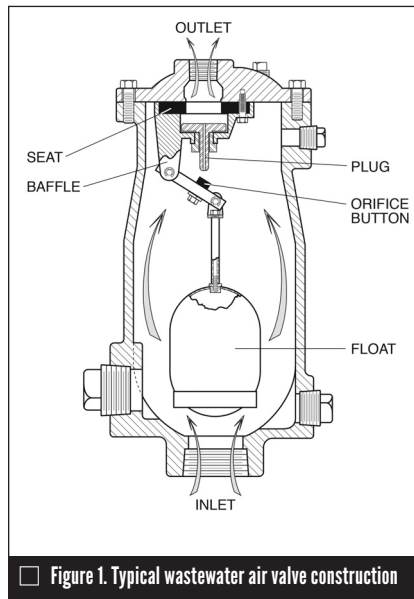
As Mike Rowe learned the hard way, wastewater can be nasty stuff. It can contain liquids and liquid-carried waste from residences, commercial buildings, industrial plants and institutions as well as inflow from groundwater, surface water and stormwater. The solids in wastewater can pack into the tight places of flow control equipment and prevent it from proper operation. One of the most challenging locations for this flow is tourist areas that have numerous restaurants where greases and oils float and collect in the upper areas of equipment to form a thick crust of grease. Without good flushing action across the entire flow way of a valve, that valve will soon be clogged and require cleaning or maintenance.

One device prone to wastewater clogging is the air valve. This is because they are mounted on top of pipes with no natural flow-through flushing action.

Air valves are essential in keeping a pipe full of fluid. But if air and wastewater gases are allowed to collect in the pipeline, the results are additional head loss, check valve slam, surges and pipe corrosion. The air valves help promote efficient system operation by automatically removing trapped gas from the pipe and by providing vacuum protection.

Air valves are automatic devices that have orifices that open to expel air when air and gases collect in the valve body. As fluid enters, a float lifts because of buoyancy and closes the orifice in the outlet of the valve so fluid is not expelled. As the pressure in wastewater systems rises and falls, the wastewater must enter and exit the air valve. The challenge here is to prevent the wastewater sludge material from adhering to the internal surfaces of the air valve and clogging the inner mechanism or outlet orifice. The U.S. wastewater industry commonly installs iron air valves with no internal coating and relies on regular cleaning or backwash operations to keep the valves in working order.

With advances in valve coating systems, an opportunity to greatly reduce or eliminate the need for system shutdowns and regular maintenance of air



□ Figure 1. Typical wastewater air valve construction

valves has been born. This same opportunity can apply to other types of valves and related equipment such as pumps in these systems. To evaluate the effectiveness of these coatings, a field test was conducted using air valves in a raw sewage lift station over a period of three years.

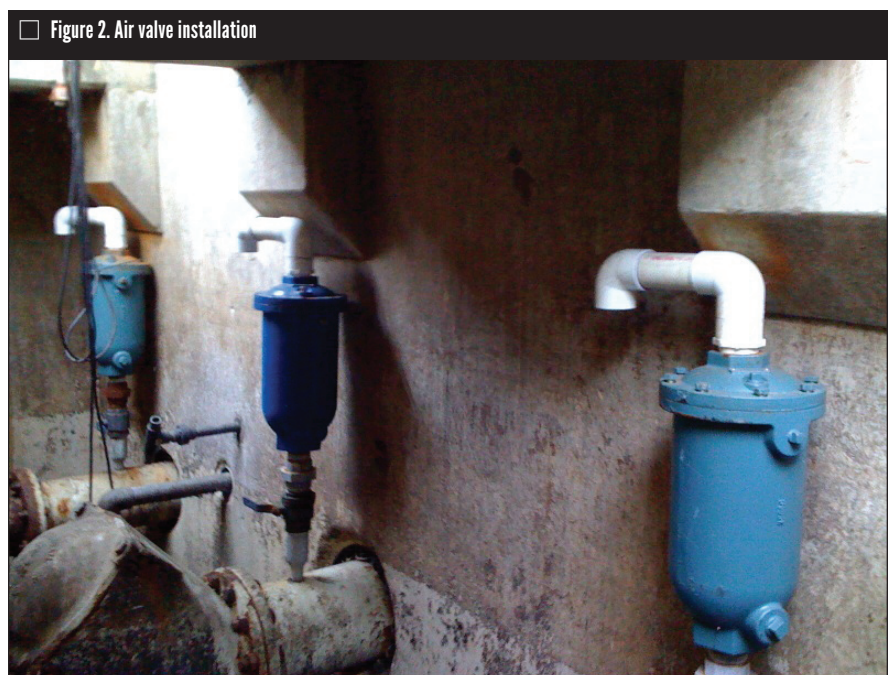
TESTING AND RESULTS

For the test, three alternate interior coating systems were applied to 2-inch combination wastewater air valves mounted on the 10-inch discharge pipe of a submersible lift pump that was upstream of check valves. The function of the air valve was to release

air and wastewater gases on pump startup and to allow air to reenter the pump column on pump shutdown. The air valves are normally open to allow the free flow of gas in and out of the valve. When sewage enters the valve, buoyancy makes the float rise, which operates a lever mechanism that in turn presses a stainless-steel plug against an elastomeric seat to close the valve. This prevents the escape of the fluid (Figure 1). Additionally, a small orifice in the center of the plug releases pressurized air and wastewater gases while the system is pressurized and in operation. This smaller orifice is sealed with a resilient orifice button when the gas is released, which allows the float to rise.

As an industry standard, these types of air valves receive no internal coating. In some applications, they may require regular backwashing or cleaning when leakage occurs. The valve bodies are elongated to prevent sewage from fouling the upper mechanism, and the bottom of the bodies are sloped toward the inlet to reduce debris buildup in the valve. The float and internal mechanisms are constructed of Type 316 stainless-steel trim and Buna-N elastomeric seals to resist corrosion and degradation over the valve's life.

Three wastewater coating systems were evaluated, along with a valve that had no coating:



□ Figure 2. Air valve installation



Figure 3. Valve 1—no coating



Figure 4. Valve 2—FBE coating



Figure 5. Valve 3—PTFE coating



Figure 6. Valve 4—epoxy coating

- Valve 1—No coating, bare iron
- Valve 2—Light-blue fusion-bonded epoxy (FBE)
- Valve 3—Black-fused PTFE
- Valve 4—Black, two-part liquid epoxy coating

Valve 1 was manufactured with no coating so it had a smooth internal cast iron surface and Type 316 stainless-steel float and trim. This configuration is common among many wastewater service valve manufacturers.

Valve 2 received an FBE coating in the factory. During the FBE process, the surfaces that were to be coated were first grit-blasted to a near-white metal surface finish and cleaned further with an etching solution. The

parts were then preheated in an oven to 350°F (177°C), spray coated with epoxy powder using an electrostatic process and post cured in an oven at the same temperature until a hard glass-like surface was achieved. Valve 3 went through a similar 650°F (343°C) fusion process except the coating material was PTFE, resulting in a smooth, matte finish. Finally, Valve 4 received a two-part liquid epoxy system applied at ambient temperature in the factory to provide a smooth, glossy surface.

All three of the engineered coatings were formulated to withstand the rigors of wastewater service. They were applied in accordance with the coating manufacturers' instructions to a dry

film thickness of 3 to 10 mils. These coatings are engineered to have low volatile organic compounds (VOCs) to protect the environment and enhance safety during the manufacturing process. The coated valves were then assembled and factory tested in accordance with AWWA C512 and delivered to a wastewater treatment plant in Elmhurst, IL.

The four air valves were installed in June 2006 on the discharge of parallel, 10-inch primary submersible lift pumps at the wastewater treatment plant. The plant serves 22,500 residents and has a design average flow of 3.3 million gallons per day (MGD) and an 8 MGD maximum flow. The valves were placed upstream of check valves and had to be able to rapidly exhaust air and wastewater gases every time a pump was started, and then allow air back into the pipe when a pump was stopped. During pump operation, the air valves also had to release entrained air in the piping system through a small orifice drilled through the plug. The valves were installed in a valve vault opposite the submersible pump wet well as shown in Figure 2. The pumps run

Table 1. Sludge buildup on air valve interiors

PUMP No.	TYPE OF COATING	BODY	COVER	FLOAT	VALVE
		Average Volume (cu in)	Average Volume (cu in)	Average Volume (cu in)	TOTAL VOLUME (cu in)
1	None	61.37	6.84	1.01	69.2
2	FBE	9.69	0.76	3.03	13.5
3	PTFE	19.38	1.9	6.06	27.3
4	Epoxy	48.45	1.14	18.18	67.8

regularly every few minutes in lead-lag fashion (except during a rainy period when all four pumps can run continuously). The air valves are continuously subjected to raw sewage—the only pre-treatment was mechanical screens.

After one month, the four valves were tested in place to make sure they were still functioning properly. All functioned and released air as required without expelling wastewater fluid when closed. The valves were then isolated one at a time to view the internals. After three months, none of the valves showed any measureable build-up of sludge, and there was no damage or wear to any valve part.

In July 2009, about three years after installation, the valves were inspected again. Plant personnel reported the valves saw about equal usage over that three-year period. Plant personnel performed no backwashing or maintenance of the valves over the duration of the evaluation, and there were no problems noted with the operation of the valves during this period.

During inspection, Pump 4 started, a burst of air was released from the air valve for two to three seconds, and the air valve closed without leakage. The four valves were isolated from the piping by closing the isolation ball valves located beneath each air valve. With the air valves isolated, Pump 4 stopped a few minutes later and several repetitive slams of the check valve were heard.

Plant personnel reported air valves are needed for this system to vent pockets of air and prevent check valve slam from momentary vacuum conditions in the pipe after pump shutdown. All the valve exteriors still displayed the factory epoxy or blue primer coating and did not show excessive corrosion. The plated cover bolts were easily removed with a socket wrench. The covers were pried loose with a tapered scraper without damaging the fiber gaskets.

It was a dirty job, but each cover and float mechanism was lifted from the valve, and the body and float mechanisms were photographed. There was no damage or wear to any of the valve mechanisms. All the valves were

operational and no clogging in the valve mechanism or bottom of the body occurred. The average thickness and percentage of the areas coated were also recorded. A summary of the observations from the test are given in Table 1 and illustrated in Figures 3-6.

CONCLUSIONS

After three years of continuous usage, the 2-inch air valves were effective in exhausting and admitting air in 10-inch raw sewage pump discharge lines and assisted in quiet check valve operation. During the test period, backwashing or cleaning was not required. The valves with the coated interiors were more resistant to buildup of sludge or debris than the valve with no coating. Therefore, the expectation is that, over the life of the valve, shutdown and cleaning of the valves will be required if buildup becomes excessive.

Of the coatings evaluated, FBE provided the greatest overall level of protection by a factor of two or more (Table 1). The uncoated Type 316 stainless-steel float had the greatest resistance to build-up, sludge or debris

over the coated floats by a factor of three or more. Hence, when possible, wastewater equipment should be provided with Type 316 stainless-steel trim and FBE-coated surfaces to reduce long-term maintenance.

Sometimes it's the small factors that can eventually make the difference in system performance. Taking the time to specify an engineered interior coating like fusion-bonded epoxy can save time and money, and most importantly, reduce the number of dirty jobs. **VM**

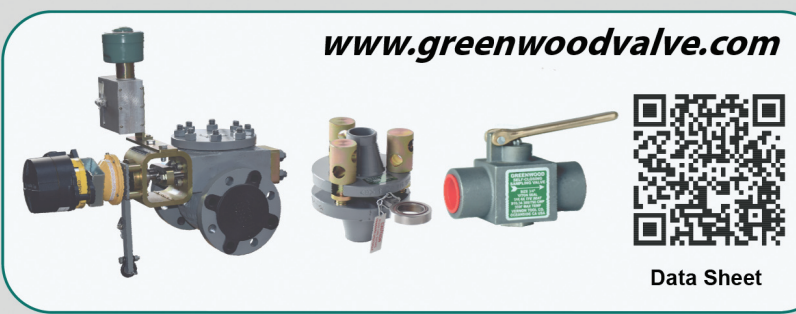
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REFERENCES

1. American Water Works Association, ANSI/AWWA C512-07 Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service, 2007.
2. Submersible Wastewater Pump Association, Submersible Sewage Pumping Systems (SWPA) Handbook, 4th edition, 2013.

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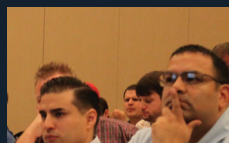
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Vahe Najarian, corporate manager of research and development, Velan (standing left) with members of an R&D team, from left: Charles Francis Ewusi, technician; Nicolas Lourdel, product development process manager; and Subhash Saini, technician. They are working on coatings issues.

The Current State of R&D in the Valve Industry

BY KATE KUNKEL

As valve end-user industries become more complex and demanding, manufacturers and suppliers must develop and find better, more efficient products to do the work. For that reason, resources are increasingly allocated to the research and development (R&D) teams that can create the technologies needed.

VALVE Magazine spoke with a few of today's innovators to find out what is currently driving R&D in the valve and actuator industries and how their companies are responding.

TEAMWORK

One point stressed by everyone interviewed for this article was the importance of a team approach to R&D. While engineers continue to be the forces behind new innovations, companies increasingly realize that other people within the company are needed to pinpoint what's needed and to assure that the results meet customer demands. They are also seeking to connect their company experts with academia and think tanks outside the company.

Luc Vernes, corporate director of product innovation and technology, Velan, who heads up many research efforts for that company, has structured most projects around the concept of working in teams. Good R&D is about fostering creativity, he explains, which is much more effective when a group is working together. The individual people that make up the research group have "specific strengths and areas of knowledge. The challenge is to bring them into a room and allow them to speak candidly to solve the problem," he says. This team of experts does not need to

Executive Summary

SUBJECT: The increasingly difficult conditions that today's valves face create an ever-broader need for new technologies and for the research and development that will create those technologies.

KEY CONCEPTS:

- New issues in R&D
- What companies are doing
- Where R&D is headed

TAKE-AWAY: The key may be in forming the right kinds of teams to tackle the tough issues.

consist of great quantities of people: "You just need a few really smart people and you need to use their combined talents intelligently," he says.

Engineers are a backbone of the teams while marketing and sales personnel and people from the manufacturing plants are critical limbs. The engineers bring technical know-how to the table; however, to be truly effective, "we have to know what the customers want and need. The sales staff are the people on the ground, interacting with the users," Vernes says. The manufacturing plant people are the realists—they know what will work on the floor so they need to be committed, and they need to be included "right from the beginning," he adds.

Velan also works in teams with academic experts and government institutions on research. The company partners with the National Research Council of Canada, a governmental body that supports technological development, as well as universities, including the University of Montreal.

These outside research specialists "are accustomed to future thinking," he says. By working with them on a team, "we can conduct common research to come up with solutions for the entire industry."

He adds that Velan works with its own supplier partners and end users as well.

"An example of this is working with Hydro Quebec and Pratt and Whitney, Canada. We are partnering on common research for solutions to wear issues due to friction and corrosion," he says.

Eric van Gemenen, vice president, research and development at Flowserve, pointed out that the current economic landscape has affected the internal dynamics and pressures for valve manufacturers' R&D departments, which has encouraged looking to outside sources of expertise.

"The larger macro economic conditions are forcing some manufacturers—especially those that don't have diverse markets—to make trade-offs between investing internally or externally in strategic technologies," he noted.

"That means we must get smarter and make more firm bets in terms of where we are going to go with R&D," he adds.



□ The 26,900-square-foot (2,500-square-meter) flow lab in the Emerson Innovation Center

As a result, many firms are carefully assessing how many people they have coming into the company's R&D program versus how much the company should invest in third-party research.

"It's important to note that the entire R&D field for our industry doesn't happen just within our companies. We collaborate with third parties for materials, coatings technology, etc., and those require routine annual financial commitments," he says.

This situation isn't about to change anytime soon, he points out.

"In order to continue to be on the cutting edge of technology, we must continue to partner with third-party vendors, even in challenging market conditions, because if we don't, those third-party experts can always share their technology with competitors," he adds.

DRIVERS FOR RESEARCH

Dale Friemoth, vice president of technology and business development for Crane Fluid Handling, says Crane looks to what's happening with end users for direction for its research.

"We have a product technology roadmap that takes its cues from the market," Friemoth explains. The company begins with the questions: "What does industry need? What are the problems?"

It then figures out what products are required to meet industry drivers, "and then we figure out what technology is needed to make the products," he says.

Friemoth says that this market-driven approach is taken across all fluid handling developments at the company, from ideation through launch of new products through follow-up to assess success.

"It's the same process across the company and around the world, but it is driven at the local level and operated locally" so that it's closer to customer requirements, he says.

The idea that the direction for research in the valve industry must be driven by customers and the market is nothing new, according to those that have been in the industry a long time.

Ted Grabau, vice president for global technology, Emerson, is about to celebrate 36 years in the field. Grabau says he's seen many new challenges pop up for the valve industry in that time and that these challenges have kept him and his R&D colleagues on their toes. His toes are planted firmly in the company's Innovation Center in Marshalltown, IA, but like some other valve companies today, Emerson has such centers in several locations around the world.

Grabau pointed out that one of the greatest challenges for all valve industry companies today is escalating customer specifications, and that those increased specification levels source from a number of issues.

"Safety and environmental and economic risks are causing customers to become more conservative in how they specify control valves," Grabau points out.

Meeting industry standards is just the tip of the iceberg of what customers expect these days, he says. Many large customers have their own, special requirements for shut-off, materials of construction, the processing of those materials and where those materials can originate, he says.

For example, some customers specify countries that cannot be a source; others have special welding requirements just for them, and still others have special non-destructive evaluation methods beyond code standards or dynamic performance criteria.

"All of these are real challenges to the research and development department as well as manufacturing operations," he says.

Grabau gave an example of the kind of unique customer requirements that come into play today and the benefits resulting tests can have. In this case, the customer wanted to know the consequences to the product's performance that might result if an explosion happened close to the product's location, exposing the valve to the blast.

A mechanical engineer figured out a way to simulate a blast impulse to sat-



Members of Velan's Engineering Department conduct a test for an international architectural engineering firm of an automated valve to be used for turbine bypass isolation, a difficult power plant application.

isfy that question. As a result, the company has a new measurement.

By developing the simulation, "we now have that capability in our tool kit to use it [the simulation test] again," he says.

Van Gemen pointed to another way in which end users have an impact on the way valve manufacturers conduct research and development in today's economic climate.

"Customers look to valve suppliers and original equipment manufacturers to provide significant reductions in total cost of ownership," he says.

Because of this, "they are more interested now in exploring possible new approaches and new technologies they perhaps would not have considered years ago. New sources of supply, new material selections and new non-traditional valve designs are given more consideration, even when the only real difference may be less expense upfront," he adds.

This trend puts pressure on R&D departments to be highly nimble and have relationships with customers that are intimate enough "to understand their truly critical requirements," van Gemen notes.

"That means we must understand what can change versus what they must have to run safely and efficiently. We must know what to trade off for what they can and cannot live without."

One challenge in meeting changing customer needs is determining if what a customer initially believes it needs might not really be the case. That scenario happens more frequently today, and when it does, R&D must determine how quickly it can come up with an alternative technology that will address the real need.

Nabil Tarfa, vice president of materials and processes at Velan offers an example.

"Sometimes you face a situation where you are given a description of the service condition of a component and you comply and do everything possible to meet the requirements," he says. Then a failure occurs "and you realize that the valves are actually being misused," or they were incorrectly chosen in the first place.

This is not something the customer does deliberately, but usually is caused by misunderstanding the true challenges the valve faces in the field. For example, end users may believe they need a valve that operates at a certain temperature, only to discover the valve

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faces higher temperatures when in place.

"In that instance, we might initially have chosen completely different materials or we would have used different seats or coatings," he says.

But those kinds of realities are part of the R&D process, especially when an application is new, he says.

NEW APPS AND THEIR CHALLENGES

Those new applications add to the importance of R&D. One example in the power industry is the newer ultra-super-critical power plants, which are believed to be the plant of the future.

As Tarfa points out, these plants are so new that how high temperatures will get has not been pinpointed.

"We have seen temperatures of 1,400°F (760°C) and possibly higher," he says. At those temperatures, packings and gasket materials, bolting material, body pressure boundary materials all must be considered by valve and actuator companies, Tarfa says.

One particularly robust area of R&D that is making it possible for components to survive these extremely high temperatures is coatings, R&D experts say.

Matthew Yao, staff engineer in the materials science department at Kenametal Canada, says his company has pledged significant resources to coatings for reasons that go way beyond temperatures.

"There are so many different environments" valves face today, Yao explains—acidic, corrosive, high pressure—that add to high-temperature challenges. There are also times when simply adding materials to a valve or the seats could introduce a problem with the base material, he added.

"A welding overlay can actually break away or other coatings can meld right into the valve," he says.

Yao is currently working on new alloys for the ultra-super-critical power generation.

"The existing materials commercially available won't work because the temperature and pressure are too high," he says. Steel was previously used in most power-generating applications to make the valve components, then stellite was applied.



□ R&D engineers work directly with customers to understand critical application requirements.

However, with the higher levels of challenges, "you need the base material to survive," he explains. The base material has to be a nickel-based alloy, but he is working now on developing exotic, advanced materials for the coating.

Another example of a more challenging application in the power indus-

try is combined cycle plants. Because these plants turn on and off frequently, they present a new level of demand.

"In the past the power plant situation was stable from the valve manufacturers' perspective," Tarfa says. But combined cycle plants, "must ramp up and ramp down in a very short period of time to be cost-effective. That is abusive to every piece of equipment in the plant; valves historically were not designed for such performance," he says.

One problem discovered early on occurred in pressure seal valves.

"The seals had metal gaskets that quickly failed," Tarfa says, so graphite became the substitute.

But those seals were but one problem in these plants.

With this constant up and down, "bolting material becomes a challenge, body pressure, boundary materials—all these must be studied and tested," he says.

"There are many materials that work, but they don't seal well, so you have to find the right materials with the right amount of life," which requires extensive testing, he says.

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OLD APPLICATIONS, NEW CHALLENGES

Van Gemeren said that it is increasingly difficult to advance the state-of-the-art when it comes to key valve performance factors.

"The low-hanging fruit in terms of materials sciences, mechanics and fluid dynamics has been plucked," he explains, which means "we must explore new, non-traditional technologies. We must engage in research to stay ahead," he stresses.

One example he gave was in the area of dealing with cavitation and noise suppression.

"For the longest time, competitors all used the same bag of tricks when it came to reducing cavitation and managing noise in control valves," he explains. "But they've very quickly drained that swamp in terms of easy, quick ways to do that. All competitors have access to the same technology and solutions, so for those who are committed to staying ahead, they must pursue less-understood technologies," he adds.

Another example van Gemeren gave is with the field of diagnostics and asset management.

"A healthy process that is sorting the wheat from the chaff in the valve manufacturer space is between those who really did have a robust diagnostics and management strategy and those who were just riding on coattails and launching 'me too' products," he says.

"Customers are getting a lot more sophisticated in their understanding and expectation of what kind of real-world solutions they are looking for, and are expecting their suppliers to keep up," says van Gemeren.

This include the number and complexity of failure modes and fault patterns their solutions should be able to recognize. It also includes the amount of advance warning that those patterns can provide end users before performance begins to degrade, he says.

"The primary goal is to be able to draw a clear connection between investment in these new technologies and the hard savings that the operator realized by having made them," he adds.

As a result, "customers have raised the bar for proof in the capabilities, which means that R&D must test solutions with much more rigidity and formality. We must have real empirical data and novel solutions that separate our solutions from others."

THEN THERE'S FUGITIVE EMISSIONS

Another R&D challenge today mentioned by all the interviewees was the need to address fugitive emissions.

"It's not just meeting the API 624 requirements, or even the draft API 641 for quarter-turn valves," offers Vahe Najarian, corporate manager of research and development at Velan. "It's the sheer amount and number of qualifications and regulations and safety concerns involved," he says. For example, 624 specifies the qualifications for every valve. But each size, class and type must be tested, which can be time consuming. Small valves take about one week each while large valves can take up to two weeks.

In other words, if there were 40 valves to qualify, it could take one and a half years to get through them all, he explains. "Then we will have to deal with API 641," he says.

There are also certain risks in the testing process itself. For example, one test involves methane gas, which carries its own set of safety concerns.

While Velan used to farm out such testing to independent

contractors," it made better economic sense to build the capacity to do it in-house," said Najarian. To do so required meeting many regulations, including those that deal with what can be done in a lab located in a city, as well as meeting challenges in getting insurance.

Friemoth agrees that fugitive emissions have brought a new level of challenge into the R&D arena.

"The expanded consent decrees that were implemented with refineries a few years back and now with the chemical process industries are driving requirements well beyond even the standards. You can't just design and work to the standards; you have to exceed the expectations. You have to improve reliability of in-line sealing to give more cycle and physical life and to improve fugitive emission control," he says.

Many of the valve industry companies are working directly to help update standards or are working on standards committees in addition to developing products that exceed the standards, he says.

Beyond exceeding requirements, many end users also want product traceability. This traceability "has to be right from the foundry through the final assembly and testing—you need to have all of it within your control," he says.

SOUR CRUDES

Changes in the oil and gas industry bring another set of R&D challenges. Grabau points to the prevalence of sour crudes as an example.

"Globally the availability of sweet gas and crude has diminished and most new exploration is relatively sour," he said. The users want to be able to buy spot crudes and enjoy the lower feedstock price. As a result, new technologies and new materials are needed, and processes must be upgraded at the front end of refining.

One area that has been particularly affected is alloy valves. Grabau says just a few decades ago such valves used to be ordered in small numbers. Today, these valves, including those made from duplex and super-duplex materials for high strength and corrosion resistance, are common.

Grabau also said nickel alloys have their own set of challenges when it comes to casting because they have such low solubility for normal contaminants. Such alloy valves have to be ultra clean, the material must be virgin, and the products often must be degassed using argon oxygen. Every casting requires a new liner in the crucible and even in the ladle, he adds.

CONCLUSION

Tarfa says it is critical to build a bridge between engineering and production as a way of developing the very best tech-

nologies to handle the challenging, changing business of process control. "There is always a gap between what is designed on a piece of paper and what can be produced," he points out.

However, the innovators are working hard to close the gap using financial resources, creating corporate-wide cultures of innovation and by building teams of research and development specialists both from within and outside their own companies. **VM**

KATE KUNKEL is senior editor of VALVE Magazine. Reach her at kkunkel@vma.org.

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Critical Service Valves and Applications

BY GREG JOHNSON

If you perform a Google search on the words “critical service valves,” you quickly discover that the number of hits is endless. The term is one of the most over-used phrases in the valve industry today, with “severe service” running a close second. Everyone seems to use the terminology in describing their valves. No doubt there is someone out there selling a “critical service” 1/4-inch 200 water, oil, gas bronze gate valve or a “critical service” 3/4-inch hose bib.

If you work in a plant surrounded by valves and piping, you probably consider the service that equipment lends to be critical. That may be true to you and your plant, but there are a number of valve applications and service environments deemed critical by end users, governmental agencies and standards development organizations.

Still, defining critical service applications is a difficult task, especially for isolation-type valves. However, in the field of control valves, a bit more clarity and agreement exists. For example, the following are conditions considered critical service applications by some control valve manufacturers:

1. The flowing media may harm either persons or the environment.
2. The potential for cavitation exists (water service).
3. There is a high vibration or noise (steam service).
4. Tight shutoff is required (ANSI/FCI 70.2, class V or VI).
5. The valves are for flashing service.

Executive Summary

SUBJECT: Critical service valves are one of the most frequently mentioned types today, but there are many different definitions of what truly constitutes “critical.”

KEY CONCEPTS:

- Who defines what “critical service” means
- The challenges of different fluids
- What goes into the testing and design

TAKE-AWAY: As applications become increasingly demanding, more valves will be needed in this category.

□ Opposite page: Hydrogen sulfide is always near the top of any valve critical service application list. The highly toxic gas is found in many oil and gas wells and requires proper material selection to help prevent the aggressive corrosion that can be caused by the material.

6. High pressures exist (ANSI class 300 and above).
7. There are pressure drops of over 650 psi.

Meanwhile, with non-control valves, the American Society of Mechanical Engineers (ASME) provides a definition of critical service in its B31.3 Process Piping Code. The term used is "Category M," defined as "a fluid service in which the potential for personal exposure is judged to be significant and in which a single exposure to a very small quantity of toxic fluid, caused by leakage, could produce irreversible harm to persons on breathing or bodily contact, even when prompt restorative measures are taken."

Many individual petrochemical and process plants have their own company-wide definitions for critical service application criteria. One global refining company, for example, classifies as critical service, applications in which the following will be included:

1. Toxic materials such as phenol, hydrogen sulfide and chlorine
2. Highly corrosive materials such as acids and caustics
3. Flammable materials, including light hydrocarbons
4. Boiler feedwater and steam requiring class 300 ratings and higher
5. Oxygen in concentrations greater than 35%

IT'S IN THE FLUID

Many fairly common process applications are considered critical because of the fluids involved. At the very top of the list are valves in nuclear applications. Some well-known services are:

Nuclear	Oxygen
Hydrogen	Highly corrosive
Hydrogen Sulfide	Emergency shutdown
Chlorine	Flammable fluids

Nuclear applications, particularly those involved in primary cooling or isolation service, are especially critical because if these valves fail, the result can be catastrophic. It is why the extent of quality control and assurance procedures and paperwork is exhaustive for this field. It's also why the standards and codes that govern the construction of this equipment are extensive and without equal. It's why manufacturing valves for nuclear service requires that the manufacturer earn and maintain an "N" stamp in accordance with ASME requirements.

It's also why requirements for castings in nuclear service are precise, requiring the highest quality levels, which in turn is why many times it is cheaper to manufacture valves from forged material rather than going through initial casting creation and casting repair.

Hydrogen and Hydrogen Sulfide

Hydrogen is a popular raw material for key refining processes, including several focused on producing low-sulphur fuels. Popular refining processes such as hydrocracking, hydroprocessing and hydrotreating all require a steady supply of hydrogen. Other refinery processes produce hydrogen as a by-product.

Meanwhile, two parameters in refinery processes are high temperature and pressure, which call for the utmost scrutiny. When hydrogen is the process fluid, the concern for safety

and integrity is great. This is because a failure mode known as hydrogen attack can occur when carbon and alloy steels are exposed to hydrogen under high pressure or temperature. Hydrogen enters the steel and reacts with the carbon to form methane (CH₄), which can result in the formation of cracks and fissures when the operating temperature is above 392°F (200°C).

Another failure mode associated with hydrogen service occurs predominantly in low-strength alloys when atomic hydrogen diffuses into internal defects such as voids or laminations. This hydrogen then precipitates as molecular hydrogen. The internal pressure created by this phenomenon is so strong that if it occurs near the metal's surface, blisters are created in the metal.

Probably the most insidious form of refinery hydrogen damage, however, is called hydrogen embrittlement. This generally occurs at near-ambient temperatures when the hardness of the metal is 22 HRC or greater. It can cause a brittle fracture of normally ductile steels under a sustained load in the presence of hydrogen at levels of less than 100 parts per million (ppm).

Because of the hydrogen permeability of steel, it is important that every step be taken to ensure the base material of a valve is of the highest homogeneity. This is why high-quality, near-defect-free castings are desired. It is also why forged materials are

□ All hazardous materials transportation pipelines are required to have emergency shutdown valves placed at intervals along their routes as well as on each side of a river crossing. The critical service applications are usually handled by pipeline-style gate or ball valves.





□ New testing standards for critical service applications are being developed by the Manufacturing Standardization Society. These standards will define the testing criteria for many critical and severe service applications.

highly valued, since their structure is much more compact, dense and free of internal defects.

Hydrogen's evil cousin, hydrogen sulfide (H₂S), is one of the more lethal fluids handled in the oil and gas industry. Also called sour gas, the highly toxic material is often found in crude oil and gas production. H₂S is inherent in some raw petroleum products until it is removed in the early stages of the refining process. In levels above 100 ppm, sour gas is hazardous to humans. What's more, the unmistakable low-concentration, "rotten egg" odor of sour gas disappears at high concentration, which makes it undetectable and always lethal.

The other, very bad attribute of H₂S is its extremely high corrosivity. H₂S material recommendations to prevent corrosion are covered in two NACE International material standards: MR0175, Sulfide Stress Corrosion Resistant Metallic Materials for Oilfield Equipment, and MR0103, Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments.

Chlorine (Chlor-Alkali) and Oxygen

If you have a swimming pool, you know what it's like to open a container of chlorine powder or pellets: You can

sense this is something bad to breathe. Your sense of smell is accurate: Chlorine in concentrations of as little as 35 ppm can be lethal. In addition to the health hazards of breathing in this chemical, it can also be very corrosive. Valves and piping systems in chlorine service need to be cleaned and dried to ensure they are free of all grease, oil or other materials that can react adversely with the chlorine. Because of the unique requirements of many chlorine process systems, valves are often specified to be designed especially for chlorine service.

Meanwhile, while oxygen is non-flammable by itself, it vigorously supports the combustion process, a process that can be intense enough to melt metals. All it takes is a minuscule drop of oil in an oxygen system combined with a spark to cause a catastrophic ignition. Like valves and piping for chlorine service, valves and piping for oxygen service must be thoroughly cleaned and free of all oils, grease and other contaminants.

Guidance for chlorine valves and piping can be found in Chlorine Institute Pamphlet 6, Piping Systems for Dry Chlorine, while guidance for cleaning valves for oxygen service is found in Compressed Gas Association and National Fire Protection Association literature.

Highly Corrosive Media

Highly corrosive media are primarily acids and some caustics. The choice of materials to handle such media is broad—usually more than one metal or non-metallic material will work. When choosing materials to handle such service, it is important that the concentration of the corrosive media, the temperature and velocity of the flow and the pressure all be taken into account. Quite often, the valve trim material is a key consideration because it will face the highest velocity or the most challenging component stress for the valve, along with the corrosivity of the fluid.

Emergency Shutdown or Isolation

Just the description "emergency" reflects the fact these valves are in critical service applications. They usually are the first and sometimes last line of defense, and they have to work when required. Emergency shutdown (ESV) or emergency isolation (EIV) valves are found in many demanding applications. EIVs are also required at intervals in most pipelines containing flammable or hazardous fluids, and are required on each river bank where a pipeline crosses a river.

Flammable Fluids

Flammable fluids include hydrocarbons such as oil, gasoline and natural gas. Usually the major concern with valves in this service is preventing unwanted leakage past the valve closure member, although pressure boundary integrity and packing leakage are important as well. With flammable fluids, additives and unwanted trace materials sometimes create corrosion issues. These are addressed in choosing the materials of construction. The need for better control of this broad range of materials has traditionally led the way in creating new valve designs, such as the triple-offset butterfly valve.

CRITICAL SERVICE VALVE DESIGN

Soft-seated ball valves made their entrance on the valve scene in the early 1960s. They are ideal choices for zero leakage. However, the soft elastomers that make them seal so well also limit their maximum service temperature. Additionally, soft-seated

valve closure members are easily damaged. To alleviate the drawbacks of the soft-seated ball valve, the metal-seated ball valve was developed in the late 1960s.

The key to metal-seated ball valve success is twofold: 1) precision lapping techniques for precisely mating the ball with its seats, and 2) the development of ultra-hard and abrasion-resistant ball and seat coatings. These two areas of design advancement enabled the ball valve to perform feats of closure not successfully attained before. This success allowed the metal-seated ball valve to become the severe service valve of choice for many applications.

Another valve design that found great favor in many critical service applications is the triple-offset butterfly valve. Unlike non-offset butterfly valves, the triple offset design relies on torque to seal tightly, instead of disc position. Many triple-offset valves can attain a very high degree of closure tightness.

The triple-offset is used more and more in critical applications such as the light-end, non-lubricated services in oil refineries. What's more, their nearly friction-free metal or composite seating components enable the valves to be used for high-temperature applications. Both the metal-seated ball valve and the triple-offset butterfly valve have replaced gate valves in many process plant applications.

The bellows-seal valve is a design that has been around since the 1950s when it was used in early nuclear applications. The flexible bellows is welded to the valve stem on one end and the valve body on the other, providing a hermetically sealed valve interior. When combined with a welded bonnet and butt-weld or socket-weld ends, the valve is virtually guaranteed to be leak-free and ideal for controlling dangerous fluids.

Another critical service valve design is the internally or externally refractory-lined slide gate valve used in flue gas or catalyst service. These valves usually operate at low pressures but temperatures up to 1400°F (760°C). Extremely fine closure adjustment and regulation is usually required, and these valves often employ exotic actuation systems to precisely adjust the flow rate.

The coking industry has relied on specific valve designs for critical and severe service requirements for many years. Unique coker de-heading valves are used on the bottom of the coke drum, for example, while highly engineered ball or plug designs are used to direct product into the coke drums from above.

In addition to specially designed valve solutions, flow control of critical fluids has incorporated the use of a range of special valve materials from stainless steels such as 347H to high-nickel super-alloys.

IT'S NOT SQUARE TO BE HIP

High-integrity protection systems (HIPS) are unified control systems designed to prevent over-pressurization in a process plant. Traditionally, over-pressure

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Table 1: Testing of a 4-inch class 300 metal-seated gate valve

Allowable leakage during 60-second test	8 drops/minute = .5 ml
Allowable leakage per hour	30 ml
Allowable leakage per day	720 ml
Allowable leakage per month	21,600 ml
Allowable leakage per year	259,200 ml
Total acceptable leakage per year	68.5 gallons —from a valve that passed its production testing requirements for seat leakage

situations were handled in a reactive manner by those silent sentinels—pressure relief valves (PRVs). The goal of a HIPS is to be proactive and eliminate the overpressure and probable atmospheric release of fluids by controlling the source of the overpressure at its root. HIPS programs are becoming very popular in refineries and chemical plants. Driven by environmental issues, regulatory directives (i.e., the need to reduce flare emissions) and inline testing of relief valves, the HIPS programs are becoming necessities instead of luxuries in critical service applications.

CRITICAL TESTING

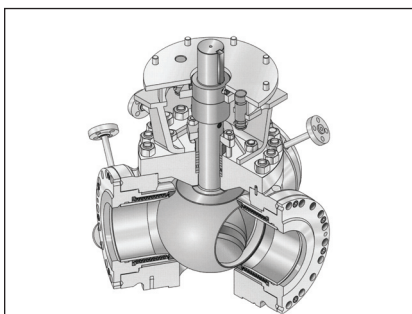
One of the fundamental issues related

to valves in critical service is what type and extent of testing is necessary to qualify the valves for that service. Leakage rates and test durations in test standards such as American Petro-

leum Institute (API) 598 and 6D as well as Manufacturers Standardization Society (MSS) SP61 often are not stringent enough for critical service applications.

Aside from valves with resilient soft seats, all metal-seated valves have acceptable leakage rates during required production testing duration. API 598, Valve Inspection & Test, does not allow any leakage for many small-diameter valves during the 15 or 30 seconds of the actual test. A drop or bubble after the required duration does not fail the valve.

As metal-seated valves increase in size, the allowable leakage rates



The coker switch valve is an example of a severe service valve design created to meet a difficult flow control application.



The torque-seated triple offset valve was created with critical service and hard-to-seal applications in mind.

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during production testing become proportionally larger. But how much leakage is accepted for critical or severe service applications? Looking at a typical valve that might be used in flammable service and tested to the required specification reveals much.

The valve used in Table 1 is a 4-inch class 300 metal-seated gate valve.

Many valves will exhibit zero leakage during these test durations; but what is needed are standardized testing procedures and protocols that match the levels of severity requirements the valve may actually see in service.

This specialized, tiered approach has been suggested before at standards development organization meetings when revisions of production test standards were underway. The addition of tiers and severity levels was rejected for a general-purpose production test standard because of the concern that purchasers would over-specify requirements for general-purpose valves. The solution now being proposed within MSS is to write a severe/critical service test document that will create meaningful testing procedures and acceptance criteria to better match elevated performance requirements for critical and severe service applications.

The new proposed standard practice will also tackle some of the thorny issues, such as establishing definitions for vague phrases (e.g., bubble-tight shut-off).

Some of the areas being considered for the new standard are:

1. Longer test durations
2. Higher test pressures
3. Cycling requirements
4. Inert gas testing as a requirement
5. Gas underwater testing for casting integrity

The primary goal of the new standard will be to create common test methods to better confirm the performance of a valve for critical service applications. A secondary goal will be to give valve buyers added confidence the critical service valve they are buying (and having specially tested) will maintain a high level of performance for an acceptable period of time.

GOING FORWARD

Since the valve research and development boom of World War II, the valve industry continues to develop new products and processes to meet the ever-growing needs of industry. From Teflon to triple offsets, the improvements have been exceptional. Today, with a much tighter focus on safety and the environment, the industry is now tackling the toughest of sealing challenges. These newer product designs and even newer ones on the drawing board are making quantum leaps in sealing efficiency.

When combined with proposed new critical service testing standards, the net result will be even higher confidence that these valves can meet the test of coping with tough sealing challenges. **VM**

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Adding Value through Positioner Diagnostics

BY JUSTIN DINUNZIO

Industrial plants are tasked with reducing costs and increasing production. To achieve this, they seek plant efficiencies anywhere they can, while increasingly facing reductions in their experienced workforce. The situation forces them to rely on their vendors for know-how in reaching their goals.

In this scenario, the users that will thrive are those choosing equipment and vendors that offer value. These users quickly realize achieving their goals is not just about cutting costs—it's about maximizing operational efficiencies.

One of the ways that companies today can find value from valves and actuators is to seek good diagnostics capabilities from positioners.

POSITIONER DIAGNOSTICS

Historically, valve diagnostics were provided as a service through vendors that used special tools and equipment designed to accurately assess valve performance. This service could take days and more often weeks to perform because the valve data had to be interpreted and processed. With the introduction of digital valve positioners, however, users now have the capability of monitoring valve performance themselves and relaying current status of equipment via communication protocols or alarm cards.

Two key ways valve diagnostics improve plant efficiency and processes are through valve performance tests and partial stroke tests.

VALVE PERFORMANCE TESTING

To improve valve efficiency as well as the overall process operation, a key valve positioner diagnostic feature is the ability to “see into the valve” to monitor its performance over time. In general, this is known as a valve performance test.

The test provides a reading of a baseline view or a “signature” of a valve’s performance in real time as it operates. The user can then compare the baseline against other baseline readings over a period of time, for



example, over the course of a week, a month or a year. The following data points are some of the critical ones to assess: hysteresis, non-linearity and non-repeatability. Also valuable are maximum measured error and inaccuracy.

Hysteresis: To determine valve hysteresis, the valve is provided a specific input signal three consecutive times. The valve positioner will monitor the difference in valve position each time. This test shows the difference between the up-stroke and down-stroke over the course of those three test cycles.

Non-linearity: Linearity is a measure of how close to a straight line the valve travels measured against the input signal that is provided. Non-linearity is measured from a curve plotted using the overall average of upstroke and downstroke errors. The non-linearity is the maximum positive or negative deviation between the average curve and the selected straight line. This is independent of dead-band and hysteresis.

Non-repeatability: Repeatability is the measurement of a valve’s ability to achieve identical results across multiple tests. Non-repeatability will measure the difference in the position of the valve (the output) when receiving the same input signal. This test is done consecutively so the measurements fall under the same operating

conditions, and those conditions are approached from the same direction. The results are typically expressed in percentage of ideal output span, not including hysteresis.

Maximum Measured Error: This measurement is fairly simple: As the valve performance test runs, a list of average upstroke and downstroke percentages at different inputs is recorded. To determine what the maximum measured error was during the test, the diagnostic selects the greatest positive or negative value.

Inaccuracy: Inaccuracy is determined by selecting the greatest positive and negative deviations from any of the measured values and reporting it in percentage of ideal output span. In other words, the deviation is any measured value different from the ideal value for increasing and decreasing inputs on any test cycle

The Results

After running a valve performance test, a baseline view of the valve is attained. Monitoring the valve’s performance, then, is as simple as running the tests again and comparing the new tests with the baselines. Such features are available automatically within select digital valve positioners.

PARTIAL STROKE TESTING

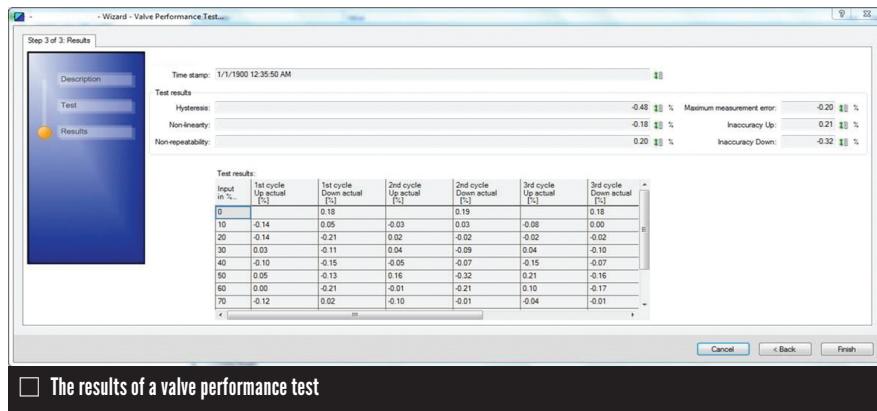
Emergency shutdown valves are inte-

gral to plants across all industries. They are engineered to operate and reduce the impact of failure/emergency situations. In the event of an emergency, the failure of these valves to operate correctly carries huge financial and logistical consequences. To ensure proper emergency valve operation, partial stroke tests are conducted.

How this test works

This test is designed to ensure proper valve stem movement in the event of failure. The valve positioner introduces a small valve stroke and relays to the user the time it takes to stroke the valve. Much like a valve performance test, the user runs the partial stroke test to generate a baseline view of the valve. This baseline view can be used to compare with results from the same test at a later date.

This test can be programmed to run daily, weekly, monthly, yearly or any



combination. The positioner also has the ability to generate an alarm if the test fails or exceeds given thresholds.

CONCLUSION

Valve performance and partial stroke tests are just two key diagnostic features industrial plants can use to increase valve performance and maximize operation efficiencies. In today's plants, these tests can be performed

easily via some of the digital valve positioners offered today. As a result, these positioners add value to valve and actuator products. **VM**

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Reference

1. Citation: IEC 61298-2



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Piping Codes and Valve Standards

BY RON MANSON

As with every intended use for valves, piping carries its own set of standards that valve companies and users need to understand. This article provides an overview of the codes (it does not necessarily cover detailed requirements for specific services).

THE CODES

The typical piping codes used in the valve industry (excluding the water industry) are ASME B31.1 for Power Piping 2014, ASME B31.3 for Process Piping 2014, ASME B31.4 for Pipeline Transportation Systems for Liquids and Slurries 2012, and ASME B31.8 for Gas Transmission and Distribution Piping Systems 2014.

In each of these codes, valves are listed in tables. When that's the case, no additional requirements are generally placed on the valve manufacturer and supplier besides the valve product standards (e.g., API 6D, ASME B16.34, etc.). Although special cases exist, such as class M in B31.3, they are not discussed in this general overview.

The question also arises about what happens in situations that call for non-listed valves. These situations vary from piping code to code so they should be examined on a case-by-case basis.

ASME B31.1

The ASME B31.1 code lists three valve standards, excluding cast iron and bronze valves. The standards are: 1) ASME B16.34, Valves-Flanged, Threaded, and Weld End; 2) MSS SP67-Butterfly Valves; and 3) MSS SP68-High Pressure Butterfly Valves with Offset Design. As stated in B31.1, para 107.1, "Valves not complying with above [the list] shall be of a design, or equal to the design, that the manufacturer recommends for the service as stipulated in para. 102.2.2. Such valves shall be pressure tested in accordance with MSS SP-61."

This puts the responsibility on the valve manufacturer to recommend the design for the service and compounds the issue when valves are supplied



Most codes covering piping in non-water service have tables that list valves covered by the code. Non-listed valves need case-by-case analysis.

through distribution. Rarely will the valve manufacturer know the actual service, since that manufacturer is not responsible for the piping system. Therefore, it is essential that the designer of the piping system clearly understands what is offered when the valve is unlisted. This is especially important with respect to pressure/temperature ratings. The piping designer should always check the suitability of the valve for the service.

ASME B31.3

The ASME B31.3 code lists four valve standards, again excluding cast iron and bronze valves. The standards are: 1) ASME B16.34, Valves-Flanged, Threaded and Welding End; 2) MSS SP72-Ball Valves with Flanged or Butt-Welding Ends for General Service; 3) API 608-Metal Ball Valves with Flanged, Threaded and Welding Ends; and 4) API 6D-Specification for Pipeline and Piping Valves.

The API 6D standard was added in the 2014 edition of this code with a caveat that the design of valves comply with ASME B16.34. (Therefore, it does not really add anything to the 2012 edition list).

Valves that are not listed may be used only in accordance with paragraph 302.2.3. Unless pressure/temperature ratings are established by the method set forth in ASME B16.34, pressure design is qualified as required by paragraph 304.7.2.

In the 2014 edition of ASME B31.3, the designer has to be satisfied that composition, mechanical properties, method of manufacture and design are suitable for the intended service. The pressure/temperature ratings should be established in accordance with rules in paragraph 304. The change from the 2012 edition to the 2014 edition caused the onus to fall on designers. This is because the 2012 edition states that pressure design shall be verified in accordance with paragraph 304 of the code; however, the latest edition states the designer has to be satisfied the design is suitable for the intended service. The situation is similar to what happens with B31.1 since the manufacturer rarely knows the service.

ASME B31.4

ASME B31.4 lists eight valve standards, once again excluding cast iron and bronze valves.

These valve standards, which are more comprehensive than the previous codes, are:

- ASME B16.34, Valves-Flanged, Threaded, and Welding End
- MSS SP68-High Pressure Butterfly Valves with Offset Design
- MSS SP72-Ball Valves with Flanged or Butt-Welding Ends for General Service
- API 600-Steel Gate Valves-Flanged and Butt-Welding Ends, Bolted Bonnets, Twelfth Edition
- API 602-Steel Gate, Globe and Check Valves for Sizes DN 100 and Smaller for the Petroleum and Natural Gas Industries
- API 603-Corrosion-resistant, Bolted Bonnet Gate Valves-Flanged and Butt-Welding Ends
- API 6D-Specification for Pipeline and Piping Valves
- API 6A-Specification for Wellhead and Christmas Tree Equipment

In this code, special valves not on the list are permitted, provided the valve design is of at least equal strength and tightness, the valves are capable of withstanding the same test requirements as covered in the above standards, and the valve's structural features satisfy the material specification and test procedures of the valves in similar service set forth in the standards. These requirements are stricter than previous codes, requiring the designer to make the valve with equal strength and tightness.

ASME B31.8

The ASME B31.8 code lists five valve standards, excluding cast iron and thermoplastic valves. These standards are: 1) ASME B16.33-Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS 1/2 Through NPS 2); 2) ASME B16.34 Valves-Flanged, Threaded and Welding End; 3) ASME B16.38-Large Metallic Valves for Gas Distribution: Manually Operated, NPS 21 .2 (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum; 4) API 6D-Specification for Pipeline and Piping Valves; and 5) API 6A-Specification for Wellhead and Christmas Tree Equipment.

ASME B31.8 does not have criteria for unlisted valves. It states that "Valves shall conform to standards and specifications referenced in this Code and shall be used only in accordance with the service recommendations of the manufacturer." This means that with the 31.8 code, one must only use valves that are listed.

CONCLUSION

The common standard for valves is ASME B16.34. While this standard has several aspects that are positive, it is not really a design code like ASME BPVC section VIII, where material strength, corrosion allowance and formula for irregular shapes are taken into account. For this reason, designs should be cross checked against a pressure vessel code.

While compliance with the piping codes is necessary in almost all cases, compliance with national and federal laws is obligatory. In the U.S., federal codes on oil and gas transportation add restrictions to the valve standards in the piping codes.

The U.S. federal code for Transportation of Natural and Other Gas by Pipeline in section 49 CFR 192.145 states:

"Except for cast iron and plastic valves, each valve must meet the minimum requirements of API 6D (incorporated by reference, see §192.7), or to a national or international standard that provides an equivalent performance level. A valve may not be used under operating conditions that exceed the applicable pressure-temperature ratings contained in those requirements."

This federal code mandates the requirements of API 6D for minimum requirements for pipelines designed per ASME B31.8, which rules out a number of the valve standards listed. For others, it adds substantial additional features and testing over and above the requirements of those standards (e.g., ASME B16.34).

Meanwhile, the U.S. Federal Code for Transportation of Hazardous Liquids by Pipeline in section 49 CFR 195.116 states each valve installed in a pipeline system must comply with

the following:

- a) The valve must be of a sound engineering design.
- b) Materials subject to the internal pressure of the pipeline system, including welded and flanged ends, must be compatible with the pipe or fittings to which the valve is attached.
- c) Each part of the valve that will be in contact with the carbon dioxide or hazardous liquid stream must be made of materials that are compatible with carbon dioxide or each hazardous liquid that it is anticipated will flow through the pipeline system.
- d) Each valve must be both hydrostatically shell tested and hydrostatically seat tested without leakage to at least the requirements set forth in section 11 of API Standard 6D (incorporated by reference, see §195.3).

While the federal code for transportation of hazardous liquids does not follow all of the guidelines of API 6D, it does follow that standard's testing requirements for pipelines designed per ASME B31.4. The main differences from the other listed codes are that test durations are longer and that metal-seated valves are allowed a larger leakage rate because the code was created mainly for larger valves.

Other regulatory bodies, such as the U.S. Coast Guard and the Occupational Safety and Health Administration, do not prescribe additional requirements on top of the piping codes.

In summary, for the product transportation codes ASME B31.4 and B31.8, when the valves are intended for use in the U.S., the sensible valve manufacturer would ensure that design, manufacture and testing encompass ASME B16.34 and API 6D. In the case of ASME B31.1 and B31.3 codes, if the valve is not listed on the table, the piping system designer has to check the suitability of the valve for service or has to clearly advise the manufacturer of intended service conditions. ■

RON MANSON is technical advisor for Cameron Valves and Measurement (www.c-a-m.com). Reach him at ron.manson@c-a-m.com

Consider the Long-term to Maximize Valve Investment

BY JIM SULLIVAN

Plant engineers are saddled with an important task: outfitting their plants with the most reliable, high quality and cost-effective valves for their applications within their allotted budgets. But choosing the right valve is a complex process that has a major impact on plant operations as well as revenue.

If a valve fails in a process application, end users lose valuable time and money to replace or repair the valve. In some cases, entire areas of a plant may need to shut down for the fix, and unexpected downtime is costly. That's why many plants choose valves based on history, performance, specification, quality and cost. When making purchasing decisions, plant engineers, maintenance and purchasing personnel must be able to evaluate available options for their facilities and consider both short- and long-term impact.

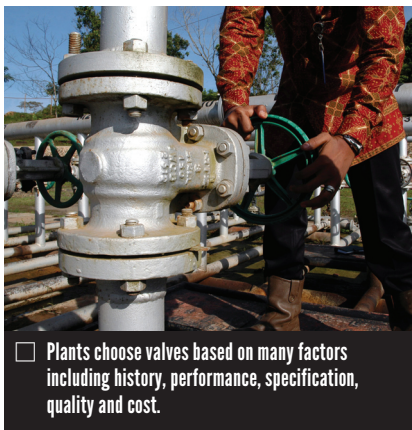
These decisions will only get harder given the growth of the industry. Forecasts by VMA and other groups predict that demand for industrial valves in the U.S. will increase significantly over the next half decade. This uptick means plant engineers will be even busier making major buying decisions.

CHALLENGES

The two most basic factors in the valve purchase-making process are functionality and price point. However, both internal and external factors often have an effect on and can muddy the waters and complicate decision making. Examples include:

The economy. Even when industries experience economic slow-down, plants must continue to operate at optimal levels with minimal downtime. To do so sometimes requires replacing aging infrastructure or completing major renovations despite the lagging economy.

Recently, the declining prices of crude oil have put the oil and gas industry under pressure. While consumers enjoy lower prices at the pump, U.S. oil companies are tightening purse strings and operating on smaller budgets to remain competitive.



□ Plants choose valves based on many factors including history, performance, specification, quality and cost.

Despite this major economic factor, oil and gas plant engineers and maintenance personnel still must ensure their plants operate at maximum efficiency and adhere to safety and environmental standards, and they do so under pressure from tighter capital budgets.

Product selection. Plant engineers and maintenance personnel commonly work with valve manufacturer representatives and distributors that assist with proper selection of valves and actuators. Key factors include selecting the proper valve body and trim materials based on pressure, temperature and media. Many manufacturers offer customers and distributors a chemical resistance guide to aid in selecting the correct body and trim materials. Many of these chemical resistance guides provide a rating for standard valve materials used in common applications, ratings that also are often found in the manufacturer's printed literature or website. This information allows customers to choose the best option for their particular applications. For instance, some chemicals work well with certain valve body materials, but only up to a specific temperature. In some cases, several valve body or seat materials may receive an acceptable rating, then customers might choose the lowest cost option based on product compatibility. In a nutshell, most applications may have several different material options so plants often determine the best solution for long-term needs. This is because specifying the right product is

critical for long-term performance, and misapplied valve products may cause unexpected downtime.

CONSIDER COSTS AND COST OF OWNERSHIP

The cost of a valve usually means the upfront cost to purchase and install the product. In the most basic of scenarios, a plant engineer might have a choice of two valves, both of which would perform the necessary duty, but with a disparity in pricing.

Cost of ownership, on the other hand, includes long-term and often hidden implications of a product choice. Evaluating cost of ownership requires plant personnel to look past product function and initial pricing. The factors they must consider could include:

Valve quality. Just like with any consumable good, valves built to last longer typically cost more upfront. For example, carbon steel is often less expensive initially than stainless steel. However, while both may perform the needed function, the carbon steel valves may have only a satisfactory chemical resistance rating. This could lead to regular maintenance and replacement costs since their lifespans are typically years shorter than their stainless-steel counterparts. By choosing the costlier option upfront, a plant will need less manpower to maintain the valve over time and can avoid repair and replacement costs.

Factors that increase the quality of a valve, and thus sometimes increase the cost, include:

Valve materials. Besides carbon and stainless steel, valves are made from many other materials such as, ductile iron, cast iron, bronze, plastics and specialty alloys. Each has a different cost point.

Valve technology. Valves are typically offered in two classifications: rotary (gate, globe) or quarter turn (butterfly, plug or ball valves). Each has unique characteristics, and in some cases, several different options are considered by plant engineers before they determine the best valve

for the application.

Manufacturer testing. Valve manufacturers test their valves to meet certain specifications. Some manufacturers will meet a wide range of industry specifications while others may be limited to just a few. Manufacturers build their valves and provide detailed instructions and training on how to install, operate and maintain their products. The manufacturers who have invested in the design of their products and quality training to end users may require a premium to recuperate their investments.

Quality assurance. Some valve manufacturers have multiple plants all over the world producing valves. Customers rely on manufacturers to have consistent quality assurance programs in place globally to minimize or avoid receiving defective products from other areas.

Valve applications. Valves have limits for specific pressures and temperatures. Some new packing and seat designs allow for the same valve to be used in many applications while other designs are unique for specific applications. Valves with wider limits may cost more, but since they can be used

in different scenarios, they can potentially cut customers' storeroom carrying costs. One example is Teflon valves. Traditional Teflon can stand up to 400°F (204°C) of heat. However, newer valves that contain Teflon with glass fillers can withstand up to 500°F (260°C). This second type may be slightly more expensive, but they can be used for more applications, potentially reducing the need for multiple valves on the store room shelf.

Standardization. Standardization means committing to one reliable manufacturer for supplying valves plant-wide. This may be costlier upfront, but it also means fewer repair kits or duplicate products in storage. It also can mean better trained plant employees who have had the opportunity to become experts in operating and maintaining the products from their chosen manufacturer.

Repair or replacement costs. At some point, all valves need to be repaired or replaced. The cost to repair or replace a valve is part of the cost of ownership. The timeframe and frequency of such maintenance plays a major role in the longer-term cost. Plant engineers can educate them-

selves on the proper servicing of their selected valves and add that estimated cost to the upfront cost of the valve. They may determine that a higher-priced valve requires less maintenance and has longer life, ultimately costing less over the course of the expected lifespan.

SUMMARY

Valve purchasing is not unlike the process consumers face any time they purchase a common household item. Consumers, like plant engineers, live within a budget, and that sometimes means making a purchase based on function and price. But when the research is done and factors such as quality, reliability, maintenance cost and expected lifespan are taken into account, a different picture of what constitutes the best choice often emerges. **WM**

JIM SULLIVAN is business development manager, Valve and Automation North America for Wolseley Industrial Group (www.wolseleyindustrialgroup.com). He is responsible for developing, managing and promoting Wolseley Industrial Group's valve and automation business in North America. Reach him at jim.sullivan@wolseleyind.com.

Help Create Valve Standards

MSS utilizes the canvass method to achieve ANSI approval of its standards and we need additional volunteers to review and comment on MSS standards being sent to ANSI for accreditation. If you would like to help, please contact Bob O'Neill at MSS for more information. He can be reached at 703-281-6613 or via e-mail,

boneill@mss-hq.org, or www.mss-hq.org.

The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry is a non-profit technical association organized for development and improvement of industry, national and international codes and standards for Valves, Valve Actuators, Valve Modifications, Pipe Fittings,

Flanges, Pipe Hangers and Supports, and Associated Seals. Since its establishment in 1924, MSS has been dedicated to developing standards for national and global application, in cooperation with other standardizing bodies and regulatory authorities. MSS is an American National Standards Institute (ANSI)-accredited standards developer.



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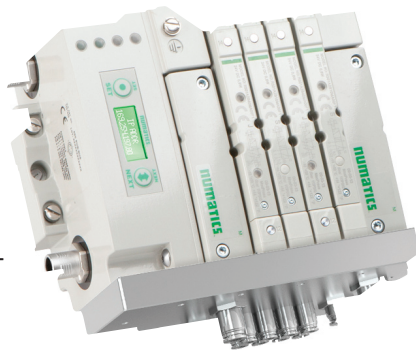
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For more information on joining the Valve Repair Council, contact Marc Pasternak at 202.331.0104 (mpasternak@vma.org).

ASCO Numatics has introduced the Numatics 501 Series panel mount adapter plate, which brings the Numatics 501 Series directional valves high-flow characteristics and compact size to pneumatic panel applications.



The mounting plate adapter allows OEMs and end users to directly connect the 501 Series valve manifold to a panel in the wall or floor of a cabinet. The 501 Series has a unique shut-off configuration that allows for easy isolation (hot swapping) and replacement of a valve without disrupting operations. It comes in three sizes—for 8, 12 and 16 valves—and is available in stainless steel and anodized aluminum.



Conval is offering hard copy, PDF and online versions of its 40-page full-line catalog at no charge to interested specifiers and plant personnel. This full-color catalog contains photos, diagrams, features, benefits and specifications on thousands of Conval products including Clampseal globe valves, throttling valves, gate valves, bellows seal valves and special application valves; Camseal

zero-leakage ball valves; actuated valves, accessories, tool kits; and a description of typical applications.

Crane ChemPharma & Energy has designed a new Pacific CSV line of cast steel gate, globe and check valves for demanding applications.

Each of these valves is uniquely built and tested per API 598 standards to perform in the global oil and gas, petrochemical, power and refining industries. The globe valves also comply with the API 623 standard released specifically for globe valves. They feature higher Cv rates and lower operating torques than alternative valve types.

These valves are available in various sizes and materials of construction, including special alloys and stainless materials.



Emerson Process Management introduces the Fisher 8590 high-performance butterfly valve that brings a selection of disk seals, actuator designs and material combinations for meeting plant-wide throttling and on-off requirements.

Using a lugged body design across the CL600 size range of NPS3–NPS24, the 8590 can incorporate a splined shaft that accepts either a spring-and-diaphragm or pneumatic piston actuator.

The pressure-assisted design of the 8590 disk seals provides tight shutoff and permits the use of smaller, less expensive actuators in meeting full ASME B16.34 shutoff capabilities.



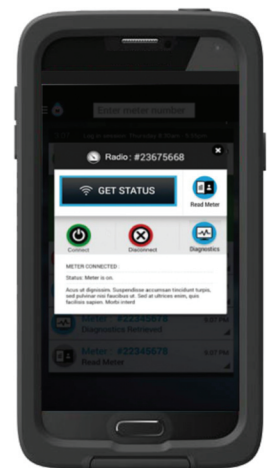
ITT, under its PRO Services brand, has launched the i-ALERT2, a Bluetooth Smart-enabled machine health monitor that allows customers to identify potential problems before they become costly failures. It tracks vibration, temperature and run-time hours and wirelessly syncs the data with a smartphone or tablet.



The product combines the latest in Bluetooth low-energy and sensor technologies commonly used in the newest consumer health and fitness trackers and smart watches such as the Apple Watch and Fitbit. It is the first to integrate these technologies into an industrial package and is engineered and rated for use in a wide range of industrial environments.

Mueller Systems' new smart phone application, mobil-eRDM, enables water utility workers to remotely check the status of service connections, read meters and connect or disconnect water service from an Android smart phone using a 2-way radio connection.

While parked within 1,000 feet of a service connection fitted with a 420 RDM, Mueller Systems' remote disconnect meter, utility workers can push a button for the function they wish to perform. The application then sends a high frequency radio signal directly to the meter. The meter sends back meter readings, system status or confirmation that water service has been connected or disconnected.



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Rotork Skilmatic SI3 electro-hydraulic valve actuators deliver all-electric simplicity with specific hydraulic actuation for reliable mechanical failsafe operation. They represent the third generation of Rotork Skilmatic actuators.

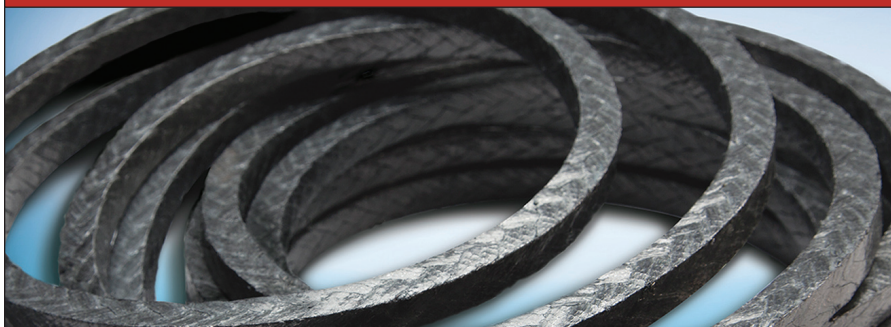
These actuators offer a wide choice of operating speeds, additional ESD options with single or dual inputs, and enhancements to partial stroking to meet a wide variety of demanding applications. They incorporate an advanced control and monitoring system based on Rotork IQ3 intelligent electric actuator technology and provide advanced communication and data logging capabilities.

Val-Matic has expanded its Swing Check Valve line to include metal-to-metal seating designed for municipal and industrial water and wastewater applications.

Series 7900 Oil Cushion Swing Check Valves are provided with metal seating as standard and available as an option on Series 7800 Swing Check Valves. Both the removable body seat and integral disc seat are made from C95400 aluminum bronze for reliable operation under the harshest of conditions. VM



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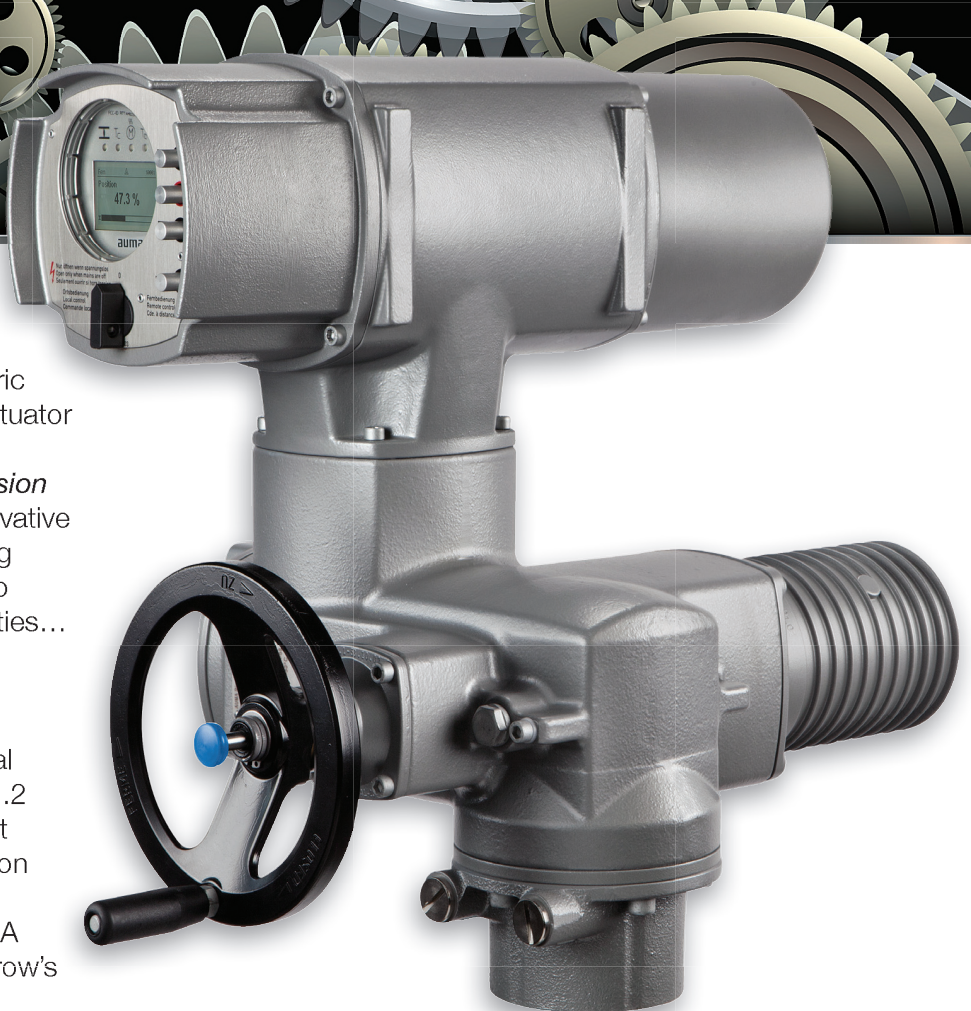
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