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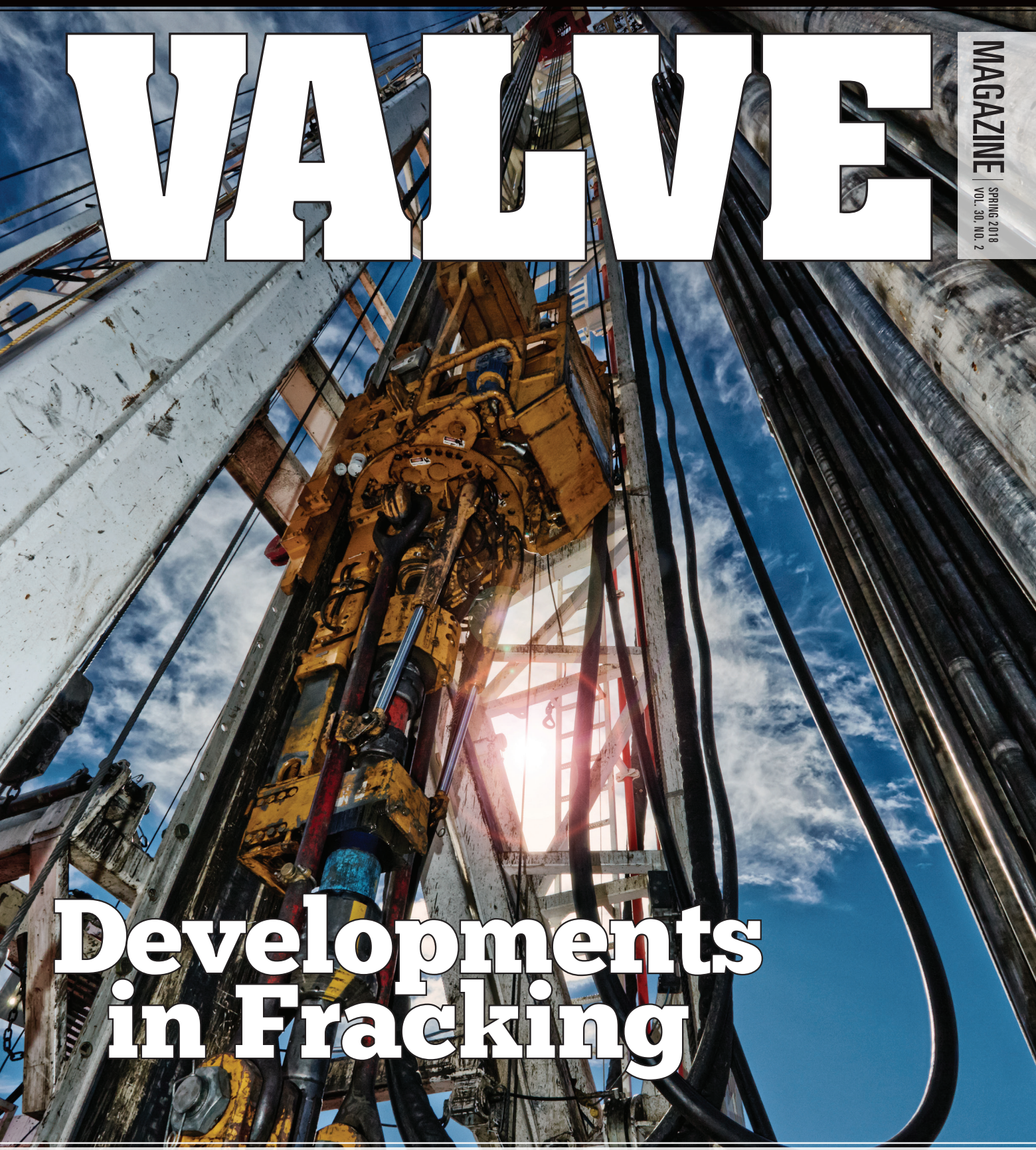
VALVE

MAGAZINE
SPRING 2018
VOL. 30, NO. 2



Developments in Fracking

- FIRE TESTING STANDARDS
- THE BASICS OF AIR VALVES
- INDUSTRY 4.0 AND ANALYTICS
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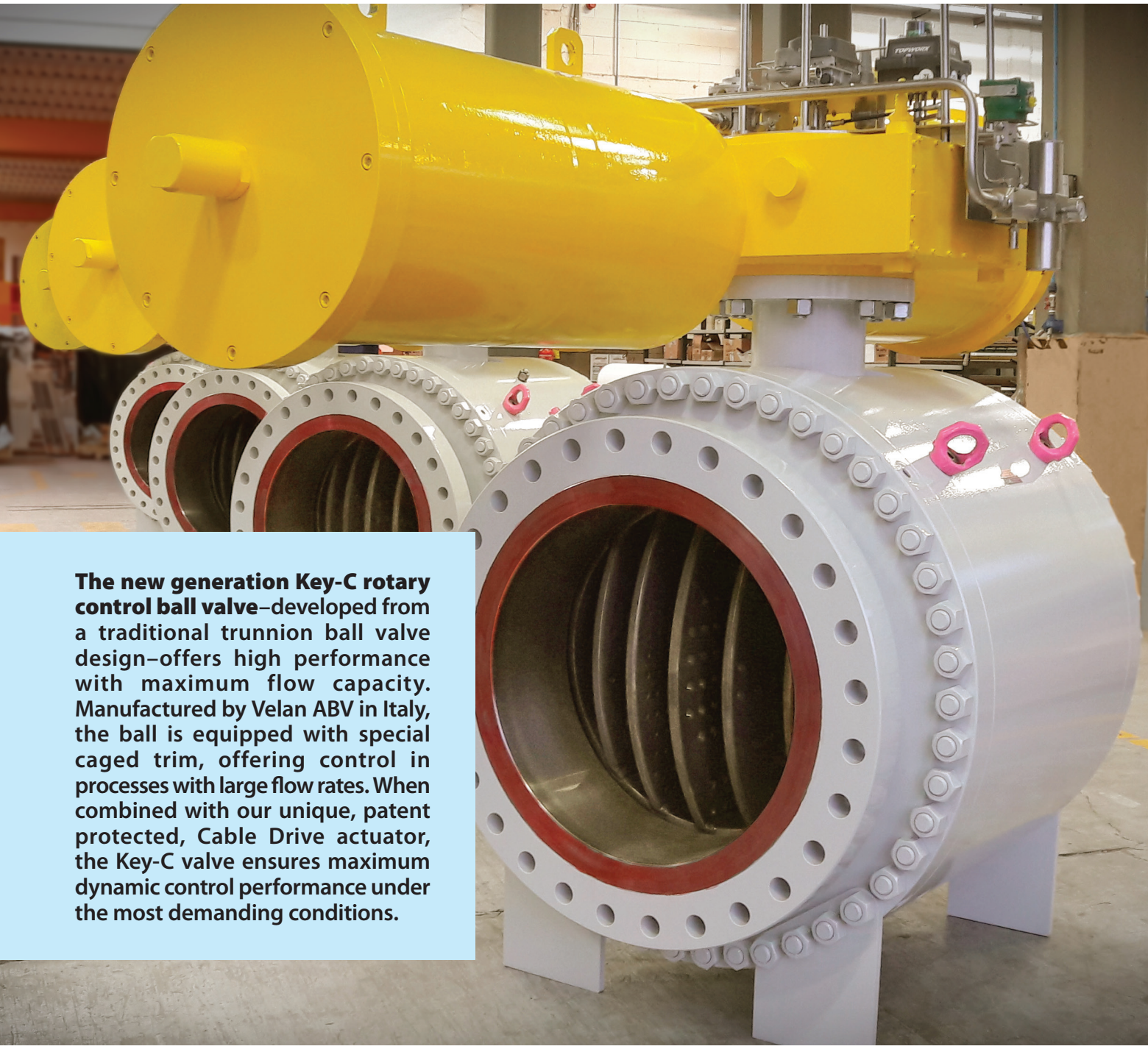

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VALVE MAGAZINE
SPRING 2018 | VOL. 30, NO. 2

18 The Past, Present and Future of Fire Testing

Valves, actuators and controls are used in many applications where the risk of explosion is high or the challenges of high temperatures are present. Fire tests help those who must meet different industry standards.

BY MATT WASIELEWSKI

VALVE MAGAZINE

www.VALVEmagazine.com

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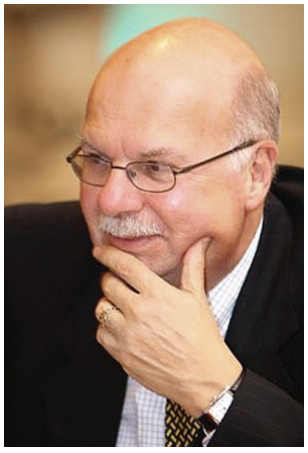
VMA VALVE MANUFACTURERS ASSOCIATION OF AMERICA
The voice of the flow control industry

www.vma.org

The 2018 Industry Outlook
Little Growth Once Again



Our recently issued "Market Forecast of Industrial Valve Shipments in the United States for 2018," coupled with discussions with industry leaders, reveal that 2018 will not be a banner year for the industrial valve industry. We forecast minimal growth of slightly under 1.5% compared to last year's 1.9%.

The only end-user industries indicating much growth in their share of the valve market are oil and gas transmission, petroleum production and commercial construction. Others are either flat or down.

Still, our industry leaders at the Valve Industry Leadership Forum held in March were optimistic. Many indicated they expect single-digit growth in 2017 continuing into 2018. Some even said they look for double-digit growth in niche markets. I also noted comments that these market conditions are not limited to the U.S. or Canada—the lag in growth is broad.

In its most recent presentation to our membership, our economic consulting firm ITR Economics pretty much echoed what these industry leaders shared with me; namely, that growth in 2018 will range from zero to 6% while several industries, including textiles and pulp & paper, expect negative growth. On the flip side, we are looking at positive growth in shipbuilding, water & sewage and natural gas distribution.

VMA and its consultants will continue to monitor the industry in 2018, and we will share with you what we find out in August at our Market Outlook Workshop in Chicago. At that workshop, we will hear from 11 end-user industry experts what they feel the outlook will be for 2019. Don't miss fall's VALVE Magazine, which covers that event.

In the summer issue of VALVE Magazine, I'll also share with you what I learn about the outlook for our European counterparts based on their Annual Congress in Italy. VM

Bill Sandler
President, Valve Manufacturers Association of America

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NEW CONTRACTS AND AGREEMENTS

Curtiss-Wright Licenses Chromatic Design

Chromatic Industries, LLC announced that Curtiss-Wright Flow Control Corporation acquired a license to use Chromatic's patented valve technology within the nuclear power generation market. Curtiss-Wright will employ Chromatic design to provide solutions for applications in that field and others.

Chromatic is a global valve manufacturer of specialty engineered valves for the energy, power and petrochemicals sectors and is a subsidiary of Sequitur Energy Resources, LLC.

Emerson and Total Sign Global Agreement

Emerson signed a long-term global agreement with Total S.A. to provide all Total geoscientists access to Emerson's Paradigm exploration and production (E&P) software portfolio. Emerson acquired Paradigm in late 2017, combining it with Emerson's existing portfolio to make the company the largest independent provider of E&P software to the oil and gas industry.

With the new agreement, Total will also become an active member of the new OpenDB Consortium, Emerson's E&P software initiative to build a next-generation database using industry standard formats.

CPV Manufacturing Awarded Three International Contracts

Admiral Valve, LLC dba CPV Manufacturing has been awarded three exclusive contracts with companies located in mainland China, Indonesia and Taiwan.

CPV Manufacturing will design and produce valves for Yangkuang Group, a coal chemical industry project in China. CPV also signed an agreement to supply valves for PT Chandra Asri Petrochemical in Indonesia. Lastly, Diekson Industrial-Taiwan has contracted with CPV to build valves and fittings for Formosa Plastics Group.

Rotork Receives Karbala Refinery Orders

Iraq's State Company of Oil Projects' Karbala Refinery, which is now under construction, will use refining processes and automated control to maximize production of liquefied gas, petrol, gas oil, fuel oil, jet fuel and asphalt. The refinery has placed orders with Rotork, including large quantities of IQ3 non-intrusive intelligent electric valve actuators.

When it opens in 2020, the facility will have a refining capacity of 140,000 barrels of crude oil per day, serving the growing domestic demand for oil in Iraq and reducing the current level of refined product imports.

Metso's Valve Business Added 24 New Distributors

Metso signed a total of 24 new distributor agreements globally in 2017 for its valve and valve controls businesses. The agreements cover many countries in Europe and include four new distributors in India and Brazil. Also, Metso's local presence is strengthened through collaboration with new partners in China, Korea and other Southeast Asian countries. Many of the distributors also provide service support for Metso valves and valve controls.

MRC Global Renews Agreement with DCP

MRC Global (US) Inc. renewed a five-year contract to supply pipe, valve and fitting (PVF) products and services to DCP Midstream, LP (DCP). The five-year contract includes both maintenance, repair and operations, and project work. MRC Global (US) supports DCP's day-to-day and project PVF needs from more than 30 service locations throughout North America in addition to multiple consignment stores on-site at DCP locations.

ACQUISITIONS & LEGAL DEVELOPMENTS

Curtiss-Wright Buys Dresser-Rand Business

Curtiss-Wright entered into an agreement to acquire the assets that comprise the Dresser-Rand Government Business (Dresser-Rand), a business unit of Siemens Government Technologies, for $212.5 million.

Dresser-Rand designs and manufactures mission-critical, high-speed rotating equipment solutions, including reciprocating compressors, steam turbines and steam system valves. The company supports Nimitz-class and Ford-class aircraft carriers, Virginia-class and Columbia-class submarines, and most major U.S. Navy shipbuilding programs.

Wolseley Industrial Acquires Duhig Stainless

Wolseley Industrial Group purchased Duhig Stainless, which will now operate as Duhig Stainless, a Wolseley Industrial Group company.

In business since 1943, Duhig Stainless is a Modesto, CA-based distributor of fluid control products, including valves, instrumentation, pipe and tubing. It serves customers in the bio pharmaceutical, food and beverage, petrochemical and waterworks industries.

AIV, LP Buys Zenith Supply

AIV, LP announced it acquired Zenith Supply.

Founded in 1946, Pennsylvania-based Zenith Supply is a leading master distributor of Velan valves—a premier manufacturer of valves used primarily in power and downstream applications of the energy industry. The company specializes in pressure seal valves.

Emerson Agrees to Buy Cooper-Atkins

Emerson has agreed to acquire Cooper-Atkins, a manufacturer of temperature management and environmental measurement devices and wireless monitoring solutions for the food service, healthcare and industrial markets. The acquisition is subject to regulatory approvals.

Headquartered in Middlefield, CT, Cooper-Atkins is a privately-owned company with about 150 employees in offices and operations in Ohio, Florida and Singapore.

ASCO Valve and Numatics Now Doing Business as ASCO, LP

ASCO Valve, Inc. and Numatics, Inc. began doing business as ASCO, LP as of Jan. 1. This change in legal entities affects neither current channel alignment nor purchasing processes—everything will remain the same including product authorizations. Within ASCO, a business unit of Emerson, Numatics will remain a product brand.

AWARDS & RECOGNITION

Emerson Named Industrial IoT Company of the Year

Emerson has been named the Industrial IoT Company of the Year by IoT Breakthrough. The IoT Breakthrough Awards, which received more than 3,000 nominations in 2017, recognize innovators, leaders and visionaries from around the globe in a range of Internet of Things (IoT) categories, including industrial, smart city technology, connected home and others. Selections are made by a judging panel comprised of professionals and experts with hands-on experience within the IoT market.

NEW FACILITIES

Matrix Metals Launches New Headquarters

Matrix Metals LLC celebrated its new North American headquarters in Stafford, TX with a grand opening at the new location: Stafford Grove Industrial Park, Suite 100, 10643 West Airport Boulevard. City of Stafford Mayor Leonard Scarcella

Matrix Metals launches new North American headquarters.

was on hand to cut the ribbon at the event.

Matrix Metals has a large capacity of 32,000 tons per annum of steel castings. In addition, it has its own machining facilities, and it works with third party machine shops to produce complete machined solutions for its customers.

Victaulic Building New Manufacturing Facility

Victaulic unveiled a plan to build an additional manufacturing center in Lehigh Valley, PA. The 400,000-square-foot facility is the result of increased domestic demand for the company's products. The new facility, expected to be fully operational in 2019, will be located on 28 acres of land located in Lower Nazareth Township, PA.

In addition to housing the company's current light assembly operation, the new facility will include several million dollars in new equipment to modernize its operations.

Chemours Begins New Innovation Center Build

The Chemours Company broke ground on the company's research and innovation facility, The Chemours Discovery Hub, on the University of Delaware's Science, Technology and Advanced Research Campus.

In partnership with University of Delaware, The Chemours Discovery Hub will conduct cutting-edge research focused on new process, product and application development to better meet customer and market needs. The 312,000-square-foot facility is expected to be completed by early 2020.

NEW CERTIFICATIONS

Three Manufacturers Get ISO 9001:2015 Certification

Solon Manufacturing Company, Val-Matic and Van-Aire Incorporated recently announced they had received certification under the International Organization for Standardization (ISO) 9001:2015.

Solon Manufacturing Company was previously certified under ISO 9001:2008 in 2011 and has been audited and registered annually by the British Standards Institute.

Val-Matic has been

APRIL

30- MAY 3
OTC18 (Offshore Technology Conference)
Houston
www.otcnet.org

JUNE

6-8
Valve Repair Meeting, Exhibits & Tour
Houston
www.VMA.org/ValveRepairMtg

11-14
AWWA'S ACE 18
Las Vegas
www.awwa.org

AUGUST

8-9
VMA Market Outlook Workshop*
Chicago
www.VMA.org/MarketOutlook

SEPTEMBER

25-27
VMA/VRC Annual Meeting*
Lake Tahoe (Truckee), CA
www.VMA.org/AnnualMeeting

29-OCT 3
WEFTEC 2018
New Orleans
www.weftec.org

OCTOBER

30-NOV 1
VMA Valve Basics Seminar & Exhibits
Pasadena, TX
www.VMA.org/ValveBasics

NOVEMBER

27-29
Valve World Expo & Conference
Düsseldorf, Germany
www.valveworldexpo.com

DECEMBER

4-6
Power-Gen International
Orlando, FL
www.power-gen.com

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

VALVE MAGAZINE

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

ISO-registered since 2006. Its quality management system scope includes design, manufacture, and service of valves and related products for the water and wastewater, commercial building construction, irrigation and industrial markets.

VanAire Incorporated passed a 3-day recertification audit for the standard. The recertification involved the entire quality management system and will be VanAire's second audit to the new standard.

ISO 9001:2015 is the most current standard focusing on quality management systems and performance. It received a major upgrade finalized in 2016. The standard includes an integrated approach to quality management and puts greater emphasis on leadership engagement by addressing organizational risks and opportunities, with a continued focus on improvements within a quality management system through internal audits, and corrective and preventive actions.

VanAire staff celebrates achieving ISO 9001:2015 recertification.

PEOPLE IN THE NEWS

FORUM ENERGY TECHNOLOGIES... appointed **Pablo G. Mercado** to serve as senior vice president and CFO as part of its continued succession planning process. **James W. Harris**, the outgoing CFO, has been leading the Drilling and Subsea segment since September 2017 and will transition full-time to that operating role, serving as Forum's executive vice president–Drilling and Subsea.

WEIR VALVES & CONTROLS USA... appointed **Matthew Davis** to the position of field service manager. In his new role, Davis will be responsible for managing the WVC USA field service crew and organizing WVC service jobs for power plants worldwide.

Davis joins WVC USA with over 20 years of experience in the power industry as a regional sales manager, AOV program engineer and project manager.

REXA... recently appointed **Geoff Hynes** president and CEO. Hynes has spent his entire career with REXA in varying roles, including factory assembly, direct and regional sales, aftermarket manager, international sales manager and director of sales.

Geoff Hynes

Elsewhere at REXA, **Robert Sass**, previously customer service manager, was appointed director of customer support. **Michael Murphy**, formerly marketing manager, was appointed director of sales and marketing. **Nicholas Lalos** will replace Murphy as marketing manager.

UNION TECH... announced that **Ling (Sabrina) Kang** has joined the firm as the director of valve sales–China. She will be responsible for the sales and marketing of Z-Series valves throughout Greater China.

Union Tech also announced that **Chris Mayo** joined the valve sales team as director for global power. He will be primarily responsible for power markets.

AUMA... announced that, after 35 years, **Matthias Dinse** retired on Dec. 31, 2017 from his role as managing director but will remain a member of the advisory board and a consultant to AUMA. As of Jan. 1, 2018, **Ferdinand Dirnhofer** was promoted to the general management team and **Jörg Hoffman** accepted the newly established position of CEO. Dirnhofer and Hoffman will take over Dinse's responsibilities.

ROTORK... appointed **Kevin Hostetler** chief executive. Hostetler joined the board on Feb. 12, 2018 and assumed the role of chief executive on March 12, 2018. **Martin Lamb** reverted to his role as non-executive chairman.

Hostetler previously worked for Ingersoll Rand and IDEX Corp. and recently led a three-year turnaround as CEO of FDH Velocitel.

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Custom Valve Training: Lessons Learned at the LACSD

Fifty engineers from the Los Angeles County Sanitation Districts (LACSD) received a customized valve education during a special program hosted at the LACSD facility in Whittier, CA, Feb. 26-27. The Valve Manufacturers Association's Valve Education team offered the schooling as part of its new custom training program.

Lessons for the program were adapted from select sessions in VMA's Valves, Actuators & Controls 101 course, with emphasis on issues of most importance to the water and wastewater community.

Much can be learned from what attendees had to say about the event as well as what types of questions they had for the instructors. Some of their questions and comments were based on the hands-on learning experience attendees receive at the "valve petting zoo."

Here's a sample:

Derek Zondervan, supervising engineer of Wastewater and Solid Waste Design at LACSD, was part of the team responsible for bringing the education program to the California facility. He was enthusiastic in his comments on the results.

"A lot of the technical training opportunities out there are general and cover a broad range of topics and industries. I especially liked VMA's seminar because it provided in-depth training customized to cover topics relevant to our organization (wastewater collection/treatment)," he said.

He also pointed out that finding industry experts from all over the country to share information from their respective areas of expertise is the "kind of training that's hard to find!"

One of the program highlights at the LACSD's custom training program was the hands-on "valve petting zoo." Here, Tom Waldmann (standing) of Kitz Corp. of America and Mary Rozaki (to his right) of PBM discuss types of quarter-turn valves.

He added that the petting zoo was a highlight for many attendees who "got the opportunity to play with the various valves, actuators and controls discussed during the presentations," which reinforced what people learned in sessions.

"Usually we engineers are told 'Hey, don't touch that!' when we venture out to the field, so it was fun and informative to explore these valve items," he said.

Shannon Bishop, a project engineer in the LACSD Reuse & Compliance Section, also praised the course's content. Bishop was there because she's being transferred to one of the facilities' design sections. She explained that the course was particularly helpful to her because it not only gave the basics regarding each valve type, but also the various design conditions in which each may be used.

She commented: "The manual will be something I can reference for many years to come," and said she found the instructors knowledgeable and genuinely passionate about the valve industry "which, as an engineer, I can appreciate."

Steven Hernandez, senior engineer of Wastewater & Solid Waste Design at LACSD, said he thought the event was particularly helpful to the company's engineers, even those with lots of experience.

"The petting zoo was a great session to get an up-close view of the various valves and their operation," he said. "In the long term, I could see us holding a similar event."

Presenter **Greg Johnson** of United Valve and former chairman of VMA's Education & Training Committee said the experience was fulfilling for presenters as well. Johnson mused that the reason attendees were so animated and involved in presentations and the petting zoo was because they were attending by choice, and not being told to attend by a boss or supervisor.

"The wastewater industry has special valve requirements. Our experienced team of presenters was able to tailor a course specific to their needs," he said.

CUSTOM TRAINING

This is the second custom training event conducted by VMA's Valve Ed team. A previous event was held near an ExxonMobil refinery in Baton Rouge, LA, and an event is planned at a VMA valve manufacturer this summer. The program is also receiving much interest from several other large valve user facilities.

AUMA's **Paul Souza**, an instructor and chairman of the VMA Education & Training Committee, sees big things ahead for the program:

"There is such a huge need for training in the industry," he points out, while "the cost of sending a group of engineers to our regular event near Houston can be prohibitive for many companies. This is exactly why we decided to offer this program."

The custom program is available for end users, engineering firms and government agencies, as well as VMA member companies. Because of the number of personnel and equipment required to put on a custom program, a minimum attendance of 25 is required. Those interested in holding an event at their facilities can contact **Abby Brown**, VMA education & training coordinator, at abrown@vma.org for more information.

VMA's next regular education program is the three-day Valves, Actuators & Controls 101 program in Pasadena, TX, Oct. 30-Nov. 1, 2018. It features numerous hands-on learning opportunities, as well as tabletop exhibits. Registration opens in July 2018.

For information, go to www.VMA.org/ValveBasics.

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Conference Offers Professionals the Latest on Valve Repair

The fourth biennial Valve Repair Meeting, Tour & Exhibition is June 6-8 in Houston. The conference is geared to professionals in the valve repair and rebuild industry, who receive a day-and-a-half of educational sessions, have the opportunity for a day of touring facilities and get a chance to visit with vendors during a tabletop exhibition.

Part of what's covered in the program this year includes:

- Updates on National Board auditing and on repair standards
- An overview of API 20E and 20F: Petroleum and Natural Gas Industries Bolting
- The latest advances in hand-held XRF for positive materials identification applications
- A presentation on NORM—Naturally Occurring Radioactive Material
- Actuation settings advice and tips

Repair shop workers prepare to disassemble and repair a large valve.

A popular feature of the conference, which was first held in 2012, is tours of local repair shops. Attendees this year will go to TEAM Industrial Inc., United Valve and A-T Controls.

Registration for the event is open to both VMA/VRC members and industry non-members; companies with multiple attendees get a price break for added individuals.

The exhibits are open on Thursday, June 7, and a special luncheon and reception are planned in the exhibit hall. The table-top exhibits feature an array of products and services that professionals in the repair and rebuild industries depend on to do their job.

The educational portion of the event is held at the Sheraton Brookhollow and special rates are offered for attendees who want to stay at the hotel.

For information on the event, contact Malena Malone-Blevins at mmaloneblevins@vma.org. For information on the program, go to www.VMA.org/ValveRepairMtg.

Water Professionals to Gather in Las Vegas

People from all over the world whose jobs are in the water sector will come to the Mandalay Bay Convention Center in Las Vegas June 11-14 for ACE 18. The annual conference and exhibition will cover "Innovating the Future of Water" in an educational program and exhibit.

This year's event is co-planned by the American Water Works Association and the California/Nevada Section.

A series of seminars and conferences covers multiple tracks in areas such as water quality, advances in treatment and technologies, operating distribution systems, management of wastewater and stormwater, infrastructure issues, threats to the water systems and much more.

Award-winning journalist and science correspondent Ira Flatow is the opening session speaker.

More than 450 leading-edge companies will be exhibiting their wares during three days of the conference.

For information, go to www.awwa.org.

VMA WELCOMES NEW MEMBERS

Pima Valve and **Optimation Technology, Inc.** joined VMA early this year, becoming VMA's first two new members in 2018.

Since 1967, **Pima Valve** (www.pimavalve.com), a full VMA member, has furnished high quality valves to the shipyards of America for uses ranging from mine counter measure ships to guided missile cruisers to nuclear-powered aircraft carriers and submarines. The company also furnishes valves for offshore oil and gas platforms.

New VMA associate member **Optimation Technology** (www.optimation.us) is headquartered in Rochester, NY. The company provides complete engineering, automation, construction and maintenance services from the conceptual stage through prototyping to full production-scale operations.

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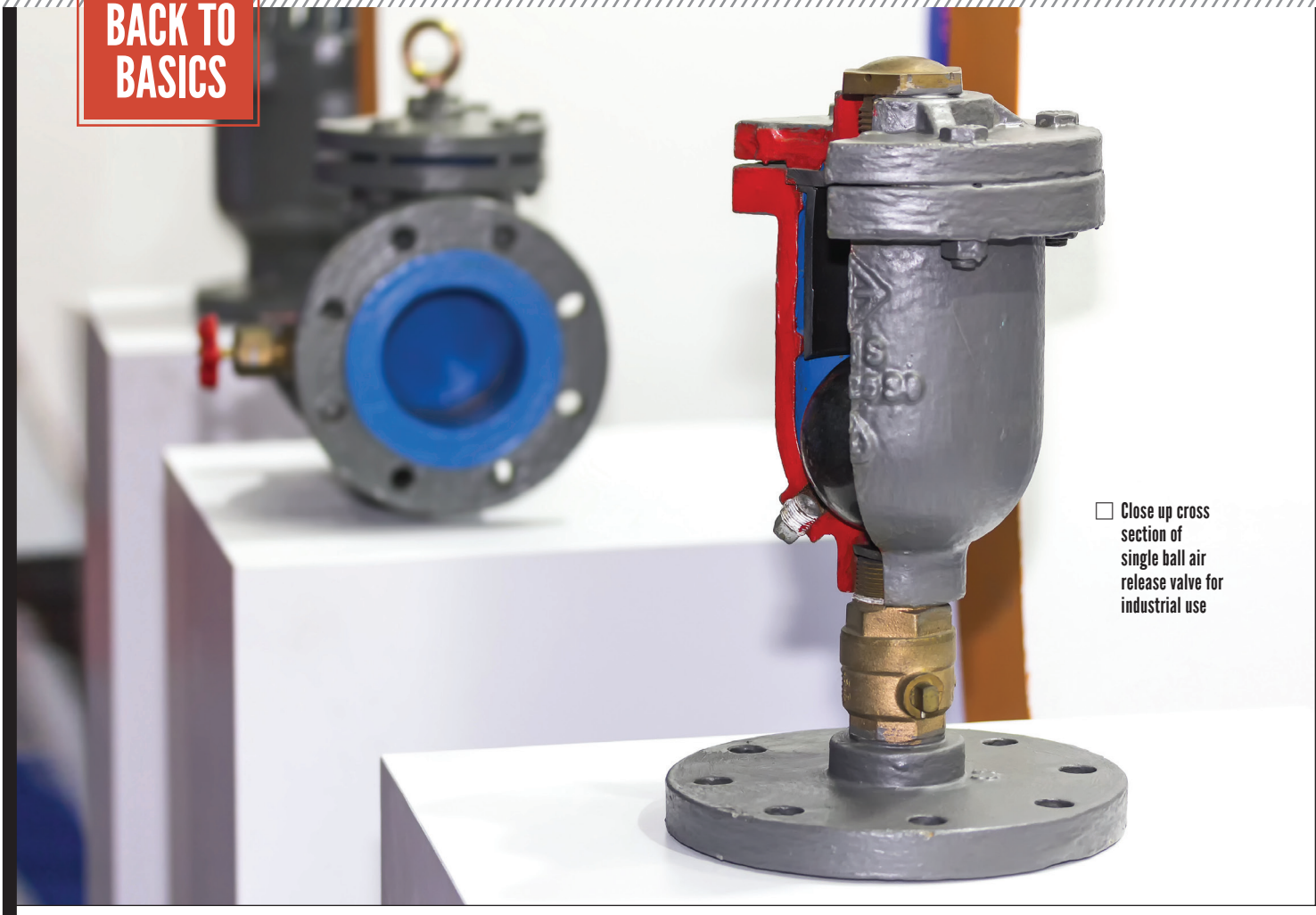


Close up cross section of single ball air release valve for industrial use

Air Valves in Piping Systems

BY JOHN V. BALLUN, P.E.

Liquid piping systems are prone to collecting air from incoming fluids, pumps and connections. This air can cause inefficiencies and serious operating problems. Last year, VALVE Magazine published "Why Air Valves are Needed in Water Applications," which outlined the sources and effects of air in pipelines. This article explains how the various types of air valves operate in liquid piping systems.

Air release valves, which expel trapped air in a pipeline, are familiar to most people, but many other types of air valves are out there that have special functions, unique construction for wastewater and sizes up to NPS 20. Safeguarding piping systems from air-related problems requires knowing how to select and install the right air valves.

TYPES OF AIR VALVES

Three basic types of air valves are defined in American Water Works Association (AWWA) Standard C512 for use in water and wastewater, including:

- Air-Release
- Air/Vacuum
- Combination

Executive Summary

SUBJECT: Several types of air valves are produced for liquid piping systems to promote efficient operation and prevent surges and pipe corrosion.

KEY ISSUES:

- Types of air valves
- Air valve operation
- Air valve installation

TAKE AWAY: The many types of air valves that exist are an essential element of liquid piping systems. Knowledge of their operation and installation is important when designing liquid piping systems.

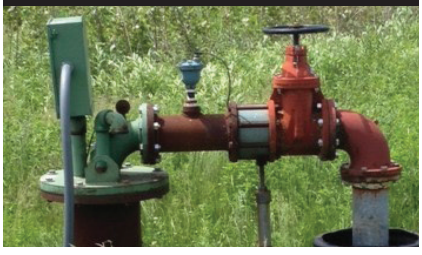
AWWA air valves are constructed of iron or stainless-steel bodies with corrosion-resistant trim for water and wastewater service. An important point here is that these air valves have a different function than pressure and vacuum relief valves, which are installed on the top of gas or steam pressure vessels and liquid storage tanks to provide overpressure protection. Relief valves have set points designed to provide overpressure protection and are beyond the scope of this discussion. The air valves presented in this article automatically control the flow of air or gases in and out of liquid piping systems at all operating conditions.

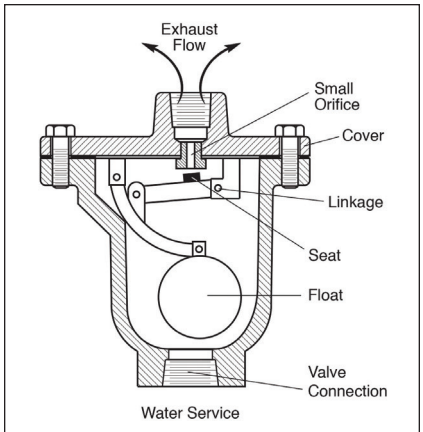
AIR RELEASE VALVES

Air release valves are probably the most widely used type of air valve and are characterized by small orifices, weighted floats and leverage mechanisms. The combination of these three features allow air release valves to expel air or gas at full operating pressure. Since air release valves have orifices that range in diameter from 1/16 of an inch to 1 inch, they have a limited capacity for admitting and exhausting air. In other words, a typical piping system will not be filled or drained using just an air release valve; such an action would take weeks. Air release valves automatically vent small pockets of accumulated air or gases as those pockets accumulate in a liquid piping system. For example, an air release valve mounted on the top of the pipe could automatically release trapped air that accumulates in the top of the piping system (Figure 1).

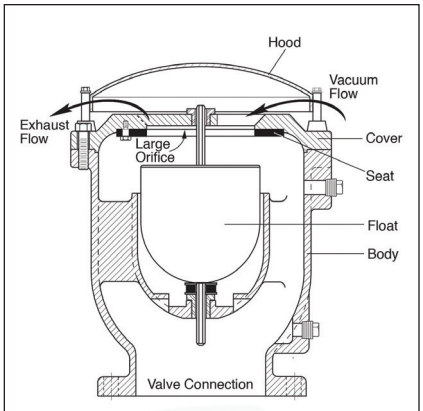
When installed, air release valves are "normally open" and expel air (Figure 2). It is only when liquid enters the valve that the float rises

☐ Figure 1. Air release valve on golf course pumping system





☐ Figure 2. Construction of an air release valve



☐ Figure 3. Construction of an air/vacuum valve

because of its buoyancy and seals off the valve's orifice. Conversely, as air accumulates in the valve body, the float will drop because of its weight and reopen the valve. To reopen an air release valve under operating pressure requires a mechanical linkage for magnifying the weight of the float and breaking the pressurized seal on the orifice. Even a quarter-inch orifice will require 3.9 pounds of force to break the seal when operating at 80 psig, and a typical 3-inch diameter air release valve float only displaces about half a pound of water. Because of this, mechanical linkage is needed to multiply the weight of the float, and the orifice diameter on air release valves is limited in size to reduce the breaking force needed.

AIR/VACUUM VALVES

An air/vacuum valve has a full-size orifice ranging from half an inch to 20 inches. Because of this, the valves can exhaust large volumes of air. The valves also will admit large volumes of air to prevent a vacuum condition from occurring in the pipeline and to allow for draining. Air/vacuum valves are normally open (Figure 3) and a float in the valve rises with the water level to seal the large orifice after the air has been exhausted. Conversely, when system pressure is lost because of draining, line break or column separation, the float drops and allows air to re-enter the pipeline. It is important to note that under normal operation, the float is held closed by the line pressure and will not relieve accumulated air. These valves do not have mechanical linkage and because of the large diameter orifice, have no ability to open while the system is pressurized. Therefore, an air release valve is needed to relieve air and gas during system operation.

A common application for air/vacuum valves is for the discharge of vertical turbine pumps. This is because after shutdown, the piping between the pump and the check valve fill with air. When the vertical turbine pump is started, it rapidly lifts the column of water, and the trapped air must be expelled before the water opens the check valve. An air/vacuum valve is the right fit for this application because it can rapidly expel large volumes of air and close when fluid fills the air valve.

An air/vacuum valve can be piped to the top of the pump column so that when the pump is started, the air trapped in the pump column is expelled through the air/vacuum valve (Figure 4). The valve in this case is equipped with a throttling device,

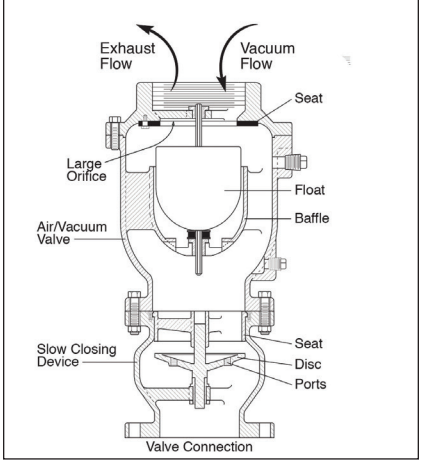
☐ Figure 4. Vertical turbine pump with air/vacuum valve

which is an adjustable device mounted on the outlet of an air valve to control the exhaust flow rate. Since the pump can reach full speed in a few seconds, a throttling device is used to slow down the exhaust of air, preventing the water from rising too fast, slamming into the downstream check valve and causing water hammer in the pump column.

Another optional device for an air/vacuum valve is a slow-closing device. This device is commonly used for pipeline applications where column separation may occur. One purpose of this device is to close when high exhaust rates might occur. It's also to regulate the exhaust rate of the air valve so that the water column does not slam into the air valve and cause water hammer or damage to the air valve. The slow-closing device can be mounted on the inlet of clean water valves and on the outlet of wastewater air valves when column separation or vacuum conditions might occur.

The slow-closing device has a disc that closes automatically when high air exhaust rates occur (Figure 5). The disc contains reduced ports that are typically 5-10% of the full orifice size. This is important when the valve is subjected to column separation or vacuum conditions in a pipeline. If the air valve location is subjected to a sudden vacuum pressure after a power outage and pump stoppage, the air valve will admit a large volume of air into the pipeline to prevent a vacuum. When the pipeline pressure returns, or a pump is started, the slow-closing device controls the exhaust rate of the air so that the water column slowly enters the air valve to prevent air valve damage and water hammer in the pipeline.

☐ Figure 5. Air/vacuum valve with slow closing device



☐ Figure 6. Dual-body, stainless-steel combination air valve

☐ Figure 7. Single-body combination air valve upstream of a flow meter

COMBINATION AIR VALVES

The third type of air valve is the combination air valve, which contains the functions of both the air/vacuum and air release valves. A combination air valve can be furnished either as a single-body design, where a single-body contains both air release and air/vacuum components, or as a dual-body design (Figure 6), where an air release valve is piped to the side of an air/vacuum valve. The two configurations perform the same functions. However, the single-body design can be more economical while the dual-body design can provide design flexibility when sizing the orifices.

Some piping designers use only combination air valves on a pipeline because all air valve functions are included; a mistake in field installation will not leave the pipeline unprotected. Other applications for combination air valves include pump discharge headers and use upstream for flow measurement devices (Figure 7). The combination air valve automatically releases air to improve the accuracy of the flow measurement device.

LOCATIONS ALONG A PIPELINE

Air valves are generally installed on liquid piping systems to exhaust air or gases and admit air to prevent vacuum conditions and air-related surges. The AWWA Air Valve Manual recommends air valves at various locations including high points, long runs, adjacent to mainline valves, downstream of pumps and where there are changes in pipe slope. Valve manufacturers provide online computer software to assist in locating and sizing air valves.

INSTALLATION

Installation methods for air valves are important to ensure their proper function (AWWA, 2016). The best results are achieved when the air valve is mounted directly on top of the pipe. Unfortunately, some pipelines are located under roadways, which requires the air valve be mounted in a separate vault. In these cases, it is important that the connecting pipe be sized for the flow conditions and slope upward to the air valve. Furthermore, extended air valve piping can have a multiplying effect on surges, so a transient analysis may be needed to evaluate this piping.

For maintenance purposes, all installations should include a shutoff valve under the air valve. Also, to help in collecting the air that travels along a pipeline, a riser pipe larger than the air valve inlet is recommended (Figure 8). A drain valve can be used to annually check the function of the air valve. If the drain valve expels air, the air release portion of the air valve may require maintenance or repair. Otherwise, the air valve should be observed during a pump operation to verify it is exhausting air and closing without excessive leakage.

Caution is needed when inspecting or performing maintenance on an air valve. This is because when the system is functioning, an air valve can release large quantities of air under

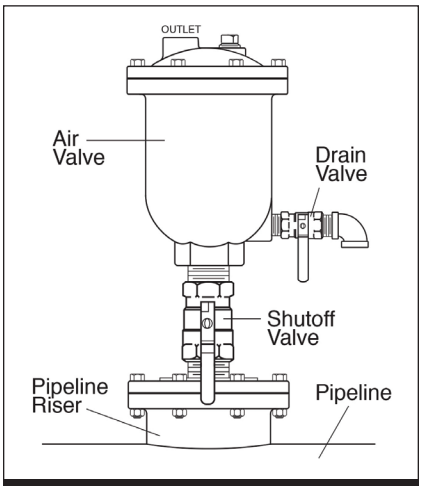
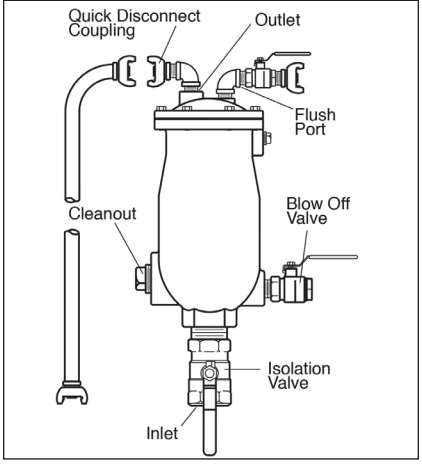


Figure 8. Air valve installation on a pipeline

pressure or admit large quantities of air under vacuum conditions. Both can cause bodily harm. Any maintenance on an air valve requires closing the shutoff valve under the air valve. But even with the shutoff valve closed, pressurized air can be trapped in the air valve. This is why care is needed when venting the air through a drain valve or pipe plug before removing the air valve cover.

Wastewater air valves can be subject to clogging from the collection of greases, grit and solids in the valve. For best performance, these valves should be equipped with elongated bodies, sloped bottoms, a minimum of a 2-inch inlet and smooth coatings. Depending on the service, a backwash kit can be added to the valve to facilitate maintenance. Also, a backwash operation (Figure 9) can be performed by 1) closing the isolation valve, 2) connecting the blowoff valve to a drain opening and 3) supplying water for several minutes using the water hose to flush out the valve. Some air valves may have a 2-inch cleanout for large debris or multiple ports on the top of the valve to flush.

Figure 9. Wastewater air valve backwash kit



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CONCLUSION

When air is allowed to accumulate in pressurized pipelines, efficiency is sacrificed, and serious system damage can occur. By having an understanding of the various types of air valves, system designers can better select and install air valves to protect liquid piping systems. VM

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The Past, Present and Future of Fire Testing

BY MATT WASIELEWSKI, PE

Because so many of the applications where valves are used are sensitive to the danger of fire and explosion, fire testing is a critical part of the process of designing the right valves. Much has occurred in the world of fire testing standards over the last 30-40 years.

A LOOK BACK

Fire test standards for valves date back to the 1960s, but many important standards developments have occurred since the 1990s. For that reason, this article begins with that decade, and takes us to the present day—the latest published and in-committee revisions of the American Petroleum Institute (API) fire test standards.

Exxon has always been an industry leader in developing and requiring fire testing of valves. The company had one of the earliest fire test standards—an infamous process that required a valve to be pressurized with kerosene and burned for 30 minutes. The requirement was that flames from an external leak could not exceed a certain distance from the valve body. Needless to say, the test itself was hazardous to those who performed it.

Exxon's concern with fire safety increased after a large fire at one of its chemical plants in Baton Rouge in 1994. Fueled (no pun intended) by safety and insurance requirements, fire-tested valve designs became mandatory. When the fourth edition of API 607 was released in 1994, Exxon dropped its requirement for its own standard and accepted valves qualified to API 607.

API FIRE TEST VALVE STANDARDS

Today, four common fire test standards for valves are published by API. They are:

1. **API 607, 7th Ed.** Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
2. **API 6FA, 3rd Ed.** Specification for Fire Test for Valves
3. **API 6FB, 3rd Ed.** API Specification for Fire Test for End Connections
4. **API 6FD, 1st Ed.** Specification for Fire Test for Check Valves

The question is often raised how API 607 and 6FA are different. The two major differences are:

1. API 607 has special circumstances for soft-seated quarter-turn valves.
2. API 607 and 6FA are for different categories of valves and controlled by two different segments of API.

Executive Summary

SUBJECT: Fire testing standards have gone through many changes in the last several decades.

KEY ISSUES:

- The different standards
- Where they apply
- What's coming down the pike

TAKE-AWAY: The standards must keep pace with new challenges from applications and the continued desire for safety.

All the API test standards specify a 30-minute burn period, which was determined early on to be the maximum amount of time that a facility on fire might possibly be saved.

The API 607 standard is written by the refinery (API downstream segment). API 607's fourth edition stated that the standard was for soft-seated quarter-turn valves. By the seventh edition of this standard, the scope of coverage changed in wording to "quarter-turn valves and other valves with nonmetallic seating."

API 6FA is under the jurisdiction of the API Subcommittee on Valves and Wellhead Equipment (API Subcommittee 6) and covers the testing and evaluating of API 6A and 6D valves.

All the API test standards specify a 30-minute burn period, which was determined early on to be the maximum amount of time that a facility on fire might possibly be saved. Except for the off-shore test of API 6FB, all tests have flame temperatures ranging between 1400-1800°F (760-982°C), which need to heat one-and-a-half-inch steel calorimeter blocks under the valves to 1200°F (649°C) within 15 minutes from the start of the test.

API 607 – FOURTH EDITION

Let's return to 1994, when the fourth edition of API 607 was released. The

☐ API 589 fire test

innovation of this edition was that it was the first to require that soft-seated valves be tested at lower pressures. End users had recognized that many Class 150/300 valves are used in low-pressure applications and that the line pressure during an actual plant fire can drop when pumps are shut down. The low pressure causes difficulty during a fire test through leakage, since there is less pressure on the ball to force it into the remaining softened downstream seat or create a sufficient metal-to-metal sealing contact. After cooldown, the valve is cycled open and closed with an additional low pressure through-leakage test performed.

This proved to be a difficult test for soft-seated ball valves. Charred or melted polymer material left on the sealing surfaces could create a leak path. Experience also has shown that for ball valves, those that are intermediate sizes (3–4 inches) often have the most difficulty in this regard. For 2-inch and smaller valves, sufficient heat during the test will completely burn the polymer seat material. For 6-inch and larger valves, enough seat material remains to maintain a good seal. The 3–4-inch valves, however, often burn their seats partially, with what is closest to the burners removed the most and those on the opposite side the least. Because of this, bits of the remaining seat material can lodge between the ball and body during the operational test.

Exxon also used the fourth edition in 1995 as a basis for a gasket fire test. (which will be discussed further in the "Gasket Test" section below).

FIFTH EDITION

Three changes occurred with the fifth edition of API 607, which was released in 2004. The first involved the trend towards co-branding, in this case, tri-branding of API, International Organization for Standardization (ISO) and Amercian National Standards Institute. The ISO equivalent was ISO 10497.

The second, fairly significant technical change was that the through-leakage measurement after

the cooldown period occurred before cycling the valve. This made the test a little easier to pass since the primary sealing member was not moved from its seated position. This version was the first edition to state that qualification of a ferritic test valve line could be extended to cover austenitic or duplex body materials by testing only a single "mid-range" size of valve.

SIXTH AND SEVENTH EDITIONS

The sixth and seventh editions went through mostly editorial changes. Co-branding with ISO ended with the sixth edition and the term "soft-seated" was dropped from the title. An emphasis was added that cavity pressure in dual-seated valves should be measured, and that the tests ended if the maximum allowable cavity pressures specified by the manufacturer were exceeded during the test.

Specifying the maximum allowable cavity pressure became the burden of the valve manufacturer. In ball valve seat design, engineering a seat that relieves upstream at a low pressure often sacrifices the valve's overall performance. Another difficulty in designing a self-relieving seat for this circumstance is that the 30 psig test pressure has little influence on moving the ball downstream. As a result, when cavity pressure builds and both seats are almost equally loaded, the direction the pressure will go is unpredictable. Cavity pressure relieving downstream will often create a leak path that cannot be remedied.

While cavity pressures greater than 10 times the valve pressure rating have been observed during fire tests, the seventh edition limits the allowable pressure to one-and-a-half times the valve rating or a pressure obtained from the manufacturer from hydrostatic testing. Cavity taps need to be installed by the valve manufacturer before the valve is tested.

NO-SEAT TEST

For soft-seated ball valves less than 4 inches, a good way to know if the valve has a chance to pass a fire test is to do a "no-seat" test. This simulates conditions for the valve after the burn/cooldown period. The valve is built without seats and positioned horizontally per the standard. Applying low-pressure water to the closed valve will determine if that valve can "seat." Too much clearance between the valve body and ball or insufficient stem/ball engagement will cause issues with sealing. This is especially noticed on larger valves where the mass of the ball may be significant.

Ball valve during API 607 test

API 6FA

API 6FA is currently in committee for its fourth edition. The third edition has been in place since 1999. As stated above, the standard was written to test API 6A and 6D valves. The test parameters are similar to API 607 for non-soft-seated valves, with the major difference in the operational test procedure after the cooldown period. Because of this, joint 607/6FA qualification can sometimes be accomplished with additional testing at the end.

API 6FA is most commonly used for metal-seated products, including ball, gate and globe valves. One view in the industry is that most metal-seated gate and globe valves are inherently fire-safe and don't need to be tested. While the majority of these valves do pass this test, some designs fail miserably. For example, if the bonnet of a gate or globe valve receives more heat from the burners than the stem does, the expansion of the bonnet can lift the gate/globe sealing member off the seat, causing almost instantaneous through leakage. Leakage can slow as the temperatures equalize, but not after failure in most circumstances.

Actuator qualifications are not part of API 6FA or 607, although when the actuator is part of the valve assembly, it is engulfed in flames during the burn. Actuators are required to sufficiently activate the valve during the operation test. The latest edition of API 607 states that removal of the grease from inside the gearbox is allowed, which reduces some hazard of flaming grease dripping or spraying out of gearboxes during a test.

The fourth edition is due out in the current year. Some of the changes under consideration involve adding cavity pressure requirements, specifying a cool-down period and expanding on the qualification criteria for various body and seal materials. The inclusion

2-inch Class 150 ball valve before cooldown

of check valves into 6FA is also under consideration, which would eliminate the need for API 6FD.

API 6FD

API 6FD is a test for check valves currently still in its first edition (published in 1995). It is nearly identical to API 6FA except for one part of the procedure: After the cooldown period, a valve in 6FA testing is operated open and closed. For a check valve, the flow is reversed at this stage to verify the operation of the check valve. The API Downstream Committee that oversees 6FA and 6FD is considering merging 6FD into 6FA.

API 6FB

API 6FB states that it is the test standard for end connections, so a variety of products can be tested to this standard. The standard has the option for on-shore and off-shore tests both with a bending moment applied and without. The bending moment option is not a common request, however. The temperature differences of each option are shown in Table 1.

Figures 1 and 2 show typical flame patterns during an on-shore and off-shore test.

Figure 1. Onshore

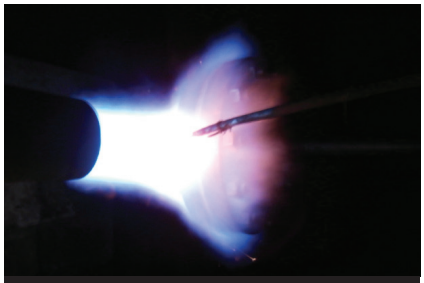

Figure 2. Offshore

Besides flange gaskets, API 6FB is also the primary fire test standard for various end connections and fittings. The off-shore option is specifically vital for drilling rig and platform equipment (Figure 3).

Table 1. Temperature Differences of Different Options

	On-Shore	Off-Shore
Number of Burners	Multiple or widespread	1
Flame Temperature (°F)	1400-1800	2000-2500
Calorimeter Block Temperature (°F)	1200	1800

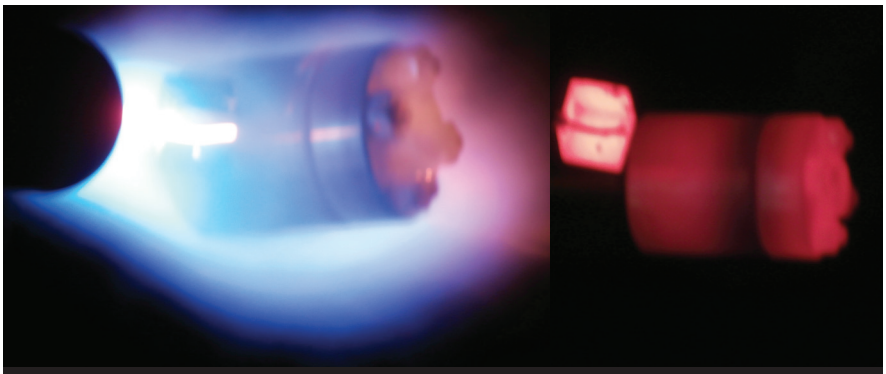

Figure 3. Off-Shore API 6FB test on connector – during burn (left) and before cooldown (right)

MODIFIED API 607 GASKET TEST

API 6FB is the dominant test standard for testing flange gaskets used in upstream, midstream and downstream applications. Before this existed, the Exxon-modified API 607 fourth edition test was the leading standard for testing flange gaskets (Figure 4). What started out as an internal test for Exxon in 1995 to evaluate its own supplier's gaskets, turned into an industry standard sometimes still used today. The test used a pair of gaskets separated by a spool piece with thermocouples inserted into the flange material, and required 1200°F (649°C) temperatures to be reached within 15 minutes of the start of the burn. The test setup required millions of BTUs per hour to achieve those temperatures.

API 6FB is on schedule to be reviewed by its controlling API committee this year. Changes to the scaling of qualifications for gasket sizes and pressure ratings will be addressed.

STEM PACKING FIRE TEST

Packing fire tests are currently performed to API 589 or to a modified version of API 607 or 6FA. API 589 was first released in 1993, with the second edition released in 1998. The standard is mostly inactive, although it's still used occasionally.

The more common test standard for packing at this time is a modified version of API 607. The test can be run on a gate valve, typically 4- or 6-inch Class 300 carbon steel wedge, with the valve partially open during the burn and the downstream pipe closed. Allowable external leakage requirements are used. Test conditions are similar to API 6FA.

With recent attention on stem packing for fugitive emissions, it may be in the best interest of the industry to reactivate API 589. Fugitive emission performance of graphite stem packing is often enhanced with the addition of lower melting point materials.

CONCLUSION

Fire testing continues to evolve as the standards are revised and updated. With the additional requirement of low fugitive emissions, these standards will reflect the increasing challenges equipment must face as well as the pressure to keep facilities and people safe when fire occurs. VM

Matt Wasielewski, PE, is president/owner of Yarmouth Research and Technology, LLC (www.yarmouthresearch.com) and has been performing fire and fugitive emission testing since 1992. He is a member of API standards committees. Reach him at matt@yarmouthresearch.com.

Figure 4. Exxon-modified API 607 gasket fire test

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SHELL

Shell is among several major oil companies using seismic data to automate processes.

Fracturing Technology in the New Age

BY KATE KUNKEL

According to a 2014 U.S. Energy Information Agency (EIA) forecast, U.S. unconventional natural gas production from shale formations will double by 2035 to generate about half of the total domestic natural gas production. At the same time, domestic oil production from unconventional shale formations was projected to increase by as much as 15% over the next several decades.

This boom in production combined with recent advances in modern horizontal drilling technology and fracking has unlocked vast U.S. shale reserves. The technology has stirred much controversy, spurring protests from environmental groups and residents of communities in active shale production areas.

To address the concerns of communities and environmentalists, the American Petroleum Institute (API) created 130 standards referenced in more than 430 citations by government agencies. Many of the innovations in hydraulic fracturing have been developed to meet those standards. The scenario has been complicated recently by the oil price crash of 2014, which inspired even more innovations by producers. Developments occurring mostly since that crash are addressed in this article.

Executive Summary

SUBJECT: Fracking has been greatly affected over the last decade by developments such as API standards changes, environmental concerns, the crash that occurred in the oil and gas market and a new Administration. New technologies have been developed in reaction to new pressures in the industry.

KEY ISSUES:

- Horizontal drilling/fracking technologies
- Changes in environmental regulations
- New methods under development

TAKE-AWAY: What's to come will depend on commodity prices and the direction political posturing will take the oil and gas industry generally.

HORIZONTAL DRILLING

Although the first horizontal well was drilled in 1929, it's only been in the last decade that advanced materials and drilling technologies have made it possible for operators to drill horizontally for a mile or more through a rock formation.

Advances have made extraction less expensive because each horizontal well reaches a much larger rock volume than the several wells drilled to develop a reservoir in vertical drilling. Horizontal wells also can significantly delay problems with vertical methods that lead to lower production and recovery efficiencies, as well as premature abandonment of wells. This is because horizontal wells tap into a much greater percentage of the reserve. Since the plays are horizontal in the strata, by drilling along the horizontal, more of the natural gas or oil can be tapped. When drilling vertically, only the small portion of the horizontal reserve that is intersected by the vertical bore can be tapped.

After the oil price crash of 2014, producers needed to refine the technology even further to bring costs down while meeting new industry challenges.

Lynn Helms[1] in his paper, "Horizontal Drilling," calls this development the second generation of horizontal drilling: operators, and drilling and service contractors have devised, tested and refined procedures, as well as designed and put into place improved equipment. The result is that displacements of over 8,000 feet are now achievable. It also is now possible to drill stratigraphic traps, heterogeneous reservoirs and coal beds. As a result, older fields can be drilled to boost recovery factors. Examples of second generation applications are Cedar Hills-Red River and Wiley-Madison in North Dakota.

There is now a third generation of this equipment, which Helms says attains much longer, deeper and more accurate placement of multiple horizontal well bores to exploit fractured source rocks, and heat injection wells such as those used in Canadian oil sands steam-assisted gravity drainage. The present middle Bakken play in North Dakota and eastern Montana is an example of third-generation horizontal drilling.

When Kent Perry, executive director, E&P Research at Gastechnology Institute (GTI), is asked what he considers the most important advances in making fracturing profitable, he points to several improvements. "Producers are moving toward higher proppant loading [the solid material, typically sand, that is designed to keep induced hydraulic fractures open], along with changes in spacing between perforations," he says. Also, the longer horizontal wellbores are being fractured, "growing to as much as three miles in length," he says.

Another advancement includes casing the well [putting sections in tubing for reinforcement] into the producing formation during drilling of the horizontal section. This allows operators to use lower density drilling mud. Helms notes that, "They can even allow the well to produce during

Enhanced oil recovery research at Shell Technology Centre Amsterdam focuses on developing new types of detergents and other fluids that are far more efficient at freeing up oil.

SHELL

drilling operations, preventing much of the formation damage that normally occurs when mud density must be high enough to keep well bore pressure greater than formation pressures."

These technological achievements have enabled smaller operators to maximize returns from each well. However, major drillers are now borrowing even more sophisticated technology from offshore operations.

One example is Shell's "iShale" initiative. The company is using sensors to automatically adjust the flow of wells and control the separation of natural gas, oil and water. Such systems are very expensive when used offshore. But Shell is looking to incorporate low-cost sensors such as those used in the Apple Watch. The idea is to use the sensors to eliminate the need for workers to be onsite at drilling rigs. The sensors could allow several wells to be overseen by workers from one place, reducing costs and making the best use of assets. Also, failures could be predicted, and repairs scheduled accordingly.

According to Perry, this is a step that companies such as Shell, Schlumberger and others are taking toward complete automation of the drilling process. Schlumberger, for example, has tested controlling well drilling in the U.S. from overseas as part of its research. "Complete automation is not yet possible for drilling a well due to many variables that require human intervention, but a considerable portion of the drilling process is now automated," Perry says.

He adds that, "The most significant change in this area is the ability to collect and process large volumes of data." 3D and 4D seismic readings and logs from large numbers of wells and other places contribute to collecting this "big data," while computer modeling, data management and new information technology assist in analyzing it.

Combinations of technological advancement from many industries such as the auto industry and the space program, which use robotics, are contributing to this data mining and use. Information technology advancements such as artificial intelligence can process and make decisions that will instruct the robotics. Data transfer via the internet and other channels enables monitoring and viewing of the processes.

CHALLENGES

Perry also notes that long horizontal wellbores have introduced some addi-

THE TRUMP ADMINISTRATION:

Litigation Burdens Efforts to Ease Regulatory Burdens

BY WAYNE D'ANGELO AND JORDAN A. RODRIGUEZ

A year into his presidency, President Trump has sought to repeal multiple environmental regulations enacted during the Obama Administration. Among the most significant milestones in 2017 were: (1) the Bureau of Land Management's (BLM) rule to limit venting, flaring and leakage of natural gas from operations on federal and tribal lands; (2) the BLM's repeal of rules for hydraulic fracturing on federal and tribal lands; and (3) the U.S. Environmental Protection Agency's (EPA) reconsideration of new source performance standards (NSPS) for methane emissions for the oil and gas sector.

Each action finds its roots in the March 28, 2017 Executive Order 13783, titled "Promoting Energy Independence and Economic Growth." The order directed a wholesale restructuring of major federal actions to regulate greenhouse gas emissions and climate change impacts, and directed EPA to review, rescind or rewrite the Obama Administration's Climate Action Plan and associated methane emission standards for the oil and gas sector. It also revoked several previous executive actions, including guidance on calculating the social costs of greenhouse gas emissions and accounting for those emissions in environmental reviews, as well as a moratorium on federal coal leasing. Finally, the order directed all federal agencies to review existing regulations that unnecessarily burden domestic energy production, and to recommend ways to alleviate or eliminate those burdens.

When President Trump issued EO 13783, Congress seemed poised to send the President a congressional review act (CRA) resolution rescinding BLM's Methane and Waste Prevention Rule (one of four Department of the Interior regulations targeted in the executive order). This rule was created to "reduce the waste of natural gas from flaring, venting, and leaks from oil and gas production operations on public and Indian lands" and requires operators to pay royalties on wasted gas. Six weeks later, the Senate failed to secure a simple majority in support of the CRA resolution.

With its failure, the Administration was forced to act unilaterally. BLM quickly announced it would excuse companies from complying with parts of the rule that had not yet taken effect, and environmental groups challenged the decision just as quickly. The Northern District of California struck down the delay of the rule on Oct. 4, and BLM appealed the decision to the Ninth Circuit two months later.

To meet the environmental group's successful challenge to BLM's informal delay of the rule, EPA also formally promulgated a rule in December delaying many of the rule's provisions until July 2019. Once again, a coalition of environmental groups sued BLM. The states of New Mexico and California also sued BLM over its decision to delay the rule. Both lawsuits, filed in the Northern District of California, remain pending at press time (California and New Mexico v. BLM 3:17-cv-07186 and Sierra Club v. BLM 3:17-cv-07187).

Like the methane and waste rule, BLM's effort to roll back Obama Administration regulations of hydraulic fracturing on public and tribal lands has taken some strange turns. This rule sought to update BLM's program for federal land and minerals development to ensure protection of drinking water, with focus

tional challenges to what's done. "One in particular that requires additional research is production techniques that keep fluids moving through the long horizontal wellbore as flow rates decrease with time," he says.

A complication is that oil and water tend to lay in low spots within the wellbore, which decreases production, he says. "The ability to determine exactly where production is coming from in a horizontal well is needed," he says. While production logs can be run to help answer such questions, collecting that data is not practical from a cost and operational perspective, he adds.

Another challenge for producers is detecting leaks in pipelines and monitoring tanks. One solution is drone technology, which makes it possible to scan huge swaths of land with

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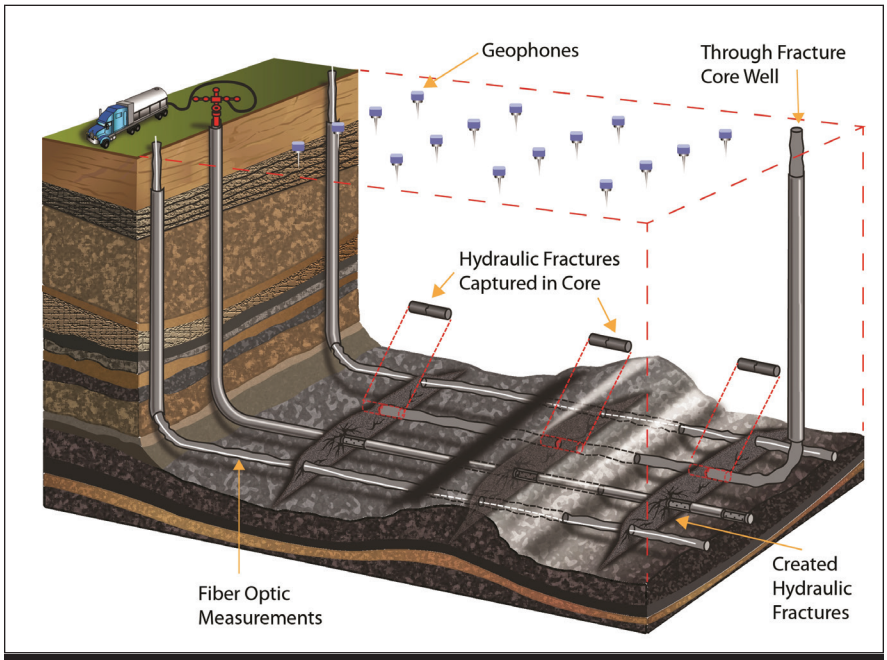

Geophones are positioned on the surface to monitor any microseismic activity related to fracturing.

on requiring disclosure of the chemicals used in fracking. A federal court in Wyoming struck down the Obama-era rule in 2016 and thus it has never taken effect. Proponents of the rule appealed to the U.S. Court of Appeals for the Tenth Circuit where government attorneys directed by Trump appointees delicately defended the BLM's authority to regulate fracking on federal and tribal lands but urged the court not to rule because BLM was reconsidering the issue. The Tenth Circuit agreed to halt the litigation in light of the new administration's decision to reconsider the rule. When the Tenth Circuit issued its decision, however, it also vacated the Wyoming court's injunction against implementing the rule. Therefore, on Dec. 29, BLM was forced to repeal the regulations through formal rulemaking procedures. Nearly a month later, California's attorney general and several environmental groups filed a lawsuit over the repeal. (California v. BLM 3:18-cv-00521 (N.D. Cal.); Sierra Club v. BLM 3:18-cv-00524 (N.D. Cal.)). At press time, this case also remains pending.

SUING THE EPA

EPA also has been sued over its attempts to delay or repeal methane NSPS for the oil and gas sector. Earlier EPA standards indirectly limited methane pollution from new natural gas wells and some upstream sources, but this is the first rule to target methane emissions across the natural gas value chain. It also requires methane pollution control at oil wells, where co-produced natural gas is often vented and burned off. On June 5, EPA granted a petition for reconsideration of key provisions of the methane standards and delayed (for three months) implementation of key provisions of the rule. On the very same day, environmental groups challenged the reconsideration and delay. (Clean Air Council et al. v. Pruitt, Case No. 17-1145 (D.C. Cir.)).

In July, the D.C. Circuit sided with the challengers, vacated EPA's delay and then granted a two-week stay with the admonition that any further delay would be seen as "arbitrary, capricious, [and] … in excess of [EPA's] statutory … authority." The court reasoned that EPA could only legally delay the effective date of a formal agency rule by undertaking a new formal agency rulemaking (with opportunities for public review and comment). EPA initiated that rulemaking process in November when it issued and took comments on two Notices of Data Availability providing new information on EPA's authority to stay the rule. Comments were due Dec. 8, and the rule remains in effect pending EPA's publication of a final modified rule.

While EPA's final action likely will moot the environmental group's suit over the delay of the methane standard, other groups are already teeing up new litigation. In August, environmental groups announced they would sue EPA for not regulating methane emissions from existing oil and gas infrastructure, arguing that once a final rule for new sources is issued, EPA is obligated to set methane standards for existing sources. If successful, this approach could require methane emissions regulation from all existing oil and gas infrastructure in the United States.

As these actions show, the Trump Administration's aggressive approach to deregulation in 2017 has been met by environmental groups' equally aggressive use of litigation. While the environmental groups were successful in 2017, their successes largely forced the Administration to abide by rulemaking procedures that it arguably overlooked in its desire for swift reform. The decisions made in these cases do not invalidate or otherwise limit the substance of the Administration's actions, however. Thus, the Trump Administration likely will continue to pursue the same deregulatory goals throughout 2018, but with more careful observance of regulatory procedures.

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CONOCOPHILLIPS COMPANY

Drilling rig at Eagle Ford Play owned by ConocoPhillips

numerous wells using thermal imaging. This cuts down on the costs of manual inspections and possible costly shutdowns.

The ability to accurately predict the best places to drill also has proven vexing. To that end, advanced downhole sensors have been developed and used to map the location of underground fractures in horizontal wells.

Also, Perry says that even though there are new methods to detect resources, producers must be able to assimilate and process the data created. This data provides input into geologic models that then provide more clarity on formation properties, he says.

One example of this at work comes from ConocoPhillips, which plans to start using magnetic resonance imaging in 2019 to analyze Permian rock samples and find the best drilling locations. The technology is not new to the industry; the company first used it for its offshore Alaska operations. However, with modern advances in analyzing the data, the results can provide better finding capabilities.

Oil companies are also using another interesting technology borrowed from medicine: DNA sequencing. Anadarko and Statoil are using sequencing to pinpoint areas that have promising potential. Sequencing works by collecting DNA from the microbes in oil, which is then used to search for the same DNA in rock samples.

ConocoPhillips is working with service providers on better accuracy and more control in the fracturing process itself. The company is looking at determining how to put greater pressure on the junctions between vertical and horizontal wellbores. With greater pressure, drillers can more effectively stimulate a fracture. According to Ryan Lance, chief executive of ConocoPhillips, this multi-lateral technology is the next breakthrough that will change hydraulic fracturing in the U.S.

Another promising innovation is laser energy. GTI has performed research using this energy instead of mechanical tools or explosives to perforate wells, which means lasers could drill the wells instead of the standard rotating drill pipe and drill bit method. Perry says that, though a commercial product is not yet available, the research shows promise.

WATER ISSUES

Whether horizontal or vertical fracking is used, one of the biggest issues facing drillers and operators is water. The issues involve the fact that scarce fresh water is used in the process as well as what to do with the produced water (the water trapped and brought to the surface along with oil or gas).

Global estimates are that three barrels of water are produced for every barrel of crude oil taken from the ground. The longer the well is produced, the more water goes into the process: In North America, the ratio approaches 10:1.

Produced water has several ingredients beyond the oil and grease that comes from the well. Those include salt, bacteria and other organisms, inorganic salts, dissolved or dispersed hydrocarbons, dissolved gases (such as H_2S and CO_2), and chemicals. Those chemicals are naturally occurring as well as what's used in the fracking

process including oxygen scavengers, scale inhibitors, emulsion breakers and clarifiers, coagulants, flocculants and solvents.

According to Kent, a large portfolio of technologies is under development for water processing, including membrane research, osmosis, vaporization and others.

All have challenges for commercial use including the demand for water that occurs in an area under development and what happens when the development moves to a new area.

"Each well changes significantly in the volume of water produced, and the quality of the water can change as well. It is not like a municipal water treatment situation where the location and other criteria are somewhat stable," Kent explains.

The primary treatment technologies for water produced from the well include using gravity oil and water separators, phase separations, dissolved air floatation, chemical treatment and distillation. Electrochemical methods also exist, including electrodialysis and electrofloatation. More recently, electrocoagulation is being explored, and some studies indicate this method has the capability of removing most of the water contaminants present in oily wastewater and produced water.[3]

GTI has a water-based life cycle model that can assess water needs. It simulates the water needs over the lifetime of a field under development. Inputs include how many wells are drilled over time, how much water each well requires, how much water comes from local sources and from produced water, what portion of the produced water can be processed based on its quality, what the cost is for doing so and more. The model identifies the water needed over time and identifies periods of excess water availability and times where more water is needed from some other sources.

Obtaining fresh water has become increasingly difficult for fracking operations for several reasons, so water treatment, recycling, disposal and reuse will continue to be top-of-mind challenges for producers even as technology to drill and produce becomes more sophisticated.

LOOKING FORWARD

Over the long term, the ability to resolve the issue of fresh water use and produced water disposal will be a main influence on unconventional oil and gas production. While it seems nothing on the horizon can replace horizontal drilling because of its importance to the world of oil and gas, the direction and future of hydraulic fracturing will depend on improvements to that process. VM

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USING DATA TO RUN OUR PLANTS

BY BILL POLLOCK

Industry 4.0 and the Industrial Internet of Things are allowing increased use of adaptive analytics in running our plants. But how did we get to the point where we are depending on this new expanded world of data and what does it mean?

Executive Summary

SUBJECT: Adaptive analytics, the Industrial Internet of Things and other technological advances have created Industry 4.0.

KEY ISSUES:

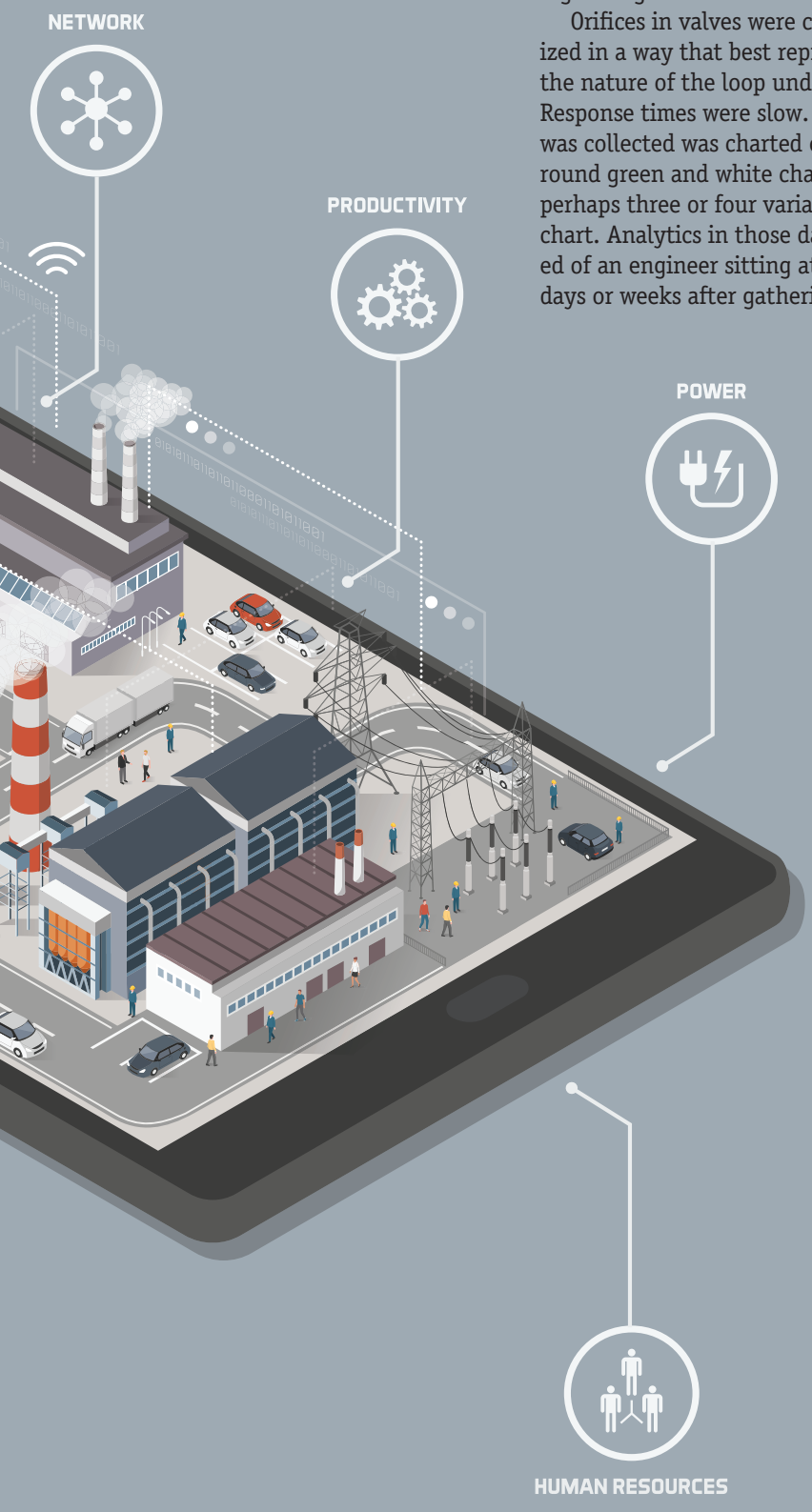
- A historical perspective
- What the next wave is
- What it may mean for plants

TAKE-AWAY: Many exciting developments are coming our way.

GOING BACK

When I began my career in 1973 as a process control engineer, the pneumatic era was ending and the digital age was just beginning—a time that became known as the Third Industrial Revolution. Pneumatic controllers were built out of an assembly of bellows, baffles, orifices and springs. Pneumatic air lines were fed under physical parameters such as pressure, temperature and flow from the production line to the control room and the responding output from the controller back to a diaphragm on the regulating control valve.

Orifices in valves were characterized in a way that best represented the nature of the loop under control. Response times were slow. Data that was collected was charted on large, round green and white charts, with perhaps three or four variables per chart. Analytics in those days consisted of an engineer sitting at his desk days or weeks after gathering data, studying the big round charts filled with squiggly blurred lines, making an interpretation, adjusting the set points and taking more data to be reviewed once again.



In the late 70s and early 80s, digital control came of age. Early in that period, Modicon introduced the programmable logic controller (PLC) for discrete control, which was soon followed by the distributed control system (DCS). Each of the major process control manufacturers introduced a DCS to the market. While control systems went digital early on, the sensor and the control valves did not. 4 to 20 mA loops were used to convey sensor data. There was no choice yet between electric and pneumatic valve actuators. The output from the DCS was sent to a current-to-pressure converter that then sent the traditional 3 to 15 psi output to the valve actuator.

Over the next decade, the architecture of the DCS system changed radically. Many proprietary and industry standard fieldbuses and communication protocols were introduced. These process-related networks included FOUNDATION Fieldbus, PROFIBUS and HART. One major advantage of this digital communication was that a large amount of information could be communicated on a single cable. Instead of one, hardwired cable for each variable, thousands of pieces of information were sent over a single cable. This meant that, in addition to the many variables a single device transmitted, multidrop systems allowed a single, two-wire cable to be connected to many transmitters and many control valves or other control devices.

Installation and maintenance costs were radically reduced. In addition, accuracy was improved through introduction of digital signal transmission. Small variations in the current loop, introduced by electrical signal interference or grounding problems would commonly cause large errors in the signal received. With digital fieldbuses, this was eliminated.

Through the 1990s and into the 2000s, DCS became the solution of choice. At the same time, PLC-based control systems evolved to include

functionality that acted more like traditional DCS systems. While functionality differences between the DCS and the PLC became smaller, the input devices and technology also merged. In both cases, many of the inputs for variables in the process plant were connected using fieldbuses.

During the past decade, the Internet of Things gained strength in commercial and home applications. At the same time, the Industrial Internet of Things (IIoT) was under development. This evolution took a step forward in 2012 when a German consortium released a standard for what was introduced as Industry 4.0; the fourth industrial revolution had begun.

THE NEXT WAVE

Industry 4.0 introduced the concepts of interoperability, information transparency and decentralized decision making as standards for the future. The cloud, big data, artificial intelligence and process analytics were coming of age. Manufacturers were no longer satisfied with historians and data for a single plant or a single process. Processes and plants were being connected and analytics could identify variations in processes from production run to production run, or differences from plant to plant.

In many ways, implementing IIoT and Industry 4.0 are just beginning. Clearly, manufacturers want to gain the advantages of an IIoT system without scrapping their installed infrastructure or building new plants. This is entirely possible. Existing fieldbus devices are smart devices connected to each other and to an intelligent platform. They send data through digital protocols to a host for analysis. Using IIoT and cloud connectivity, this data can be available to monitor process conditions and learn from what's going on with them. Data can be stored remotely and reviewed, using process analytics to improve performance.

Leveraging IIoT technologies to process control insight is becoming a must in today's digitized manufacturing environment.

Where fieldbus or process data connections are not yet in place, wireless connectivity can be used to expand field networks rather than a multiplexed fieldbus. This is particularly useful when islands of older, analog-based field transmitters are in place. Little cost or rework is required to make the changes.

To this point, we've focused on the fieldbus and input devices. However, process control for DCS or Industry 4.0-based systems need to have final control elements as well. While an increasing number of these elements are digitally driven pumps, the control valve still dominates—it continues to be a critical asset for quality control.

In the pneumatic control era, we had analog valves, and some portion of them were equipped with positioners. In many cases, the control valve of 2018 is equipped with its own "computer." The equipment can monitor, control and transmit important status data, including air supply, electrical supply, travel stroke and other important parameters. While this data has been available for some time, the variables were seldom well understood, and local plant technicians did not have the ability or time to analyze and use the information provided. Only in the age of IIoT, artificial intelligence and process analytics can this data be used to correct valve operation, maintenance or operational performance.

Many valve manufactures have developed control valve analytics systems to deal with the complexity and overcome the local plant expertise gap. These systems identify maintenance tasks and improve performance using the information available from the onboard valve computer. When used appropriately, these systems can predict valve health and determine necessary maintenance.

In the past, data that was available was underutilized. IIoT and the functionality of Industry 4.0 are changing this reality. Leveraging IIoT technologies to process control insight is becoming a must in today's digitized manufacturing environment.

IIoT, using the cloud and functionality defined by Industry 4.0, is

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Gaskets Are Not Created Equal

BY GREG JOHNSON

Gaskets are near the bottom of the food chain of valve components; trim, body materials and packing seem to get a lot more press. But gaskets serve an important purpose: They are the static seal between non-moving valve components—usually the body and bonnet. Without gaskets, those two (and sometimes three) body or body/bonnet parts would have great difficulty sealing after assembly. It's important for maintenance and repair personnel to understand what gaskets are and how they work because so many of those gaskets will need to be replaced or repaired.

Gaskets have been around as long as valves have been manufactured. Although some gasketless designs such as threaded and welded bonnet types exist, the bulk of today's linear and check valves all have gaskets.

The earliest gaskets were made from organic materials such as jute or flax. Natural rubber was a popular choice before the chrysotile-based asbestos materials came into vogue at the turn of the 20th century. Asbestos, rubber and soft iron (actually soft steel) were the industrial gasket materials of choice until about the 1950s.

While gaskets are found in nearly all two-piece-bodied valves, the bulk of the attention on gasket materials and gasket design is focused on the linear or multi-turn type of valves. In many cases, quarter-turn valve gaskets are more of an engineered seal or component part, rather than an off-the-shelf gasket. Quarter-turn gaskets or seals are also usually much smaller in cross-section than their multi-turn cousins.

☐ Today, most reassembly of body/bonnet bolting requires the use of specialized torque-control equipment, such as this hydraulic bolt tightener.

THREE STYLES

Today's gasket styles can be differentiated by the type of force generated to cause them to seal. The simplest gaskets are called "crush" gaskets. These flat gaskets rely on brute force to tightly squeeze the gasket between two flat surfaces, filling any imperfections in the flange sealing surfaces. The most common crush-style materials are polytetrafluoroethylene (PTFE), rubber and soft corrugated metal. These materials work well for containing moderate pressures of 300 psi or less.

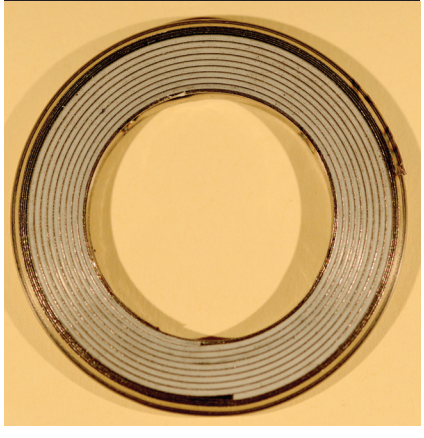
"Controlled-crush" gaskets use force to seal, although the crush rate is usually limited by tangs or geometric designs that prevent over-torqueing. The most common controlled crush gasket is the spiral-wound type. To achieve maximum effectiveness, the compression is limited to about 20-30% of relaxed gasket height.

Additionally, the spiral-wound gasket must be contained on its inner diameter (ID) and outer diameter (OD) to prevent delamination of the alternating rings of metal and filler material.

A newer style of controlled-crush gasket is the Kammprofile type. This gasket relies on a multitude of tiny serrations designed to deflect or bite into a surface material such as graphite. Kammprofile types have been successfully adapted to many applications that once were the sole domain of the spiral-wound gasket.

A third controlled-crush gasket

☐ This image shows the laminations of alternating stainless steel and PTFE on this 3-inch diameter spiral-wound gasket. Spiral-wound gaskets can be made in virtually any size and diameter.



☐ A delaminated spiral-wound gasket is shown next to the pristine replacement gasket. Delamination can cause catastrophic leaks and damage downstream piping components.

is the ring-type-joint (RTJ). The RTJ gasket relies on an oval or octagonal ring resting between two, smoothly machined grooves. The RTJ ring must be softer than the mating grooves to allow for slight deformation or "fit" into the grooves. Like many other valve innovations, the RTJ design originated in Texas. It was first used in the West Texas oilfields in the 1920s and, until the greatest generation all retired, it was also known as a "Texas Joint."

The last style of gasket is the "pressure assisted" design. These gaskets are also known as pressure seals. They originated in Germany in the 1920s, where they were used for high-pressure research work. It wasn't until the mid-1940s that the pressure seal found use in valve design as an excellent high-temperature, high-pressure gasket seal.

Originally, pressure seal rings were made of soft steel and coated with silver. This design worked well, but the silver plating was easy to scratch. Developments in the late 20th century resulted in pressure-seal gaskets made of a composite of stainless steel and graphite. These composite gaskets offer superior sealing because of their ability to negate the negative effects of minute scratches or deformities in the valve body at the point where the pressure seal makes contact.

GASKETS FOR SPECIFIC APPS

Valve types, pressure classes and sizes each use specific gasket types for several reasons. Valves in low-pressure, ambient applications such as water and wastewater work very well with sheet materials such as rubber or in cases where the media is harsh, PTFE. Rubber O-ring seals are also often used as gaskets in these types of valves.

This is an example of a failure of a graphite-laminated soft steel gasket on a Class 150 gate valve. The failure created a catastrophic leak.

Many valves in the chemical industry are small and commonly see only lower pressures. These valves, often made of stainless steel, also function very well with sheet PTFE materials. In cases where a bit more strength is required of the PTFE, additives of materials such as glass and graphite can be mixed with the base material before final forming. For round-bonnet Class 300 valves, either the spiral-wound or Kammprofile type is specified.

Most steel industrial valves in Class 150 use a wavy soft-carbon steel gasket sheathed in graphite. This combination of graphite and easily-deformed soft steel works well for the rectangle-shaped bonnets of the Class 150 gate valves. The round bonnets of Class 150 check and globe valves are usually home to either the spiral-wound or Kammprofile gasket. Gasket specifications for gate, globe and check valves in refinery and petrochemical service are detailed in American Petroleum Institute (API) specifications: 594, 600, 602, 603 and 623.

As pressures get higher, the design of appropriate gasket seals also changes. API refinery valves in Class 300 and in some cases Classes 600, 900 and 1500, use a fully contained spiral-wound or Kammprofile gasket type. When pressures are greater than Class 300, the RTJ or pressure seal design is often used. RTJ gaskets are available in soft carbon steel, low alloy steels and stainless steels to meet virtually any valve body material requirement.

The pressure seal gasket is at home in the highest pressure/temperature applications. Its ability to seal tighter as the pressure rises is an advantageous feature. However, pressure-seal gaskets also can be very fickle if their diet of high pressure is greatly reduced. This once-tight, high-pressure seal can easily leak if the working pressure is dropped significantly and the bonnet bolts are not retorqued.

PROPER TORQUEING

For all these gaskets to operate as they are designed to, proper torque must be applied to the bolting, and hence to the gasket itself. The load applied to the gasket is a result of

RTJ gaskets require carefully machined smooth grooves in order for the metal gasket to seal properly. The RTJ gasket must also be softer than the groove material so it can slightly deform into the groove area.

RTJ grooves must be smooth on the sides where the gasket touches or leakage will occur. This damaged RTJ groove will require machining and possibly weld repair.

the spring force applied by the gasket bolting. The "spring" comes from tightening the bolting to a percentage of its maximum yield strength. As long as the torque is less than the maximum yield strength, the bolt will function as a tightly-wound spring. If the yield strength is exceeded, the bolt will deform and become slightly longer than it originally was—it will not return to its original length and it will become "loose."

In years past, the primary bolt-tightening tool was a hand-held wrench or an air-powered impact wrench. With today's emphasis on quality manufacturing and remanufacturing (repair), combined with concern over fugitive emissions, the brute-force torqueing methods of the past are no longer in vogue. In today's valve assembly plants and repair shops, the annoyingly loud chatter of impact wrenches has been quietly replaced by the near-silence of hydraulic-controlled torque wrenches. These devices provide the exact amount of torque where and when needed for tightening gasket bolting.

WHAT CAN GO WRONG?

As long as the torque is correct, the flange surfaces are exactly parallel, the material of the gasket is right, the dimensions of the gasket are the right ones, the surface finish of the flange faces is right and the joint was assembled correctly—nothing can go wrong. All valve bonnet gaskets work perfectly and never leak!

The reality is that sometimes gasketed valve joints do fail whether they're flat gaskets or RTJ gaskets. The most common cause is incorrect load on the gasket. This can come from using the wrong gasket or not tightening the bolting as required to effect a good seal. The incorrect tightening problem can result from either under- or over-torqueing the bolting.

Spiral-wound gaskets can fail catastrophically if a shoulder or ring on the ID is not there to prevent delamination of the metal and filler material rings. The use of a crush-style gasket in an application that calls for a controlled-crush style can also cause a major leak. The finish of gasket surfaces must meet the requirements of the gasket type. Any lateral scratches across the gasket sealing surface can cause a leak path. If an RTJ gasket ring is too hard and the bolting torque too high, the ring gasket can deform the body and bonnet flange grooves, resulting in a leaky joint.

Gasket designs and assembly techniques have improved alongside advances in the design of the valves where they are installed. Although there is no one perfect gasket, the multitude of designs and materials available today make selecting the right gasket for each application much easier than it was 75 years ago. However, proper assembly techniques are required to ensure that these gaskets work as they should. VM

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"Borrowing" a Distributor Partner's Capabilities

BY TIMOTHY GREGG

Plant owners, operators and purchasing managers have a challenging job: They must make sure their plants run with little downtime, maximum safety and top efficiency. However, the reality is that their jobs often include many responsibilities beyond those criticalities. When a plant has a procurement team, they're often focused on purchasing direct material, while maintenance, repair and operations products (MRO) and indirect purchases take a backseat. This means any time a plant needs to purchase a new piece of equipment or MRO supplies, department leaders and engineers are taken away from the manufacturing business and into the business of procurement.

One solution is to lean on distributor partners and their capabilities.

GETTING THE PRODUCTS

Procuring a product for a manufacturing plant involves more than just adding something to a digital cart and clicking the "buy now" button, then sitting back while it arrives at your doorstep. The ultimate price tag of that product often will be much higher than the amount on the check.

When we look at total cost of ownership, we look past the price to all the costs associated with purchasing, storing and paying for the product. Those costs add up fast (Figure 1).

Figure 1. Total cost of ownership

In fact, according to Exel Analysis and Supply Chain Insights, for every dollar of unit price spent on a product, two dollars of support cost can be associated with the product price. That means if the focus is solely on the purchase price variance, it's likely more will be paid in total cost of ownership including excessive repair or replace costs. How can that be?

An abbreviated list of support costs (not including repair or replace costs) looks like this:

- Sourcing
- Ordering
- Shipping
- Taxes
- Tracking
- Handling
- Warehousing
- Warranty tracking
- Payment processing
- Invoice reconciliation
- System support
- Inventory optimization
- Returns

Imagine accruing those support costs over the course of a year, averaging 1,000 purchases each month from more than 500 suppliers? Then compound those costs year after year. This shows total cost of ownership is often substantial, and in the long run, can be five to 10 times the cost of the product.

When a plant manager is busy running the plant, these functions can sometimes be rushed through or fall to the wayside altogether. Oftentimes, there isn't a dedicated plant employee devoted to keeping procurement costs down. This is where a trusted distributor partner can step in.

In today's industry, distributors seek to be more than just suppliers. They are also solution providers, identifying solutions for their customers that are geared at lowering a plant's total cost of ownership.

THE RIGHT ERP

Enterprise resource planning (ERP) technology is the platform a business uses to manage processes and track resources. It does everything from purchasing to payment to inventory management to payroll and beyond. When it comes to total cost savings, the ERP platform can be a plant's greatest asset or its weakest link.

Unfortunately, ERPs aren't cheap. They can cost upwards of $2 million for a system, plus the cost of upgrades to keep it current. Once a business is invested in its ERP, they're in it for the long haul. Meanwhile, there are more than 10 major ERPs commonly used by industrial plants and distributors. To complicate matters, those ERPs rarely have the ability to seamlessly "talk" to each other to make interfacing and transacting possible.

DISTRIBUTORS AS SERVICE PROVIDERS

Today, a distributor that also has in-house supply chain services can essentially "lend" its system functionally to customers, lowering an industrial plant's total cost of ownership. The system can "talk" to the plant's system, working together to streamline most business processes. When

a distributor partner has the right supply chain capabilities, then the customer can operate reliably on the distributor's system. This means the plant can have a totally separate ERP, an outdated ERP or no ERP at all and still benefit from the functions of this particular supply chain service provider's operating system.

Imagine placing all of a plant's purchases through a common operating system that links to just one of the distributor's supply chain services operating systems. This particular distributor, who also might have supply chain management capabilities, acts as a procurement partner, essentially allowing the customer to place all purchases, no matter the product category, through a common system. All orders can be placed in one system but are transferred to the individual suppliers' systems. Instead of 500 separate invoices a month, there would be one or two. Plus, managing invoices, making payments, reordering inventory, returning products and other tasks all run through this one operating system.

Streamlining processes in this manner with a trusted distributor and proven supply chain service provider takes a tremendous amount of labor and ownership costs off the shoulders of industrial plants. Additionally, order accuracy increases and the number of errors decreases. The icing on the cake is that plant customers can use the data to improve processes. Examples of reporting capabilities include:

- Volume by category or supplier
- Supplier delivery performance
- Item availability
- Fill rate accuracy
- Receipts and issues
- Purchase order replenishment
- Savings commitments
- Performance to budget

An example of how using the distributor in this way can improve total cost of ownership is shown in Figure 2.

Figure 2. Comparison of before and after

Before distributor supply chain services	With supply chain services
500+ MRO suppliers	One MRO supplier
1,000+ invoices per month	One or two consolidated invoices per month
Outdated limited ERP system	Use the service provider's modern ERP system
Millions of dollars in customer-owned inventory	Up to 10% annual reduction in customer-owned inventory
No visibility to maintenance inventory	100% visibility to all program items
Manual, time-consuming approval path	Automated, simplified approval path
Poor inventory visibility and accuracy	Inventory cleansed, cataloged and cycle counted
No warranty management	Full warranty management program
P-Card use by several associates	Elimination of P-Cards
Purchases not tied to budgets or assets	All purchases tied to budgets/assets
No reporting	Robust reporting program tied to key performance indicators
Several million dollars in annual spend	Significant first year savings

SUMMARY

Industrial plants must always consider more than just the unit price of the products they purchase to keep operations running. When distributors take the next step to turn into service providers—helping to reduce plant operational and labor costs using technology—they're ultimately able to save their customers time and money in the procurement and inventory management process. VM

Timothy Gregg is a general manager for Wolseley Industrial Group's (www.wolseleyind.com) Integrated Services team. Reach him at timothy.gregg@wolseleyind.com.

4 of the Top 5 Industrial PVF distributors* in 2017 are members of the Valve Manufacturers Association!

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Any distributor or channel partner of valves and/or actuators that, at the time of application, is incorporated in the United States or Canada and is engaged in distribution of valves and/or actuators manufactured in a U.S. or Canadian facility, is eligible for distributor/channel partner membership.

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*Modern Distribution Management 2017 Top 5**

Questions? *Contact VMA President Bill Sandler at wsandler@vma.org or call 202.331.8105 ext. 306.*

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Trends in Valve Automation

BY HOWARD WILLIAMS

Just as a valve exists to suit every kind of application, there also is a valve actuator to provide just the right level of connectivity and control for that application. This reality has been complicated by many factors today including the steady increase in the automation of process applications across all industries. These applications range from unmanned installations in remote locations to complex plant processes controlled through advanced supervisory control and data acquisition (SCADA) systems. The processes are scaling up in size without an increase in operations and maintenance staff.

We all recognize that human error can have a devastating impact on a plant's processes, and we know the more pressing issue is often that we have to find ways to reduce overhead costs.

Meanwhile, every valve automation application is unique so it is worthwhile today to get help from actuator manufacturers to review the best solution for that unique set of challenges. Actuator manufacturers work closely with valve manufacturers and distributors to ensure the sizing and physical fit are correct and to support assemblies once they are in service. However, understanding basic operational parameters today is critical even before a particular actuator is selected.

ACTUATOR POWER SOURCES

Today's valve actuators are powered electrically, with fluid power or in some cases through a combination of the two. The power for an electric actuator is ideally a 3-phase supply, but in remote locations this might not be practical. A single-phase AC- or DC-powered electric actuator is an option that can operate through a portable power supply, generator or solar system.

Many plants have a pneumatic supply available, but the cost of supplying clean and dry instrument air is a significant challenge. When more devices are added to the air system, the additional load will eventually lead to a larger pneumatic system.

In remote applications, pipeline gas may be available to drive an actuator, but the devices that control the pressure going into the actuator typically bleed to the atmosphere. This is an issue because emissions of power gas or instrument air laden with lubricant are fast becoming an environmental no-no. However, these options do not need to be ruled out because "zero bleed" control devices are available.

ACTUATOR FUNCTIONALITY

Factors that need to be considered with actuators include the duty cycle (the number of stroke operations per minute), stroke time and failsafe mode in cases where the power supply or control signal could fail.

A pneumatic or hydraulic actuator typically uses a piston, diaphragm or vane to stroke a valve once pressure is applied. The simplest and fastest way to provide a failsafe function is to use an opposing spring (known as spring return). However, electric actuators also can provide a failsafe function by using a secondary or stored energy supply. This energy might be a backup electric supply, an external battery backup system or energy internal to the actuator through modern super capacitor technology. These options are not going to give the split-second closing force of a spring, but depending on the configuration, they can provide several actuator strokes during a power outage or control system failure.

This typical oil and gas upstream application using a solar panel powers a failsafe electric control valve actuator.

An actuator is performance tested at the factory prior to shipment. Each actuator is supplied with its own test certificate confirming torque output from the actuator.

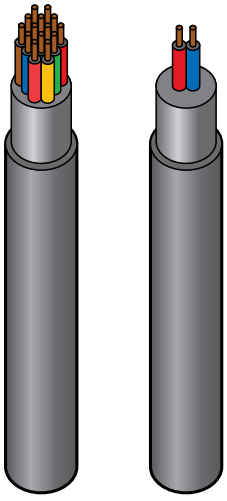
ENERGY CONSUMPTION

Actuators used in remote locations are designed to operate with the lowest power consumption, so they use portable or renewable power sources. Anyone with modern cordless drills in the toolbox at home has seen that low consumption motor technology and rechargeable battery life just keeps getting better.

Low-powered brushless DC motors also can perform a high-duty cycle, which makes them suitable for operating control valves on a continuous-rated duty cycle. This includes rotary, linear and quarter-turn control valves.

An electronically controlled electric modulating actuator can provide an instant response to a control signal with virtually no dead time and a positional accuracy of 0.1%. Repeatability of positional accuracy is hard to match using a pneumatic actuator because of the compressability of air or gas. For some applications, a hydraulic or an electro-hydraulic actuator is an option. The hydraulic power supply can be remote from the valve and capable of supplying multiple actuators or it can be integral, making it a self-contained actuator. A self-contained hydraulic actuator can provide significant force on a high-duty cycle valve using a low power, single-phase AC or DC solar power supply to drive the hydraulic power pack. With a spring failsafe, faster failsafe stroke times can be obtained.

A 2-wire daisy chain control network provides full access to all of today's smart actuators without the cost of running discrete multi-core cables to each actuator.



TECHNOLOGY

Since the mid-1980s, valve actuators have become more and more electronic. Conventional electro-mechanical devices

within the actuator such as a limit switch have been replaced with electronic sensors. Also, torque sensing facilitates continuous measurement of force needed to stroke the valve from the first day of commission to the day that valve is pulled out of the line for rebuilding or replacement.

Within its physical capabilities, the actuator will always provide just enough force sufficient to operate the valve in any condition. Typically, the valve torque demand curve will increase as the valve wears until the actuator can no longer move it. When new, an actuator is sized with a safety factor to allow for future torque demand.

But every device has physical limitations. The output of the actuator should never exceed the physical limitations of the valve drive train. Today, many plants strive for minimal downtime and preventative maintenance because of costs lower than the costs of unscheduled breakdowns. Regardless of the actuator selected, a level of analytic data is available to implement a preventative maintenance program.

Manufacturer's technician accessing the electric actuator data logger to diagnose a performance issue.

CONNECTIVITY

Recognizing the potential of available data from a valve actuator, manufacturers have been early adopters of 2-wire control networks to reduce the cost of field wiring and input/output (I/0) hardware in the control room. Today, several common 2-wire protocol options are offered by actuator manufacturers including Modbus, Devicenet, Profibus, Foundation Fieldbus and Hart. There also are custom, self-healing loop technologies specifically designed for large quantities of actuators spread over great distances. These systems connect to a data concentrator that operates as a slave device to the host control system using a conventional gateway protocol or Ethernet. The field loop also can pull in other digital or analog I/0 through a neighboring actuator or generic field unit devices. Segments of this network can be wireless.

The actuator manufacturer can provide efficient client support to ensure 24/7 availability of their valve actuators.

FUTURE TRENDS

What the future holds for valve automation and actuation is exciting for those of us who have seen the recent developments.

Selection criteria will remain broad, and technology will continue to add functionality, reduce power consumption, physical size and weight. Connectivity options will become more generic as wireless and other remote connectivity technology is adopted across all industries. As is often heard today, we will probably "have an app for that."

As industry focuses more on efficiency and cost of plant ownership, equipment manufacturers will be even more pressed to efficiently support their equipment in the field. Reliability and availability will be key because plants do not want the expense associated with unplanned shutdowns through product failure.

Actuator manufacturers who have the right product life-cycle management tools can be part of the answer to getting that reliability.

Many smart actuators installed today are not fully utilized because their available data is not being accessed.

Too often, internal data loggers are viewed by a factory technician when called to site after the actuator has failed. If obtained earlier, this data could be used to prevent the inconvenience of a field service breakdown call. Also, plant maintenance teams cannot be expected to be experts on all field equipment, so an opportunity exists for end users to leverage manufacturers to provide ongoing preventative maintenance services for a reasonable fixed cost.

The actuator manufacturer can provide efficient client support to ensure 24/7 availability of their valve actuators.

This would come with the manufacturer's guarantee that the actuators will function 24 hours a day, seven days a week. Smart analytics are in use across most industries today to predict problems before they occur, so it falls that this development will apply to the next valve actuator purchases. VM

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Life cycle testing is performed on an electric on/off actuator.

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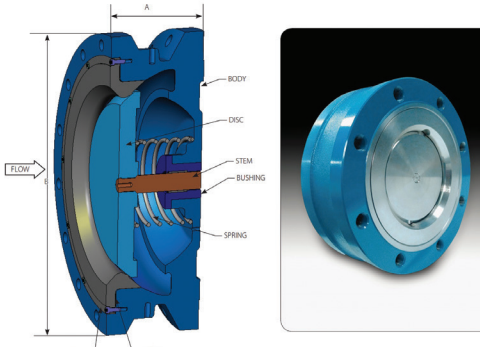
For more information on joining the Valve Repair Council, contact Marc Pasternak at 202.331.0104 (mpasternak@vma.org).

Spirax Sarco released the FT23 range of float and thermostatic steam traps suitable for heavily contaminated steam applications. The range is available in sizes 1 1/2 inches to 2 inches and two body materials: FTC23, carbon steel body with stainless-steel cover and FTS23, stainless-steel body with stainless-steel cover.

The FT23 also includes new plug and seat design with self-cleaning capability making the steam trap less susceptible to the risk of failure from fouling.

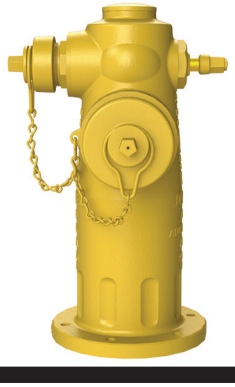


DFT Inc. released its new TLW Check Valve. The TLW is a Tapped Lug Wafer silent check valve specifically designed for use in horizontal and vertical installations for liquid, gas and steam applications where exposed bolts are not suitable.

The TLW is a spring-assisted, center-guided check valve with a lightweight compact wafer-style design (fits between mating flanges) that meets API 594 face-to-face dimensions and testing that meets MSS SP-61 and API 598 (shell and seat).

Victaulic launched its new Refuse-to-Fuse Series 906 Knife Gate Valve (906 KGV), the industry's first in-line maintenance KGV for HDPE pipe. The 906 KGV for HDPE pipe is ideal for fluid lines containing solids or abrasive materials common in mining, wastewater treatment, power generation and other industrial settings with applications such as slurry and tailings lines or cyclones.

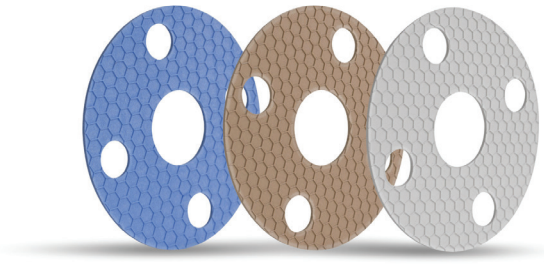
The revolutionary design eliminates the need for rigging with heavy chains and pulleys swinging over the heads of maintenance crews.



Mueller Water Products recently announced the new Jones Triton J-4048 Dome Top Wet Barrel Fire Hydrant. The new dome feature gives access to an auxiliary port at the top of the hydrant, which allows it to be used for other purposes, such as construction water access, installation of pressure sensors, etc. In the event of an emergency, the horizontal hydrant nozzles remain fully accessible to the fire department or utility, even if the dome port is being used.

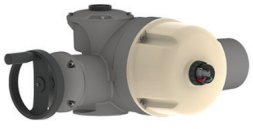
Curtiss-Wright Industrial Division announced that its business unit Farris Engineering will offer restricted lift on its 2600 and 2600L Series API-type pressure relief valves. The restricted lift option is available on orifice sizes D-Z for compressible service for both new 2600 Series valves and as a retrofit option for Farris' in-service valves.

Farris' design option allows operators to customize the valve lift to meet specific capacity requirements of ASME Code Section VIII and API 526.



Garlock launched the GYLON EPIX, a patented next generation of polytetrafluoroethylene (PTFE) gasketing featuring a hexagonal surface profile with superior compressibility and sealing for use in chemical processing environments. The product combines the sealing and blowout resistance of a 1/16-inch gasket with the compressibility and conformability of a 1/8-inch gasket. It will be available in the same three materials as traditional GYLON products; fawn (silica filled PTFE), off-white (barium sulfate filled PTFE) and blue (aluminosilicate microsphere filled PTFE).

Bernard Controls presented its new AT range of multi-turn electric actuators. This new range has been designed to address customers' need for solutions combining performance, user-friendliness and competitiveness.



With 6 models under the FIRST BC label, the AT range of multi-turn electric actuators has been created for moderate environmental and operational constraints. The products' key features include powder coating with higher mechanical resistance and a modular position sensor that enables up to 1700 turns with the same product or a wide stem acceptance.

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

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- **ASSOCIATE - SUPPLIERS** Companies that supply products and services to U.S. and Canadian manufacturers of valves, actuators and controls
- **ASSOCIATE - DISTRIBUTORS/CHANNEL PARTNERS** Companies that take title to and stock valves, actuators and controls manufactured by at least one VMA member
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Using Data to Run Our Plants,

CONTINUED FROM P. 32

changing the way process plants operate and providing radical improvements in performance and consistency. Suppliers are providing sensors, transmitters and valves that can provide and integrate with IIoT industrial process analytics. These analytics systems can read vast quantities of streaming time-series data, historical data, unstructured and unconventional data and addressing what they find.

Suppliers are leveraging cloud infrastructure services to deploy the data and connect it to process manufacturing sites. By combining data from smart devices with the process historian data such as flows, pressures and temperatures, a better outcome and more reliable predictions can be achieved. Data aggregation and contextualization can create efficiencies not previously possible.

CONCLUSION

When we view how adaptive analytics are applied to manufacturing plants in 2018, there isn't really a way to compare it to DCS systems of the past. In the past half century, we have gone from stone to space age (or in a 1960s analogy, from the Flintstones to the Jetsons).

Today, we have big data. We have cloud computing and apps on mobile devices so we can watch production from almost anywhere. Manufacturing plants have sensors that are faster, less expensive and more comprehensive; the software is better, and more data is available.

It's easy to see why real-time analytics are increasingly a part of our operation. The true value of these analytics is allowing functionality for decision-making to be carried out by online computing using artificial intelligence; rapid decision-making done in real-time and only monitored by a human rather than controlled by one. The biggest challenge—using all the data available from in-plant sensors and valves—is now being overcome. Industry 4.0 is changing the world of manufacturing. VM

Bill Pollock is founder, president and CEO of Optimation Technology, Inc. (www.optimation.us). Reach him at bill.pollock@optimation.us.

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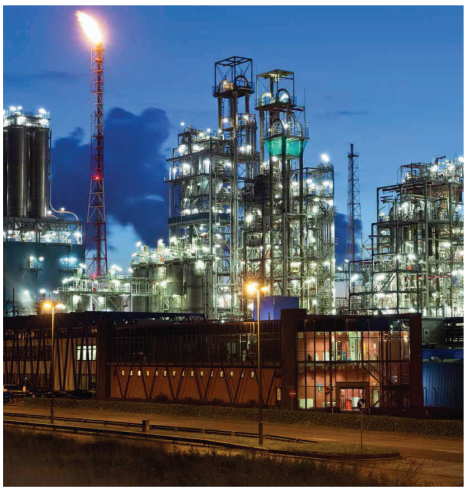

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