

# VALVE

## Paving the Path for Valve Expertise



: WATER  
: RECYCLING  
: IN  
: BUILDINGS

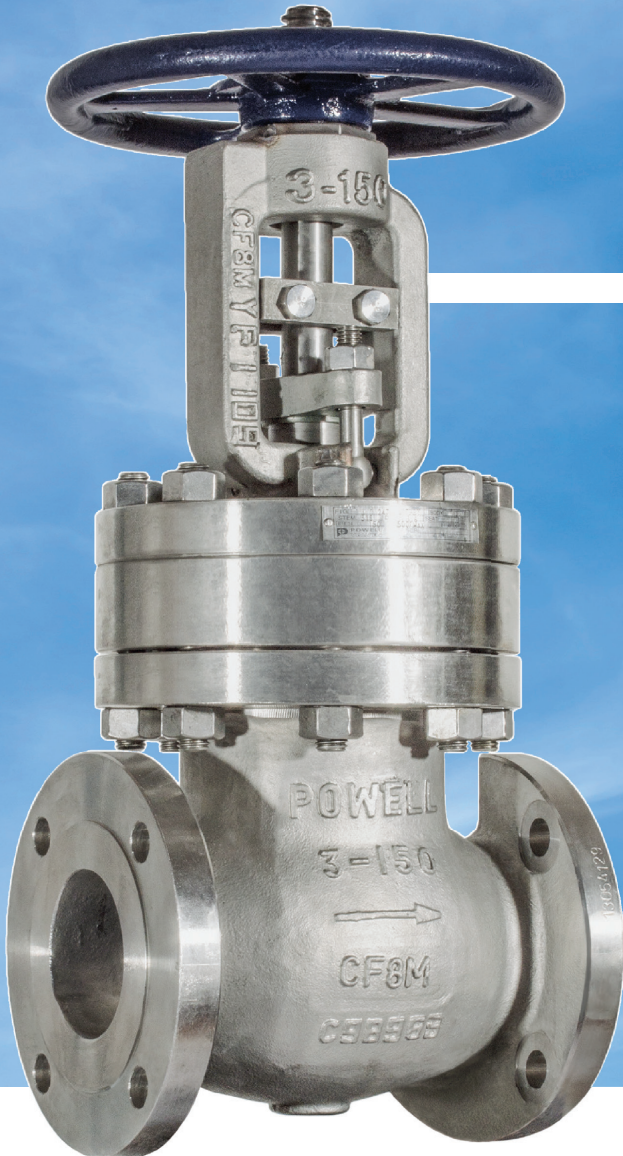
: THE  
: INDUSTRIAL  
: INTERNET OF  
: THINGS

: THE LATEST  
: ON VALVE  
: STANDARDS

: ELECTRIC  
: ACTUATORS FOR  
: LINEAR VALVES

**POWELL NEXTGEN ENGINEERING.**  
*LEADING THE INDUSTRY SINCE 1846*

# ZERO EMISSIONS



***Products:***

Bellows Gate and Globe (Forged and Cast Steel)

***Size Range:***

1/2" to 12"

***Pressure Class:***

150, 300, 600, 800, 1500

***Materials:***

WCB, A105, F22, F11, F5, F9, 316, 316L, 304, 304L, F91, and Special Alloys

***Design Features:***

API 622 Packing  
Hydro Formed Bellows



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*We can carve a moon roof in the top of a pickup truck, or we can machine virtually any size valve or valve component*

United valve has just put into operation the largest vertical boring mill installed in a valve service company in the United States. The massive 351,000 lb. machine stands nearly 40 ft. tall and can machine parts up to 19' tall and 20' in diameter. Combined with our 40-ton overhead crane capacity and 37-foot under-hook height, parts up to 80,000 lbs. are easy to manipulate and machine. The tremendous swing allows us to machine many very large valves without disassembly as well. Due to the huge mass of the mill, extremely fine, chatter-free finishes are easy to accomplish and extremely hard materials are easily cut.

The machine has already proved its worth in large valve repair work. A recent project involved refurbishing 48" Class 300 alloy gate valve bodies lined with 310ss. The seating surfaces of extremely hard Tribaloy T-800 (55-60 HRC) were also machined and polished on the big mill.

Machine time is available for large components, very large valves or vehicles needing a moon roof. Please contact United Valve for more information.

# It Really Is That Big



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# VELAN

# VALVE

MAGAZINE  
SUMMER 2017 | VOL. 29, NO 3



## 16 THE ROAD TO VALVE KNOWLEDGE

Valve professionals have a wealth of tools available to establish themselves as experts in the valve field.

BY GREG JOHNSON

## 12 WHERE VALVES ARE USED: WATER HARVESTING SYSTEMS

The building industry is finding more and more ways to reuse water from rooftops, lavatories and building system operations. Valves are a major player in keeping these systems flowing.

BY STUART BAILIN

## 24 MONITORING VALVE HEALTH VIA THE INTERNET

The day has come when many plants are looking at a centralized system for keeping track of valves using the Industrial Internet of Things.

BY JONAS BERGE

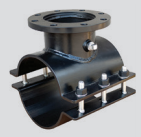
## 30 AN UPDATE ON U.S. VALVE-RELATED STANDARDS

Keeping up with the various standards that affect the valve industry is a constant process, but one that's critical for all companies.

BY CARLOS DAVILA, P.E.

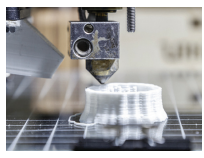
## 42 Editor's Picks

PRODUCTS



- Steel Tapping Sleeve
- PTFE Gasket
- IIoT Platform
- Intelligent Pressure Control
- Cast Valve Line
- Groove System
- Water/Steam Detection
- Pump Control Valve

## NOW ON... VALVE MAGAZINE .COM



### What is the Right Manufacturing Process for a Prototype?

With choices including 3D printing, CNC machining and injection molding, you must consider several questions including, how many parts are needed, when are they needed and how long will these parts be used?

- » Valves in Oxygen Service
- » The Need for Early Project Team Interaction
- » High-Temp Metal Sealing Design
- » Turning the Tables on Valve Corrosion
- » The Future of Power Plant Design
- » Valves and Wireless Technology
- » Magnetic Particle Examination—and More
- » Valve Selection Impacts SIS in Refining
- » Control Valve Positioner Diagnostics
- » Profitability Via Maintenance Management

## COLUMNS

**4 Perspectives**  
New Joint Educational Program  
BY BILL SANDLER

**33 The Distributor Channel**  
Commissions  
BY FRANK HURTTE

**34 Know Your Valves**  
Christmas Tree or Wellhead  
BY JESSICA LEE

**36 Actuators & Controls**  
Sizing Electric Actuators  
BY JUSTIN LEDGER

**38 Education & Training**  
The Value of Apprenticeships  
BY JESSICA BELLO

## DEPARTMENTS

- Industry Capsules ... 6
- VMA Calendar ... 7
- VMA and VRC Member Roster ... 40
- Index to Advertisers ... 44

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VICTAULIC

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www.vma.org

# A Joint Educational Program



**VMA recently released news** that met with much enthusiasm from the industry and from those involved in its creation: The VMA Technical, Manufacturers and Communications committees have agreed to a joint educational seminar beginning in 2018, to be called the **Valve Industry Knowledge Forum**. Included in the joint effort will be features of previously separate workshops, including (but certainly not limited to):

- An optional plant tour on day one
- An exhibit program on day two to be held during lunch, the afternoon break and a separate reception time
- Concurrent sessions for each group, to include tracks on technical, manufacturing and human resources; attendees can pick and choose which sessions to attend.
- Joint networking opportunities so that people who haven't met before can expand their horizons.

We see this meeting as an opportunity for more meaningful dialogue between different segments of our industry, as a way to expand the attendee base and for individuals to learn about different areas of the valve business.

Most important to VALVE Magazine readers is that attendance will be open to both VMA members and non-members. This means a wide variety of possible attendees from end-users, engineering and consulting firms, various personnel within manufacturing firms and other industry groups.

The first Valve Industry Knowledge Forum will be held April 11-13 at the Hilton Savannah Desoto in Savannah, GA. Attendees will be able to choose from one of two optional tours on April 11, followed by a day-and-a-half of educational sessions on April 12 and 13.

As the program is further developed, we will share more information with you through this magazine as well as our website and electronic media. If you have any questions on the new concept please contact me at [wsandler@vma.org](mailto:wsandler@vma.org).

VMA will continue to offer programs for members only, such as our Leadership Forum, Market Outlook Workshop and in 2018, our 80th Annual Meeting. Companies that are not members, but are manufacturers, suppliers, distributors or repair facilities that qualify for membership, can go to our website ([www.VMA.org](http://www.VMA.org) > About VMA) to review our criteria and apply for membership online. **VM**

**Bill Sandler***President, Valve Manufacturers Association of America*

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- Increase plant availability
- Maximise productivity
- Reduce cost of ownership
- Protect the environment



## MERGERS & ACQUISITIONS

### Emerson's Pentair Acquisition Finalized

Emerson completed the purchase of the Valves & Controls business from Pentair plc for \$3.15 billion. Headquartered in Schaffhausen, Switzerland, Pentair Valves & Controls has almost 7,500 employees around the world. The business is being integrated into Emerson Automation Solutions.

### Spirax Sarco Acquires Chromalox

Spirax Sarco Engineering

plc signed an agreement to acquire Chromalox, Inc. from Irving Place Capital for a cash-free, debt-free consideration of \$415 million. Chromalox is a provider of electrical products, systems and solutions for industrial process heating and temperature management. The company will form part of the Spirax Sarco business group and be reported as a separate segment within that business.

### Crane Co. Acquires Westlock Controls from Emerson

Crane Co. purchased Westlock Controls from Emerson for \$40 million. Westlock manufactures

and sells switchboxes, position transmitters and other solutions for networking, monitoring and controlling process valves. With primary operations located in Saddle Brook, NJ, Westlock had 2016 sales of \$32 million.

### Flowserve Selling Gestra AG to Spirax Sarco

Flowserve Corporation entered into a conditional sale and purchase agreement to sell its Gestra AG business unit to Spirax Sarco Engineering plc for \$231 million. In addition to the product's core manufacturing facilities in Bremen, Germany, the sale includes several

other smaller associated businesses supporting Gestra products. Flowserve obtained Gestra AG in 2002 as part of the acquisition of Invensys Flow Control.

### Weir Acquires KOP Surface Products

Weir Oil & Gas entered into an agreement to acquire KOP Surface Products, a provider of advanced pressure control wellhead technologies, systems and services. KOP is a provider of wellheads, surface trees, valves, actuators and aftermarket services for the oil and gas industry. The business is headquartered in Singapore, has a

## MARKET FOCUS: The Global Valve and Actuator Market

The global market for valves shrunk by about 2.7% to end 2016 at about \$206 billion, according to a new Global Forecast prepared by Oxford Economics for VMA and the British Valve & Actuator Association (BVAA).

The amount marks the second year of decline, but the industry is still well above where it was before the financial crisis of 2008-2009. Oxford said the figures show the tremendous impact of growth in Asia, in particu-

lar, in China, over the past decade.

The best performing market was the Middle East, which grew by 3.3%. That growth was largely fueled by a 20% growth coming from the United Arab Emirates.

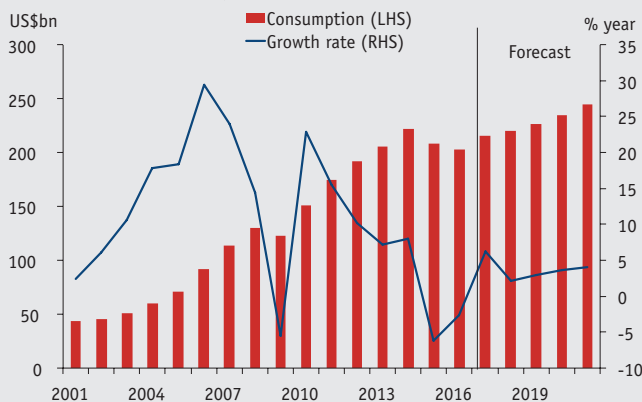
The global actuator market, meanwhile, is at \$98 billion, which is a 3.8% decline. However, that leaves the market more than double the size it was a decade ago.

Oxford's report was optimistic going forward, predicting a global

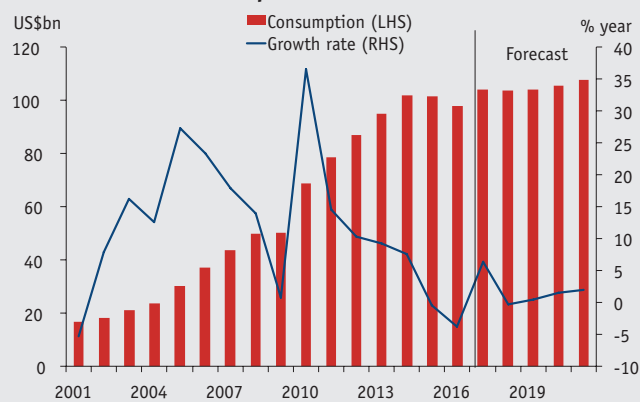
rebound in gross domestic product over last year's figures. Global manufacturing Purchasing Manufacturers' Index has been steadily rising since August of last year and is currently at a 3-year high.

Of the industries that see the most valve activity, the cyclical industries of chemicals, mechanical engineering and shipbuilding are forecast to accelerate more sharply than sectors such as food and beverage, and fuel refining.

World: Valve consumption



World: Actuator consumption



manufacturing facility in Batam, Indonesia, and sales and service offices in seven countries. KOP's current management team will continue to lead the business from Weir's Oil & Gas division.

**NEW FACILITIES**

**MRC Global Opens Regional Distribution Centers**

MRC Global (US) Inc. will open two new regional distribution centers. One of those centers, which is in La Porte, TX, will serve as the operational hub for the Gulf Coast area. The new facility will house over 400,000 square feet of warehouse space as well as more than 75,000 square feet of office space and an extensive pipe yard.

The other is in Shafter, CA, just outside Bakersfield. It will hold about \$15 million in inventory to support operations on the west coast and in Alaska. This center will be about 80,000 square feet of warehouse and a 5,000-square-foot valve and engineering center along with a pipe yard and office building.

**Automation Technology Expands UK Office**

Automation Technology, LLC (ATI) announced a relocation and expansion of its office in the United Kingdom. The expansion follows the eighth consecutive year of continued growth for ATI and will provide a larger and more efficient workspace for current and future staff. It underscores the commitment to both their new and established customers in the eastern hemisphere.



□ ATI's expanded facility

**GE Oil & Gas Expands with New Sub Saharan Africa Facility**

GE Oil & Gas opened a new facility in Takoradi Port, Ghana. The facility, which will be the primary service center for deep-water offshore projects in Ghana, has an indoor test area of about 5,400 square feet (1,600 square meters) with capability for testing three subsea trees simultaneously, and more than 13,000 square feet (4,000 square meters) of indoor and outdoor storage. The new infrastructure already plays a critical role in supporting installation for Eni's Offshore Cape Three Points (OCTP) project. GE was awarded an \$850 mil-

lion order for the supply of equipment to the OCTP block in 2015.

**Emerson Opens Second 3D Printing Center**

Emerson opened an advanced additive manufacturing center at its Singapore campus, the second such center created. The centers' goal is to spur innovation that will address customers' engineering design challenges and accelerate speed to market for new products. The first center was launched three years ago in Marshalltown, IA. Emerson also has entered into a five-year research collaboration agreement with Nanyang Technological University, Singapore.

**AWARDS & HONORS**

**DFT Named 2017 Pennsylvania Company of the Year**

DFT was named the 2017 Pennsylvania Company of the Year by the World Trade Center of Greater Philadelphia. This year marks the organization's 15th Annual World Trade Centers Day Awards and



□ Arie Bregman (left), vice president and general manager, accepting the award for DFT from Gary P. Biehn, Chairman of WTC.

**AUGUST**

**3-4**

**VMA Market Outlook Workshop\***

*Boston*

[www.vma.org/MarketOutlook2017](http://www.vma.org/MarketOutlook2017)

**SEPTEMBER**

**13-15**

**VMA/VRC Annual Meeting\***

*Fernandina Beach, FL*

[www.vma.org/AnnualMeeting](http://www.vma.org/AnnualMeeting)

**30-OCT 4**

**WEFTEC,**

**The Water Quality Event**

*Chicago*

[www.weftec.org](http://www.weftec.org)

**OCTOBER**

**3-5**

**Valve Basics Seminar & Exhibits**

*Pasadena, TX*

[www.vma.org/ValveBasics](http://www.vma.org/ValveBasics)

**31-NOV 2**

**2017 Chem Show**

*New York, NY*

[www.ChemShow.com](http://www.ChemShow.com)

**DECEMBER**

**5-7**

**Power-Gen International**

*Las Vegas*

[www.power-gen.com](http://www.power-gen.com)

**2018**

**MARCH**

**21-22**

**VMA Leadership Forum\***

*Arlington, VA*

[www.VMA.org/LeadershipForum](http://www.VMA.org/LeadershipForum)

**APRIL**

**11-13**

**VMA Valve Industry Knowledge Forum: Seminar, Exhibits & Tour**

*Savannah, GA*

[www.VMA.org/KnowledgeForum](http://www.VMA.org/KnowledgeForum)

**JUNE**

**1-3 (tentative)**

**Valve Repair Meeting, Exhibits & Tours**

*Houston*

[www.VMA.org/ValveRepair](http://www.VMA.org/ValveRepair)

\* Open to VMA/VRC members only. Visit [www.VMA.org](http://www.VMA.org) to learn if your company qualifies for membership.

# VALVE MAGAZINE

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manuscripts, photographs  
and ideas from our readers.  
For a copy of the magazine's  
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Celebration, which recog-  
nizes the achievements  
of leading businesses  
throughout the region and  
the economic contribu-  
tions of world trade cen-  
ters across the globe.

The award recognizes  
individuals and companies  
for business leadership at  
the local level and global  
successes, which, in turn,  
have strengthened the  
region's economy.

**Victaulic Repeats Best Places  
to Work Honor**

For the fourth consecutive  
year, Victaulic was hon-  
ored as one of the best  
places to work in Lehigh  
Valley, PA by The Morning  
Call newspaper.

Over 70 companies  
participated, represent-  
ing 18,888 people in  
the Lehigh Valley. The  
employee survey seeks  
responses covering areas  
such as alignment, effec-  
tiveness, connection,  
management, employee  
engagement, leadership  
and pay/benefits/flexi-  
bility.

**Curtiss-Wright Earns Safety  
Award for Third Year**

As part of the Minnesota  
Governor's Safety Awards,

a Curtiss-Wright facility  
located in Chanhassen,  
MN, received a Governor's  
Safety Award for superior  
performance in workplace  
safety and health. The  
Chanhassen site produces  
Exlar electric actuators  
and earned the award  
by reporting better than  
industry average record-  
able rates on the safety  
program evaluation scale.  
Applicants are judged on  
injury data compared to  
their industry's national  
statistics as well as prog-  
ress in implementing a  
comprehensive safety  
program.

**Spirax Sarco Receives Top  
Safety Honor**

Spirax Sarco was presented  
with two Commendation  
of Excellence awards for  
exemplary top safety  
records at its two sites,  
Carolina Pines and North-  
point, located in Blythe-  
wood, SC.

The awards from the  
South Carolina Chamber of  
Commerce were given to  
companies and organiza-  
tions who achieve a com-  
mendable case rate during  
the 2016 calendar year for  
days not lost to occupa-  
tional injury or illness.

**Key Bellevilles Celebrates 50th**

Key Bellevilles, one of  
the largest manufactur-  
ers of bellevilles in the  
world, is celebrating its  
50th anniversary in 2017.  
A feature article on the  
company in The Pittsburgh  
Tribune-Review reported  
that: "Key Bellevilles Inc.  
has built its 50-year his-  
tory on one product used  
in many things—from the  
mechanical shark in 'Jaws'  
to space shuttles." Found-  
er and president Robert J.  
Key reported in the article  
that the company has 77  
employees and hasn't had  
a layoff in 45 years.

**ValvTechnologies Renews API's  
Q1 Certification**

ValvTechnologies, Inc.  
successfully renewed  
American Petroleum  
Institute's (API) Q1 cer-  
tification. The company  
has held this certification  
since 2001, making it the  
seventh oldest Q1 certifi-  
cate awarded worldwide.

To become API Q1 cer-  
tified, companies undergo  
an evaluation process that  
includes review of quality  
manuals and an on-site  
audit by API.

**REXA Gets Global Trade Award**

REXA received a Global  
Trade Award from the  
Associated Industries of  
Massachusetts Interna-  
tional Business Council.  
The award recognizes Mas-  
sachusetts companies that  
demonstrate excellence  
in international trade and  
set standards for global  
business.

REXA engaged the Mas-  
sachusetts Manufacturing  
Extension Partnership  
(MassMEP) to assist with  
reintroducing the concepts  
of lean manufacturing to

□ Spirax Sarco's team accepts a safety award.



its workforce. In conjunction with REXA's management team, MassMEP developed a curriculum of lean training that would cover all functions within the organization.

## CONTRACTS & AGREEMENTS

### Setpoint Partners with Continental Disc

Setpoint Integrated Solutions (Setpoint IS) will represent Continental Disc Corporation in Louisiana and Southern Mississippi.

The agreement adds a top-tier OEM for rupture discs to Setpoint IS's offer-

ings, which allows it to provide additional safety solutions to customers, according to the company.

### Bernard Controls Supplies Honda Plant

Bernard Controls recently installed 25 quarter-turn electric actuators, EZ10 models with LOGIC integrated control, into a Honda car manufacturing plant in Marysville, IN. After a commissioning phase, operations started up in May 2017. The actuators were part of a plant expansion.

### Rotork Actuators Supplies Middle East Refinery

Rotork fluid power valve



Rotork's grassroots refinery actuators

## PEOPLE IN THE NEWS

**VAL-MATIC...** named **Terry Massey** vice president of sales and marketing. Massey will be responsible for the company's worldwide sales and marketing activities. Most recently, he served in sales management roles at Crane Co. He also held management positions with Pentair (Tyco) and Flowserve (Durco).



Massey

**FLOWSERVE...** announced that **Bill Rusnack** and **Lynn Elsenhans** have retired as members of the board of directors. Board member **Roger Fix** has been elected to replace Rusnack as chairman.

**VALVTECHNOLOGIES...** appointed **Michelle Baker** chief financial officer (CFO). She previously was CFO at Leedo Manufacturing. Before that she was CFO/vice president of finance at Brouger Inc., and director, group project risk management and director of finance for Cameron International Corporation.

**WEIR OIL & GAS...** hired **John Hrcncir** as vice president of sales and service, pressure control. Hrcncir will be responsible for safety, sales and aftermarket services for Weir's pressure control business. Prior to joining Weir, Hrcncir was director of global sales and marketing—surface wellhead for FMC Technologies.

**A.W. CHESTERTON...** hired **Uday Karmarkar** as vice president of engineering. Karmarkar was principal engineer—chief engineering for GE in Erie, PA. He also held engineering positions at Akron Rubber Development Laboratory, Inc.

**MRC GLOBAL...** senior director of implementation services **Brenda Combs** was recently honored by *Supply House Times* as one of 20 women to watch in the plumbing, heating, cooling, piping/pipe, valves and fitting supply chain

industry. The third annual awards featured women who have enjoyed productive industry careers. The magazine asked for their thoughts on how they broke into the business and advice for young women considering a career in the industry.

**VANAIRE...** named **Steven Soderman** CEO and quality manager. **Bill VanDeVusse** will continue in his role as president. Soderman has held key positions throughout his career, most recently filling the role of corporate director of quality for another manufacturing firm.

VanAire, Inc. also added **Tony Lambert** and **Eric Miller** as owners of the Michigan-based manufacturing company. The two join VanDeVusse, who has owned the company since 2014.

**ITT...** appointed **David J. Malinas** president of its Industrial Process business. He will be responsible for delivering the strategic and operating plans of ITT's Industrial Process business, which employs about 2,500 people globally and had 2016 revenues of approximately \$830 million.

Malinas joins ITT from Thermo Fisher Scientific where he progressed through roles of increasing responsibility, most recently vice president and general manager of the Controlled Temperature Technologies business unit.

**CHROMATIC INDUSTRIES...** **Mark Gamber**, former vice president of operations at Cameron's Distributed Valves Group, joined Chromatic Industries as CEO effective April 10.

Additionally, **Mark Cordell** has joined Chromatic as a senior advisor. Before his retirement in 2016, Cordell was president of distributed and process valve divisions at Cameron, responsible for all valve and manufacturing operations in Canada. Cordell is a past chairman of VMA.

actuators have been ordered for multiple applications at a new grassroots refinery under construction in the Middle East. With a capacity of up to 400,000 barrels a day, the refinery will process crude oils to manufacture petrol, ultra-low-sulphur diesel and fuel oil for export and to satisfy local demand.

**GE Oil & Gas, Alpha Petroleum Work Together on Cheviot**

Alpha Petroleum and GE Oil & Gas are partnering to advance the subsea infrastructure for the Cheviot oil field, one of the largest undeveloped fields in the United Kingdom's North Sea. Alpha named GE Oil & Gas as the exclusive supplier of early engineering, project management and procurement activities for the project.

GE will supply subsea trees, a full control sys-

tem, three manifolds, flexible jumpers, flowlines, risers and umbilicals as well as subsea construction and installation services.

**ATI Supplying New Electric Power Facilities**

Automation Technology (ATI) recently provided linear valve actuators for two new natural gas-fired power generation facilities currently under construction. NTE Energy owns the plants, which are the Middletown Energy Center in Ohio and the Kings Mountain Energy Center in North Carolina. Both facilities are scheduled to be completed in 2018.

**MRC Global Renews Chevron PVF Contract**

MRC Global Inc. extended its worldwide master contract with Chevron Corporation for seven more

years. The contract is to provide pipe, valve and fitting (PVF) products and services to Chevron Corporation's global operations and project work. Chevron has been MRC Global's largest customer since 2010.

**United Valve Puts Large New Machine Tool into Service**

United Valve recently finished the first month of operating a huge new vertical boring lathe. The 38-foot-tall machine weighs nearly 350,000 pounds and has the capacity to swing components up to 24 feet tall and 20 feet wide. Situated under a 40-ton capacity crane, the machine is the largest of its kind in any valve service company in the United States.

The company uses the lathe for projects such as removing seat rings, lap seating surfaces and machine ring-type, joint-groove ends on a large repair order for 42-inch and 48-inch Class 300 gate valves.

**Velan Supplying Valves for Third-Generation Reactors**

Velan will provide nuclear valves to NNB Generation Company (HPC) Limited, a subsidiary of a French-British power utility, and AREVA NP. The valves are for the primary and safety auxiliary systems of the two new-generation EPR reactors at the Hinkley Point C nuclear power plant, Somerset, United Kingdom. Delivery of the equipment is scheduled for 2019-2021.

**Total Valve to Represent Curtiss-Wright**

Total Valve Systems is the

new representative for the Curtiss-Wright Valve Group product lines for Oklahoma, Kansas, Western Arkansas and Texas' Northern Panhandle. These products include Farris Engineering pressure relief valves, Solent and Pratt butterfly valves and Phoenix Group products.

Total Valve Systems is now part of the FAST (Farris Authorized Service Team) Center Network.

**Metso Providing Valves for Petrochemical Complex**

Metso will supply 400 Neles emergency shutdown valves for an ethylene cracker as part of the new Liwa Plastics Industrial Complex Project in Sohar, Oman. The new complex will process light ends produced in Orpic's Sohar Refinery and its aromatics plant as well as optimize natural gas liquids extracted from currently available natural gas supplies. The valves will be delivered in early 2018.

**MRC Global Awarded Expanded Contract with PBF Energy**

MRC Global (US) Inc., a subsidiary of MRC Global, has been awarded an agreement to be the preferred provider of pipe, valve and fitting products and services to PBF Energy Company LLC. The five-year agreement includes all project and maintenance, repair and operational needs.

As part of the agreement, MRC Global will now service the Torrance, CA and Chalmette, LA refineries, which were recently acquired by PBF, in addition to Delaware City, DE; Paulsboro, NJ and Toledo, OH refineries.



United's super-sized lathe

# Valve Basics Seminar & Exhibits Expands

To make room for an enhanced hands-on experience, the next Valve, Actuators & Controls 101 course will be held in a state-of-the-art training facility in the Houston area. The event is Oct. 3-5, 2017 in the Houston Area Safety Council Training Center, Pasadena, TX.

The basics program has continually grown in popularity and reputation since its 2009 inception. It has helped nearly 2,000 individuals who come to broaden their understanding of the complex world of industrial valves, actuators, controls and related equipment. VMA's Education & Training Committee chose the new venue because the training facility can accommodate not only a larger crowd, but a larger hands-on workshop. The "Valve Petting Zoo" is one of the most popular features of the 3-day event as it backs up what is learned in the classroom with the ability to see and examine the products up-close and ask questions of the industry experts manning 10 different product stations.

## WHAT'S COVERED

The course offers 15 individual lessons stretched out over a three-day experience. On day one, classes cover an introduction to the industry as well as to the different types of equipment used today, including multi-turn, check, quarter-turn, and manual and fluid-power actuators. That day also includes a reception featuring dozens of tabletop exhibits from the companies that offer products and services to the industry.

Day two continues the overview with classes on controls and on-off panels for fluid-powered actuators; electric actuators; valve data, feedback & asset monitoring; solenoid valves; and controls valves and related systems. Day three's classes cover pressure-relief valves, packings and fugitive emissions, valve materials, critical service applications and valve repair. Each day also includes two hours of practical, touch-and-see



experience in workshops that feature the equipment under discussion.

Valve Basics was developed to meet the emerging need for knowledge for newcomers to the industry. It has evolved, however, into an event that

serves as a refresher for many levels of professionals in the industry as well as a class for people outside the industry that need to understand how valves work and a way for people with limited knowledge of one type of valve product to expand and learn the rest of the industry. As a result, attendees range from engineers who specify valves to sales representative who sell into the industry to distributors and manufacturers' representatives who will offer valves, actuators and controls to their customers. Attendees come from many of the end-user industries as well as manufacturers and vendors to the industry. The class has also been embraced by upper-level mechanical engineering students who are chosen to receive scholarships from VMA and its members to support the industry's education program.

*Early-bird pricing for fall ends July 31. Information on the new format, the program specifics, exhibiting and other aspects of the Valve Basics course is available at [www.VMA.org/ValveBasics](http://www.VMA.org/ValveBasics).*

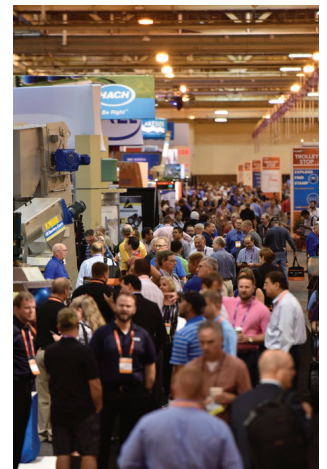
## WEFTEC 2017 to be in Chicago

Water professionals from a wide range of industries will gather Sept. 30-Oct. 4 at the McCormick Place, Chicago for the world's largest annual water quality technical conference and exhibition. WEFTEC, which celebrates its 90th year of existence in 2017, provides a wide-ranging educational opportunity as well as access to the cutting-edge technology and services that make today's water supplies clean and safe.

The conference, which was started in 1928 by the Water Environment Federation, draws thousands of water and wastewater professionals who come to soak up information from experts who share the latest practices, equipment, solutions and regulations on water quality.

An extensive technical program addresses today's contemporary issues such as collection systems, energy conservation, nutrient removal, storm water issues, plant design and operations, research and other areas. More than 1,000 vendor companies crowd the exhibit hall to show off their latest products and services and network with the wide range and many levels of professionals.

*For information, go to [www.weftec.org](http://www.weftec.org).*



WHERE  
VALVES  
ARE USED



□ A complete greywater harvesting system installed at the University of Colorado in Boulder, CO

# Applications in Water Harvesting Systems

BY STUART BAILIN

Water harvesting in commercial projects involves collecting rooftop rainwater, stormwater runoff, condensate from air handlers and greywater from showers, baths and lavatory sinks. This water is reused for non-potable applications such as toilet flushing, irrigation and cooling towers.

Because it offsets the use of drinking-quality water, this reuse has the potential to save millions of gallons per year for one single building.

To ensure public safety, public health agencies oversee the proper design of these systems.

## TYPES OF WATER GATHERED

The National Plumbing Code and NSF International defined the types of harvested water as:

- *Rainwater*: Rain or snow falling naturally from the sky that is collected from rooftops.
- *Stormwater*: Rainwater that has fallen onto hardscapes or the ground and is more contaminated than rainwater, requiring additional treatment and monitoring.
- *Greywater*: Water from showers, baths, spas, lavatory sinks and laundries.
- *Blackwater*: Water from toilets, food and kitchen waste sinks and other heavily contaminated wastewater. Blackwater is not easily treated as harvested water for onsite reuse.

## Executive Summary

**SUBJECT:** On-site water reuse or “water harvesting” is rapidly becoming a standard building feature. These systems use various types of valves.

### KEY ISSUES:

- How the systems operate
- What valves are used
- What those valves do

**TAKE-AWAY:** The increased call for recycling means these valves may be a lucrative market going forward.

- **Reclaimed Water:** Blackwater that is dewatered by municipal water treatment facilities. This water is considered non-potable and its reuse options are limited by code.

All water from rainwater, storm-water and greywater harvesting treatment systems must meet certain performance standards for reuse. These standards vary by state, but most of those states are adopting the NSF-350 standards listed in Table 1 below:

**Table 1. NSF 350 STANDARD**

	MAX	AVG
Turbidity	5 NTU	2 NTU
TSS	30 PPM	10 PPM
CBOD	25 PPM	10 PPM
E. coli	200 MPN/ 100 ml	2.2 MPN/ 100 ml
Odor	Non-Offensive	
pH	6.0 - 9.0	

### VALVE USE

To meet the demands of properly designed water harvesting systems, valves of many types are used. They control where the different types of water can and cannot go. Materials of construction vary by local code, but polyvinyl chloride (PVC), stainless steel and copper/bronze are the most common.

That having been said, there are exceptions. Projects designated to meet the "Living Building Challenge," which requires rigorous green construction standards, preclude the use of PVC and some other materials that have been deemed harmful to the

environment because of the manufacturing processes or disposal methods.

Beyond materials is design and valve type choice. The section of this article to follow looks at common rainwater and greywater harvesting system designs and how different types of valves are used within each.

In general, how harvested water will be reused and how local plumbing codes apply affect what types of valves are used. Also under consideration is the reality that, the volume of water available to be harvested may not be sufficient to meet 100% of reuse demand. In that case, domestic (potable) water may be included in the system to make up the shortfall.

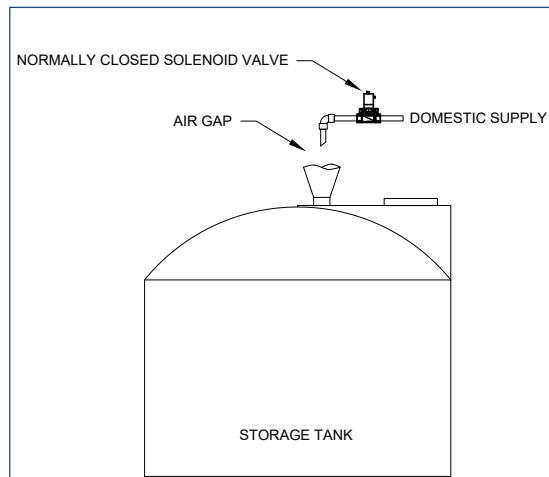
The major concerns of public health and plumbing regulators are separating the domestic water source from the harvested water interconnection and potential contamination of the domestic potable water supply.

### DOMESTIC WATER MAKEUP

In critical applications such as toilet flushing, codes require a backup water source when using harvested water as the primary source.

Two such backup sources are 1) direct connection and 2) air gap.

Direct connection (Figure 1, below) requires using a reduced pressure zone valve (RPZ) as well as an actuated valve for separating the domestic water source (potable) from the harvested water (non-potable). Most sys-



□ Figure 2. Air gap system

tem designers use a normally open/held closed solenoid valve (NOHC-SV) for this. The solenoid valve needs to have a duty cycle of 100%, meaning the valve is rated as energized 100% of the time without excessive heat buildup or failure of the valve coil.

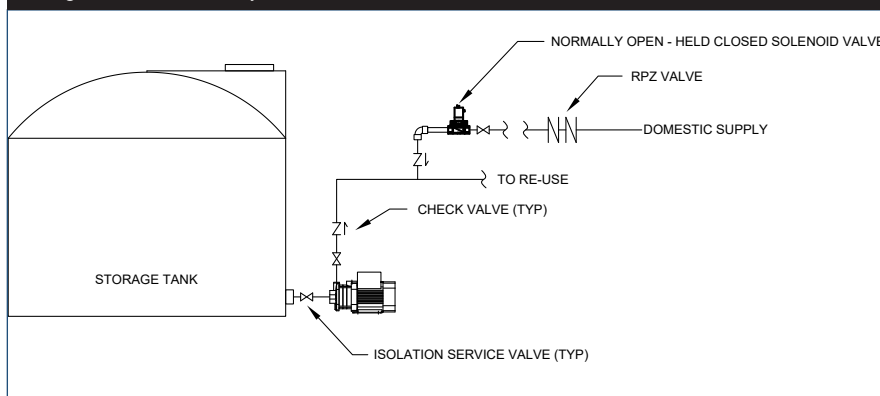
The advantage of using the NOHC-SV is that, if there is a power failure or a system fault, the valve will automatically open without any additional controls. This allows domestic water to flow to toilets automatically.

However, some states such as Illinois and California do not allow RPZ systems with direct connection to harvested water systems.

Air gap separation (Figure 2, above) for domestic makeup is the other option for backup and is universally accepted as safe. The air gap separation design requires the use of a day tank and a physical gap for the domestic water to freefall into the day tank. This method of protection against cross contamination is considered 100% reliable for keeping the integrity of the potable water system safe.

With these systems, booster pumps are used to generate water pressure for reuse. Level controls in the day tank allow the process control system to add domestic makeup through the air gap at controlled low-level start and high-level shutoff of a domestic makeup valve. This makeup valve is a normally closed valve that can be a solenoid or a motorized valve. Typically, spring-loaded valves (air to open/spring close) are not used because a

□ Figure 1. Direct connection system



compressed air source is not available. Many system designers normally use a solenoid valve with a water hammer-free design so that the valve has a built-in dampener to slow valve closing and prevent water hammer.

## HARVESTING

Rainwater harvesting involves collecting and storing large volumes of water in a cistern. Because it doesn't rain every day, rainwater systems are designed to maximize the volume of water collected so that the supply can carry through to the next rain event.

Treatment of rainwater is fairly straightforward—a series of filters remove debris and suspended solids (turbidity) in the water. The filtered water needs to be sanitized before its reuse. Sanitation is typically accomplished by using ultraviolet sterilization or a chemical agent, such as chlorine.

Greywater harvesting involves collecting raw greywater typically from showers, baths, spas and lavatory sinks. By code, this raw greywater must be sent to a sanitary sewer every 24 hours to prevent it from deteriorating into blackwater. Greywater requires more rigorous treatment to become reusable and NSF-350 compliant.

An important note is that once the raw greywater is treated, it's no longer classified as grey, which means it can be stored and reused for many applications. This is what is termed by the industry as onsite treated non-potable water. One advantage of using a greywater system in a residential building such as a dormitory, hotel, barracks or other institutional/recreational structure is that a new supply of water is created every day. Also, storage of processed water is greatly reduced as compared to a rainwater system.

## STORAGE/SANITATION

A day tank may be used for the sanitizing vessel for toilet flushing and cooling tower makeup applications. For irrigation systems, pumping directly from the cistern to reuse is common. In this case, the water travels directly to the final filtration

and sanitation step before it exits to the sprinkler heads of the irrigation system.

Water harvesting typically uses ball valves because they are quick opening and closing with a full-port flow profile and low pressure loss. Good design allows isolation of equipment for servicing without disrupting the entire system. For example, a common practice is to use ball valves on tank nozzles to allow servicing of downstream equipment without having to empty the storage tanks. Pumps have isolation valves to allow servicing of the pump without draining the entire pipeline. Also used in the isolation process is backflow prevention valves (check valves) (Figure 3).

Motorized, 3-way ball valves are used to allow one pump to direct flow for more than one purpose. This saves the cost of an additional pump as well as related controls. Figure 4 shows a motorized, 3-way ball valve used to send water to recirculation and sanitizing or to the process skid for treatment.



Figure 4. Use of motorized pumps



Figure 3. Rainwater skid showing ball valves, ball check valves and solenoid valves

## PREVENTING CONTAMINATION/TREATMENT

Prevention of backflow is an important part of any water harvesting system. Ball check valves are commonly used to guard against backflow in pipes when a pump is shut off and system pressure is lost. Check valves are also used to prevent domestic water or harvested water from backflow, which would cause contamination or intrusion of water where no one wants it to go.

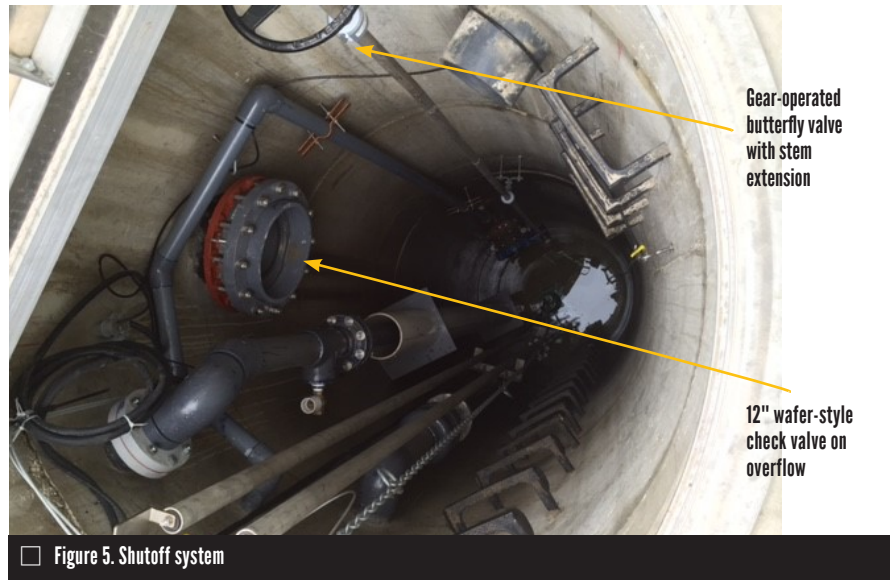
Small check valves, which are called injection valves, are used when dosing pumps are adding chlorine or blue dye chemicals to a pressurized line.

Large wafer or disk check valves are used with overflow systems on storage tanks to prevent sewer backup and rodent intrusion into the harvested water system.

Butterfly valves with manual or motorized operation are used as shutoff valves for large-size pipes (Figure 5). For below-grade applications, a manual, gear-operated butterfly valve is used to shut off the flow from cisterns, which often hold hundreds of thousands of gallons that will allow safe and easy service to pumps in wet wells. A shaft extension allows control of the below-grade valve from the grade level.

Some designers also use lug-style butterfly valves, which offer the ability to remove downstream piping so the valve can be a blocking valve. These lug-style butterfly valves are bolted to mating flanges from both sides of the valve. (Wafer-style butterfly valves do not allow for this feature). Note that in Figure 5, the valve and extension are located inside the wet well, which allows service access to the valve without the need for a valve box.

When actuated valves are required for below-grade applications such as cistern draining, electric valves are not a practical choice because electric actuators often fail in the presence of water. Pneumatic valves, on the other hand, are usually precluded because of the lack of compressed air supply. Hydraulic (water-pressure) actuated valves are often the solution instead. An electric pilot solenoid located safely near the control panel can send pressurized water to a normally closed hydraulic actuator to open or close the valve even when the actuator is submerged. With a hydraulic actuator, no danger of water contact with



the actuator exists, a situation that would be problematic with an electric actuator.

**CONCLUSION**

On-site water reuse systems aren't that different from other systems where flow must be controlled. Most of the principles that apply to the use of valves and other mechanical water-handling systems are simply employed in a different manner to

meet the unique requirements of this emerging new sector in the water industry. Still, with the call towards more sustainable buildings growing every day, it's likely that this industry is one that could be important to the valve industry. **VM**

**STUART BAILIN** is director of engineering for Wahaso Water Harvesting Solutions, a design-build firm specializing in commercial water reuse systems. Reach him at [stuartb@wahaso.com](mailto:stuartb@wahaso.com).



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# The Road to Valve Knowledge



BY GREG JOHNSON

Valve expertise is a journey, not a destination. The journey is spiced with new talents acquired and knowledge learned throughout the trip. But to put these informational destination stickers on a suitcase of valve knowledge and be labeled an “expert,” a person must begin with the desire to take the trip in the first place, then build on that desire.

The key is to develop and feed a passion for information, and the best way to accomplish that is one step at a time and one subject at a time. Hopefully, the roadmap presented in this article can help some VALVE Magazine readers make the trip successfully.

## THE TRAVELERS

Valve professionals come in many shapes, sizes and educational backgrounds. An interesting aspect of the industry is that everyone has the opportunity to become skilled in at least one facet of the business. It doesn't matter whether a person has a degree in engineering or a degree in education, a two-year degree in music appreciation or just a general education degree: Everyone has access to the road to valve expertise.

The actual path each person takes will be different, but that's a good thing, because in the end, each person's expertise will be unique. A person with a degree in mechanical engineering, for example, has a path quite different than that of a person working his or her way up through the ranks department by department. The route may not always be clearly marked, but it's there for everyone who has the desire and who makes that first step.

Let's start with a typical employee in the industry: We'll give that person a high school education and a few semesters of college. He or she is now in the sixth month of working for a manu-

facturer's representative selling quarter-turn valves.

Goal number one should be to develop into the very best quarter-turn product salesperson. Or, if that scope of knowledge seems too big to tackle at first, the person should focus on an easily digestible part of the quarter-turn product range such as ball valves or butterfly valves. This requires commitment and desire, maybe forgoing a night or two a week of television binge-watching to increase valve skills. The goal should be to become the go-to person in the company or group for a product or valve type.

## Executive Summary

**SUBJECT:** The valve industry has a wealth of ways its professionals can enter the busy pathway that travels from newcomer to expert.

### KEY ISSUES:

- Who is making the journey
- A map for getting there
- Resources that can aid along the way

**TAKE-AWAY:** It's important to remember becoming an expert is an evolving, constant process.

Being mentored is a great way to glean information, but that requires finding a willing mentor. Professionals who want to get ahead and who manage to locate someone in their organizations that can serve as a mentor should attach themselves to that person and ask all the questions they can dream up, just short of being a pest. But there is more to the journey than being mentored.

Here's my idea of a roadmap:

1. Take a valve basics course (VMA will be offering an expanded Valve Basics 101 course in the Houston area Oct. 3-5. See page 11).
2. Ask questions.
3. Ask more questions.
4. Obtain copies of catalogs for as many current products in a chosen area of study (quarter-turn valves for the example above) as possible. The internet is full of them, just for the downloading.
5. Obtain or copy older catalogs as well. The older catalogs are often full of informational material and in some cases, provide easier to understand examples and data. The older catalogs will also help to develop a history of the product range.
6. Ask to visit a valve repair shop or OEM service center and look at valves in their disassembled state. Ask questions, take notes and take photographs when that's allowed.
7. Start assimilating all this material into a digital file or (for those who are old school) a hard copy binder.
8. Read as many valve books as can be obtained. A later section of this article reviews many of the popular valve books published in the last few decades.
9. For basic knowledge in the physics and mechanics of valve operation, a college text on applied physics is useful. Those who are mathematically challenged should not worry: the arithmetic required for the problems is very, very basic.
10. Take the ASM International

online course "Metallurgy for the Non-Metallurgist." The course is not difficult and does not require any engineering background. The knowledge gleaned might even make a professional the go-to person for metallurgy in the company.

11. Subscribe to as many industry magazines as can be obtained. Number one should be VALVE Magazine, which is free to U.S. and Canadian subscribers. There also are numerous other good industry magazines, some of which carry high subscription fees and some with low- to no-cost subscriptions.
12. Finally, as information accumulates—pay it forward. Share what is learned with those around you. They will either learn something from it or confirm that the lessons being learned are correct.

If the goal is to gain actuator expertise or control valve expertise (as opposed to our example of quarter-turn valves), the road will be parallel, but will have some different scenery along the way.

The engineer's path is slightly different. A graduate engineer should already have a good knowledge of basic metallurgy and fluid statics and dynamics, for example, so the metallurgy and industrial physics course material would be redundant. However, the rest of the pathway still applies.

### STANDARDS AND SPECIFICATIONS AS A LEARNING TOOL

Reading and learning to understand valve standards and specifications can be a huge help on the road to valve knowledge. The information they contain can unlock mysteries in valve design and operation that make understanding valve functions much easier. (For a good summary of some current standards turn to page 32 of this issue.)

The refining, petrochemical and chemical industries rely on a multitude of American Petroleum Institute (API) valve standards and recommended practices. The best way to gain

access to API standards (aside from buying the current finished documents) is to locate an API committee member and ask that person to send copies of any current working drafts. Superseded documents can also provide a wealth of basic information and are often available cheap via eBay or other online sources. Those with contacts at end-user or engineering companies can ask them for outdated versions of valve specifications, since they are often discarded anyway.

Other sources of valuable information are end-user or engineering-contractor specifications. These company or project-specific specs often contain application information not found in other places. Don't worry if some of the information appears to be above current valve knowledge level. The information provided in these standards and specifications will help fill in some knowledge gaps down the road.

Here are some valve API standards and the valve types they pertain to:

Valve type	Standard
Gate valves	API 600
Globe valves	API 623
Check valves	API 594
Plug valves	API 599
Ball valves	API 608
Butterfly valves	API 609
Pipeline valves (all types)	API 6D
Valve pressure testing	API 598
Relief valves	API 521, 526 & 527

If the oil and gas industry is not your bailiwick, there are informative standards for other industries. The waterworks industry has standards for a variety of valve types, as well as actuators. People in the water/wastewater field should be aware of the standards put out by the American Water Works Association. For those in the control valve industry, the International Society of Automation (ISA) has standards for final control elements.

### ONLINE AND HIGHLY INFORMATIVE

There are excellent online sources of valve information available for

downloading by anyone.

For example, the Department of Energy (DOE) has an excellent, 50-page valve handbook that can be pulled down from the agency's website. It is the DOE Fundamentals Handbook, Mechanical Science, Volume 2 (DOE-HDBK-1018/2-93). The handbook was originally targeted to the nuclear industry, but the information is applicable to all valve industry segments, and best of all, it's free.

The most thorough valve application guide available for free download is the Electric Power Research Institute's (EPRI) Valve Application, Maintenance and Repair Guide. While much information on power plant applications is in that guide, including repair and maintenance, the whopping 400-plus pages also contains a huge amount of general knowledge.

Another free EPRI document is its Guide for the Application and Use of Valves in Power Plant Systems. While this guide obviously focuses on power applications, the overall valve information contained in its 500 pages is impressive.

To access EPRI documents on the web, go to EPRI.com. Then click on

EPRI Portfolio and after the new page loads, insert either of the article titles in the search box. Other informative titles available from EPRI are also available there: Just enter "valves" in the portfolio search box, and they'll pop up. However, many of the documents are not free and have price tags of \$25,000 and higher—feel free to ignore those documents!

Valve seminars and forums also can be informative and are often topic-specific in focus. VMA puts on a valve technical program each year that offers many interesting and useful tracks that go beyond the basics. API also holds a Tank, Valves & Piping Conference in early winter each year, offering a dozen or so informative valve presentations.

As this article mentions, there are excellent resources available for free on the internet. However, here's a "caveat emptor": even though the buyer is paying nothing for the information, he or she needs to be aware and diligent in assessing the credibility of internet sources. There also are companies putting lots of words and images out there for downloading that almost plagiarize others works

and some don't have the capability of getting it right, much less the ability to create their own "expert" content. Usually, the larger the company and the more well-known it is, the more reliable the information.

### THE VALVE PROFESSIONAL'S BOOKSHELF

A dozen or so valve books have been written over the past four or five decades. Even though a book may have been published before a valve professional is born, it doesn't mean that the information is bogus or out-of-date. Many timeless texts are available on the used-book market that can really help with the journey to expertise. The following section contains short reviews of many of the valve books written since about 1965. Also included are a couple of non-valve titles that are nevertheless very informative. Any out-of-print books can be found on eBay and used book sites such as AbeBooks ([www.abebooks.com](http://www.abebooks.com)).

**Handbook of Valves and Actuators** by Phillip Skousen: This book covers all the basics, including pressure ratings and valve types; however, it is first and foremost a reference for

# Help Create Valve Standards

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

[boneill@mss-hq.org](mailto:boneill@mss-hq.org), or [www.mss-hq.org](http://www.mss-hq.org).

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

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



**The Manufacturers Standardization Society  
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tion and sizing, materials and valve positioners in depth.

**The Valve Primer:** This little 4-inch by 6-inch book is the pocket reference for the valve industry. There are no frills, just easy-to-find information on virtually everything valve-related. Everyone in the valve industry should own a copy of this primer. It is a great refresher for the experienced valve professional and a potential "I can answer that question in 60 seconds" book for the valve newbie.

**Lyons Encyclopedia of Valves** by Jerry Lyons: This encyclopedia contains something for both the experienced valve engineer and the industry newcomer. The illustrated, 72-page valve terminology section is thorough, though it focuses somewhat towards the control valve segment. Some very technical information in this book such as valve spring design and fluid power symbols and standards will only be appreciated by a specific group of valve professionals.

**An Introductory Guide to Valve Selection** by Smith & Vivian: This book, which is published in the United Kingdom, is general in scope. It also offers much of the same information

found in the Lyons Encyclopedia. However, the publication does cover special valve applications along with a good overview of valves for upstream and midstream petroleum applications.

**Crane Catalog #60**—This catalog was printed nearly 60 years ago, but much of the information in its pages is timeless. By studying the gate, globe and check valve designs and materials, a valve professional can gain a good understanding of where many of our designs of today originated. Copies of the catalog are available on eBay where the book is often offered for sale at ridiculous prices aimed at ignorant plaintiff's attorneys involved in the asbestos litigation industry. Don't pay over \$20-30 for a copy.

**Fundamentals of Applied Physics** by C. Thomas Olivo: This publication can be found used for less than \$10. Covered in the content is basic machines, properties of liquids and solids, basic mechanics, threads, fluid power and electricity. An updated college textbook covering the same material is Applied Physics, which can be purchased used for about \$20. The material is easy to comprehend and

will help readers understand what happens to fluids under pressure and in motion. The basic mechanics segments also help in understanding stems and actuators and how they work.

**Metallurgy for the Non-Metallurgist** edited by Arthur C. Reardon: This book provides an important background for valve materials knowledge. Many material questions that come up along the valve expertise trail are answered in this book. Those professionals who can't take the ASM course mentioned in my roadmap can use this volume as the next best thing.

**Petroleum Refining in Nontechnical Language** by William Leffler: This publication offers an excellent overview of refining operations. The material can be helpful for those supplying and specifying valves into the refining industry. Learning about customers' businesses is always a positive thing. Those professionals involved in the downstream valve segment can rely on this volume for some great background information.

## CONCLUSION

No one becomes an expert overnight, and the journey to valve expertise is no exception. The trip is much more of a steady jog than a sprinted race, so individuals need to take their time and enjoy the trip.

They also need to learn that the pace is occasionally disrupted by life's realities. However, the best investment valve professionals can make is in themselves. Along the pathway to expertise, confidence will grow as the miles of lessons learned are collected, collated and shared. Soon the valve expertise learning trip will result in fewer and fewer questions asked and more and more questions answered.

The engine is running for valve professionals, so it's time to hop in the car and get going.

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



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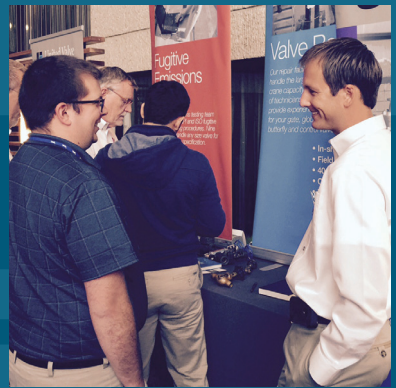


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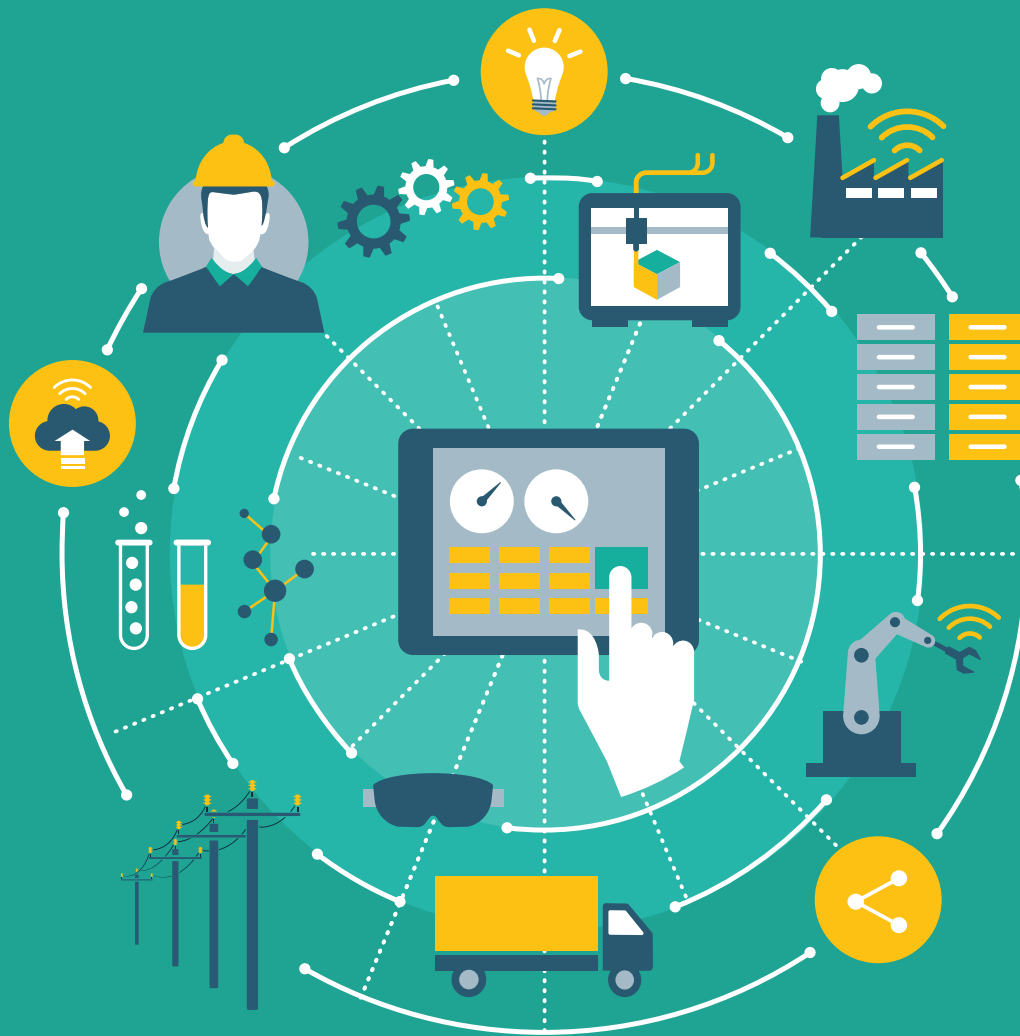
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# Monitoring Valve Health via the Internet

BY JONAS BERGE

Most valve end users are already using smart valve positioners on some control valves, but they may not have time to check the valve diagnostics software to notice if any valves are developing problems. Imagine instead simply getting a weekly report listing which valves need attention.

The Industrial Internet of Things (IIoT) enables valve experts at corporate engineering or company expertise centers to monitor the health of the valves in a plant remotely to drive better valve performance over the lifespan of those valves. Related equipment such as pumps also can be monitored.

IIoT is just starting to be a catch-phrase, and those considering its use are often left wondering how to get started. Many plants have chosen a phased approach to implementation, starting within the plant, then connecting to the internet much later.

## Executive Summary

**SUBJECT:** The day has arrived when how well valves and equipment are faring can be monitored from a central location through the Industrial Internet of Things.

### KEY ISSUES:

- What IIoT is
- Steps to a logical approach
- Where money and time are saved

**TAKE-AWAY:** The most effective way to implement IIoT for many companies will be using a phased approach.



□ Figure 1. The phased approach

## PHASED APPROACH

Some plants already use digital networking at the field instrument level. Those that bring the data across the internet to a center of operations are deriving the benefits of IIoT. However, most plants are not yet there. For these plants a step-by-step solution for deploying IIoT may be a good solution (Figure 1).

The first several steps do not connect to the internet, which means the instrumentation and controls (I&C) department can launch an initiative right away. The information technology (IT) department gets involved later, when access across the internet is implemented.

### Step 1: Plant-wide Digital Field Communications Networks

Some of the many plants that already use smart valve positioners are digitally integrating them with intelligent device management (IDM) software for centralized control valve diagnostics. Modern plants built with a control system that has digital fieldbus communication networking to integrate instrumentation typically use intelligent valve positioners.

Control systems based on 4-20 mA that do not support the HART communication protocol require the instrument engineer to bring a laptop with a modem into the field to perform valve diagnostics, which hampers valve management. Deploying HART multiplexers would be costly and could damage existing marshalling cabinets.

Adding wireless sensors and integrating them with the existing control system makes the plant more efficient and reliable by covering measurements left out of the original design. This proves the technology works.

By installing wireless adapters on smart valve positioners, the valve diagnostics also can be accessed across the wireless field network (while control still uses the real-time analog 4-20 mA signal). Modern plants built

on fieldbus allow easy connection of additional sensors but also deploy wireless sensor networks.

Some equipment data is collected manually, which encumbers condition monitoring and energy management. Yet deploying 4-20 mA transmitters would be expensive and could damage existing cable.

A good place to start the process of stages is by deploying WirelessHART (IEC 62591) networks in each plant unit. Using the correct protocols, gateways connect to the distributed control system (DCS), historian and condition monitoring software.

The IIoT solution must be an extension that is backwards-compatible with the existing networks in the plant. Fieldbus and wireless instruments form the base layer for the IIoT.

Once the WirelessHART network is deployed, sensors that will meet the needs of departments that deal with reliability; maintenance; energy efficiency; operations; health, safety and environment (HS&E); and integrity can follow.

### Step 2: Instrumenting Assets

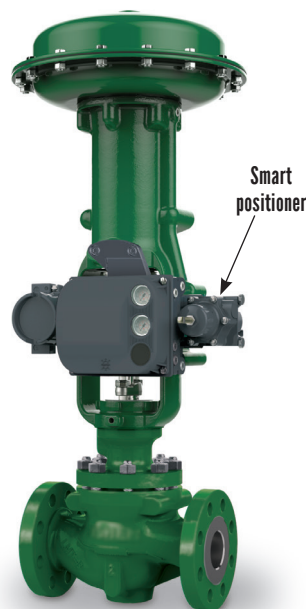
If a plant is using fieldbus, the valve positioners are already intelligent, and sensors for condition monitoring of other equipment can be added easily to the same fieldbus networks. If a plant is built on 4-20 mA and on-off signals, valve positioners may not be smart. A good step forward is to modernize all control valves with smart valve positioners, starting with the most critical valves (Figure 2).

Sometimes smart valve positioners were not deployed in the past because the control system did not support HART communication pass-through. This is no longer an issue because smart valve positioners fitted with a wireless adapter send data to valve diagnostics software through a wireless gateway bypassing the DCS.

A discovery session should be conducted to identify critical control valves, see if they are digitally integrated with valve diagnostic software and ascertain if the HART communication is still working (not just the 4-20 mA signal). In addition, each department should be contacted to ascertain their challenges in areas beyond control valves and identify opportunities to improve plant operability and maintainability. Some areas of concern could be manual data collection, inability to predict failures, maintenance prioritization, optimizing corrosion control, pinpointing fouling, energy overconsumption and leaks.

From the needs identified in this modernization audit, the sensors required to instrument each piece of equipment can be identified. Some measurements will be displayed in the historian and some in the control system. Simple applications such as data collection do not need specialized software.

Applications can grow domain by domain. Many plants have started with a single sensor per piece of equipment then added more sensors



□ Figure 2. Control valve with smart valve positioner



□ Figure 3. MOV digitally integrated using standard protocol

to gain additional insight.

Once the smart valve positioners and additional sensors are in place, personnel will spend less time on manual data collection. They also can predict failures, prioritize maintenance, optimize corrosion control and detect leaks. They can use wireless acoustic transmitters on relief valves to monitor releases and passing. Personnel are usually surprised to detect so many failures when the system is activated, since they were not visible in the past.

This added capability drives maintenance activities and operations, reduces cost, downtime, losses and incidents. Behavior will change from a reactive maintenance culture to a predictive one that identifies problems early and helps to prevent failures.

It is interesting to note that an intelligent valve positioner is actually a collection of sensors conveniently housed in the positioner enclosure mounted on the valve. These sensors monitor position, supply pressure, actuator pressure, temperature and air mass flow (through inferential sensors). In other words, valves are monitored by several sensors just like other equipment such as heat exchangers and pumps. The principle is the same—these sensors collect data analyzed by algorithm in the positioner to diagnose the valve, although some diagnostics and visualization is done by software on a computer.

Along this vein, if electric actuators and motor-operated valves (MOVs) are hardwired or use proprietary digital communication networks, they should be upgraded to use standard FOUNDATION fieldbus communication instead to make the MOV diagnostics accessible. This is so that they can be part of a predictive maintenance program on the premises or part of the IIoT

connected service solution. It doesn't matter if the rest of the plant is using 4-20 mA and on-off signals; the MOVs can still use fieldbus (Figure 3).

Plants built on FOUNDATION fieldbus may have intelligent on-off valves digitally integrated through the fieldbus network. In this case, the on-off valve diagnostics can also be monitored through IIoT-based connected services (Figure 4).

### Step 3: Deploy Predictive Analytics Software On-premise

Plants store lots of process data while analyzing only a small amount of that data. Most plants today do not capture much equipment data at all.

Control valve data is collected by the sensors in the valve positioner. This valve data has to be analyzed to provide actionable information to service engineers, however. Some analytics are done in the positioner itself; others are done in valve diagnostic software. Most diagnostics are non-intrusive: They are performed while the valve is controlling without disrupting the process. Other diagnostics are intrusive and can only be done when the process is not running.

Certain valve diagnostics are continuous and others are scheduled on a periodic basis. Fieldbus positioners, for example, continuously conduct performance diagnostics, so this diagnosis need not be scheduled. Intelligent on-off valves and MOVs that are inte-

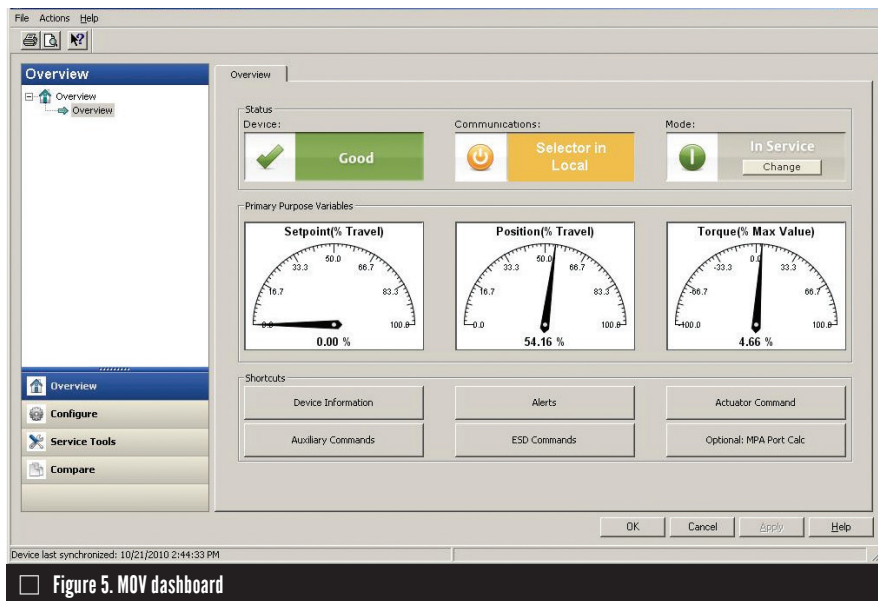


□ Figure 4. Intelligent two-wire on-off valve using fieldbus communication

grated using standard fieldbus protocols can be managed from the same IDM software as the control valves and other instrumentation.

A simple dashboard based on the electronic device description language with an at-a-glance view of the overall health of the valve package will be the first place instrumentation readings appear (Figure 5). From there, instrument technicians can zoom into greater levels of detail such as valve diagnostics, including description of problems along with recommended action (Figure 6).

Some process equipment challenges



□ Figure 5. MOV dashboard

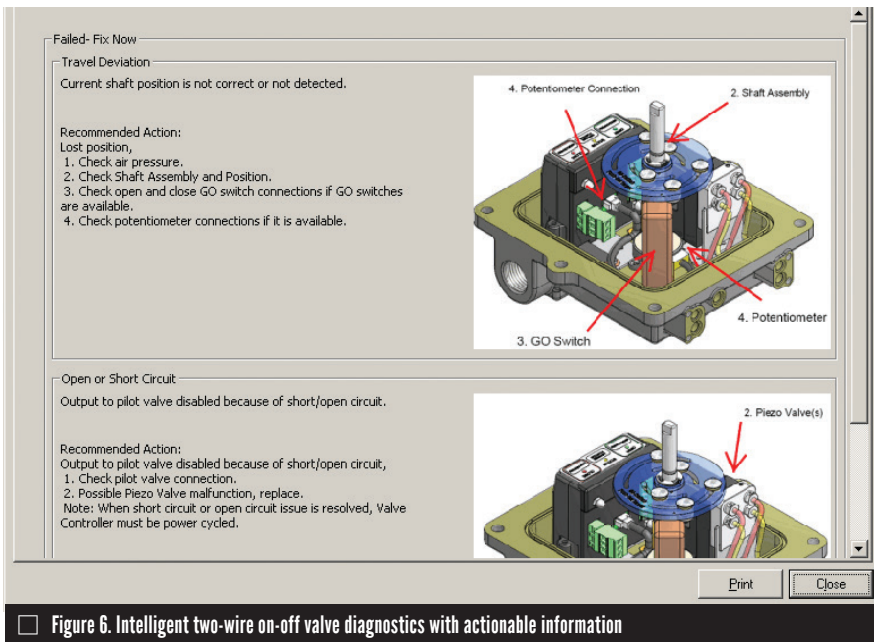


Figure 6. Intelligent two-wire on-off valve diagnostics with actionable information

require more advanced solutions with more than one measurement needed to diagnose the health, determine the performance and detect overconsumption of the equipment. For instance, vibration alone is not enough to get a complete picture of pump, compressor or fan health.

By deploying smart positioners, intelligent on-off valves, digitally integrated MOV and software, valves become smart valves. Similarly, by deploying sensors and software, process equipment becomes smart, connected equipment; pumps become smart pumps.

This software extracts actionable predictive information from raw sensor data. For instance, each heat exchanger bundle is trended to visualize how fouling responds to product blends and anti-fouling chemicals. Valve and equipment diagnostic software can run on an on-premises server—there is no need to connect to the cloud in this case, so an internet connection is not needed.

Because of all these factors, consideration must be given to a budget for engineering and commissioning.

As stated earlier, the solution must be backwards compatible with the existing control system as well as historian software in the plant. OPC applications form the software layer for IIoT. An additional layer of middleware software should not be required; it also shouldn't be neces-

sary to replace the existing historian platform.

With special software, the plant also can gain the ability to pinpoint fouling and energy overconsumption, and optimize fan speed. This ensures high availability of this equipment at low cost, reduced maintenance time, reduced energy consumption and more.

#### Step 4: Review Work Processes

Once the smart positioners, sensors and software are in place, the standard operating procedures (SOPs) can be modified to proactively use the software in the daily operation

and maintenance of the plant, rather than having to manually inspect valves and equipment. Rewriting SOPs is an important step that should not be missed.

If the plant is managing valves on premise, the SOP for engineers should be to review the instrument diagnostic alarm log each day to catch valves with developing issues and to drive maintenance based on that. The SOP for a complaint from operations about a valve would be to check the software first, before going to the field to verify a problem with the valve and what's needed to fix it.

Similarly, if the plant is managing process equipment such as pumps and heat exchangers on premise, the SOP for engineers is to also review the alarm log every day to spot equipment that is developing issues early and drive maintenance accordingly. To put this into place, maintenance should get predictive alarms before operations and before trip.

Lastly, staff must be trained to use the new information. Once software is set up properly, the plant will get into a "check the software first" mentality, which saves time and reaps the benefits.

#### Step 5: Enable IntRAnet of Things

A site may not have sufficient staff with valve diagnostics, vibration analysis or corrosion experience. This can be a particularly difficult prob-

## GLOSSARY

**HART:** Digital communication protocol superimposed on top of 4-20 mA analog signals. Used between handheld field communicator and instrumentations such as transmitters and valve positioners, and in some plants also for IDM software.

**Fieldbus:** Purely digital networking used between instrumentations such as transmitters and valve positioners, and the control system including IDM software. Designed specifically for the industrial plant environment; long distance, hazardous areas, time-critical, etc.

**Distributed Control System (DCS):** The system that controls the process, by reading sensors and manipulating valves and other final control elements. Consists of input/output system connecting to field instrumentation, controllers executing the control strategy, servers for data storage and process supervisory function, as well as workstations for operators and system configuration.

**Intelligent Device Management (IDM) Software:** The software part of an asset management system enabling central device configuration and condition monitoring as well as calibration management.

lem in areas challenged with attracting employees for work in remote sites away from their families.

By connecting the valve and equipment condition monitoring systems to an enterprise intranet, the data from the site can be accessed across the internet by company employees anywhere in the world, such as an onshore office or a global center of excellence with valve, vibration analysis and corrosion experts. Access is not granted to external vendors and service providers. This is more of an IntRAnet of Things than an IntERnet of Things.

**By connecting the systems to the internet, access to data from the site can be granted to selected external vendors and service providers anywhere in the world. This is the full Internet of Things architecture.**

Intranet connectivity enables some personnel to work in an office near their homes rather than on an offshore platform or other remote area. It also lowers the capital and operational cost since offshore installations can have smaller living quarters, and less transport logistics are required.

#### **Step 6: IntERnet of Things Business Models**

A plant may have fieldbus valve positioners and wireless sensors but without an internet connection for remote monitoring; this is not yet IIoT.

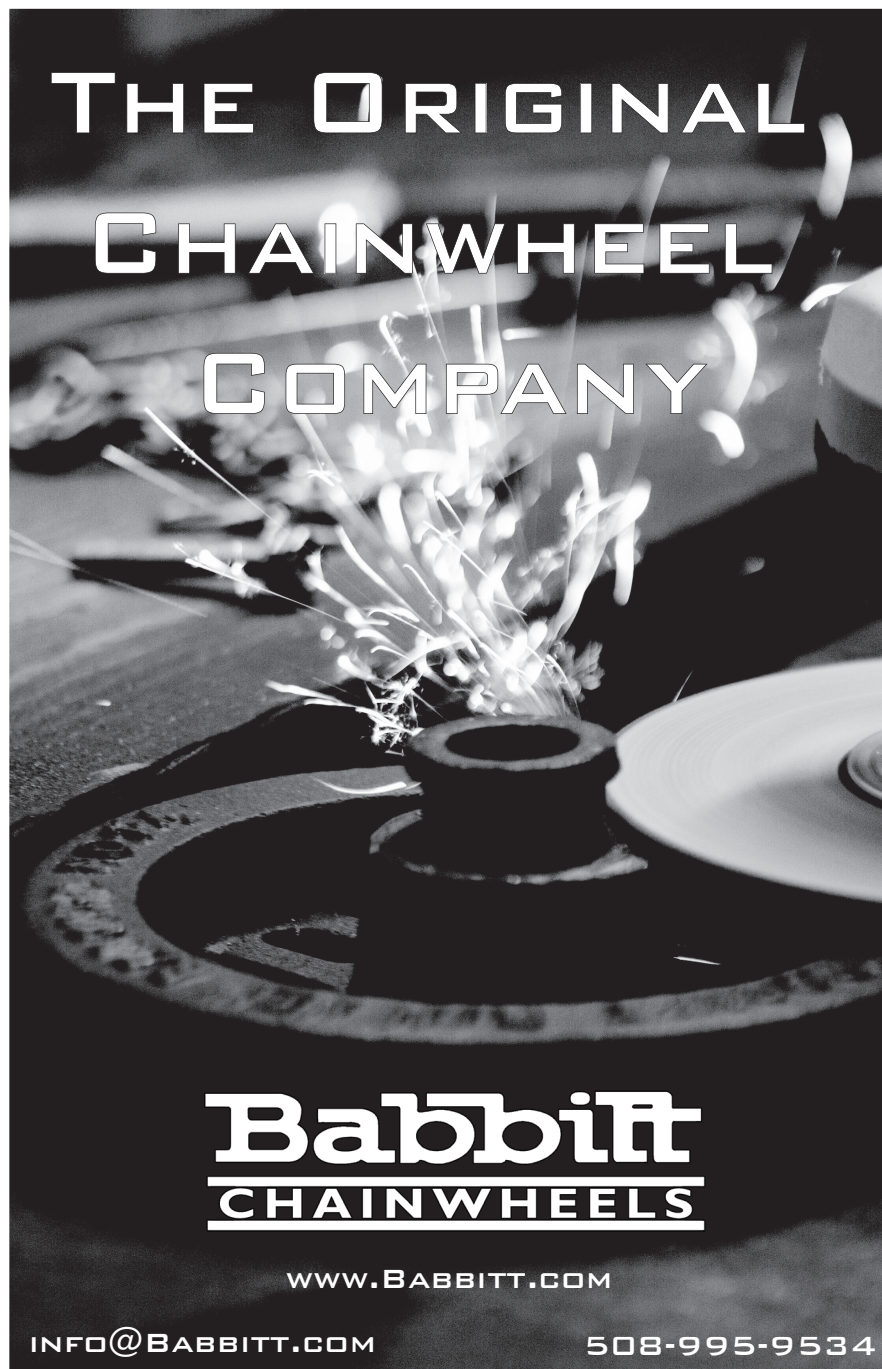
The valve or process equipment manufacturer's expert knows the equipment best but is not onsite. A site may not have sufficient personnel to troubleshoot problems. In the past, a remote expert would have to request site personnel to run various tests, take photos and make screen captures, then send them across communications channels. Problems could take days to resolve under this scenario.

By connecting the systems to the internet, access to data from the site can be granted to selected external vendors and service providers anywhere in the world. This is the full Internet of Things architecture. Digital valve positioners and sensors with IIoT enable a digital transformation of outsourced business models.

#### **BUSINESS MODELS**

Some independent service providers and OEMs can remotely monitor the health of equipment in plants. Their experts, who are in a central location, watch the status of equipment for which they've been granted access. These can be subscription-based services where the plant pays a monthly fee per asset (such as a valve or compressor). The service provider alerts the plant to equipment issues that are developing and generates reports for equipment health and performance, which drives maintenance in the plant.

The instrumentation involved in this service can belong to the plant, but the service provider could also provide the instrumentation and use its own software. In that second model, no upfront capital investment for the plant is required. Instrumentation and software is included in the



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subscription fee, which is an operational expense. For instance, in the case of pump monitoring, the service provider would install vibration, pressure and temperature transmitters on the pump, motor, mechanical seal and strainer, etc., to collect required data.

Furthermore, the manufacturer's factory-trained personnel or a maintenance service provider might carry out the maintenance tasks to ensure availability and efficiency of the equipment—an outcome-based model that might possibly mean bonus payments when an agreed level of service is attained. For instance, in the case of a valve, the manufacturer would not only provide a report listing problems, but also go to the site to fix those problems.

Using the data from the equipment, the service provider could predict developing issues before failure or trip, avoiding downtime and helping to troubleshoot equipment while getting production back to capacity sooner. If the plant has a problem with a valve, they can call the valve manufacturer's pool of experts, which can remotely access and diagnose the

valve. In this scenario, problems could be solved in minutes instead of days of bouncing emails back and forth.

### CYBER SECURITY AND IT/OT INTEGRATION

Considering the multitude of asset classes in a plant such as valves, compressors and pumps, and more, several manufacturers might have to be granted access to equipment data. This requires developing security with specific access rights for each vendor. Such arrangements already exist in many places. Since IIoT involves both the internet and instrumentation, the IT and the I&C departments (information technology and operational technology) must work together. Like the saying goes: "good fences make good neighbors." A clear boundary of responsibility between IT and I&C should be developed, usually a demilitarized zone with firewalls at level 3.5 of the enterprise architecture.

In some plants, the equipment monitoring system is separate from the control system. The wireless sensors send their data through the

wireless gateway and a 3G mobile router straight to the software in the cloud, bypassing the DCS. This architecture is used for outsourced, remote monitoring services. Since there is no connection to the control system or plant networks, the plant IT department need not provide a network connection.

### IMPLEMENTING IIoT

Many suggest that developing a plan for IIoT for the plant should be a three-year process starting with a discovery session to uncover modernization opportunities around the plant. The later steps of the IIoT strategy need not have much detail initially.

With IIoT in place, the plant can be run and maintained in a proactive and less reactive manner. Personnel will spend less time collecting data, and have more time to work on the equipment, which improves reliability and performance. ■

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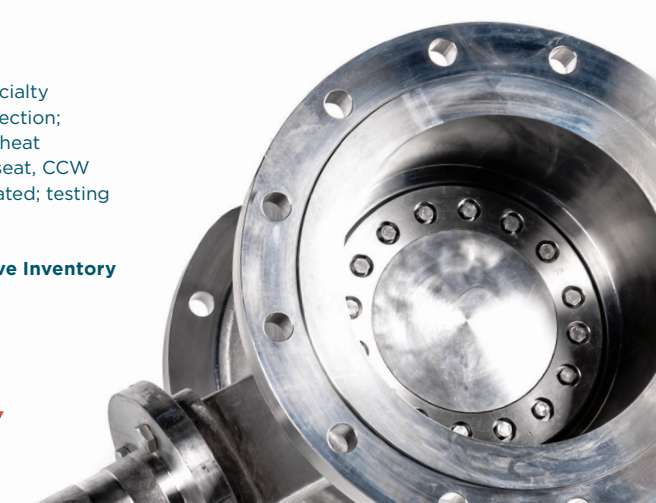
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# An Update on U.S. Valve-Related Standards

BY CARLOS DAVILA, PE

It takes much time and effort by many people to upgrade existing codes and standards, or to develop new ones. The process begins when a parent standards organization (see below) forms a task group to work and prepare an initial draft or investigate proposed changes to an existing document.

This preparation or revision process is complicated in itself, but then there is the approval process, which is especially cumbersome when a draft is balloted and many comments or negatives are received. These comments and negatives must be addressed before a new (revised) draft is prepared. The whole procedure may repeat itself many times until a final is finally approved by the applicable committee membership.

There are also substantial resources involved in producing or revising a valve standard. Individual volunteers lose time from daily work and spend money on travel. The organizations involved have substantial overhead costs in getting the standard reviewed, addressing comments and going through the voting procedure.

Still, because industrial and public safety are paramount, most industry professionals feel the cost and efforts to resolve negatives is necessary to ensure that the standard is useful for the industry.

## Executive Summary

**SUBJECT:** The valve industry keeps a close eye on what happens within the various standards organization that determine guidelines to follow and when.

### KEY ISSUES:

- What's happening at ASME
- API revisions
- MSS, ANSI and more

**TAKE-AWAY:** Keeping up is a constant task but well worth it for those in the industry aiming for quality.

Here is a summary of what's happening that valve professionals are monitoring.

## CURRENT CHANGES UNDER WAY

### **American Society of Mechanical Engineers (ASME)**

ASME is working on several issues including:

**ASME B16:** The ASME B16 Standards Committee is under the ASME Board for Pressure Technology Codes and Standards. Seven subcommittees with balanced memberships are responsible for about 34 standards. The published standards are ANSI accredited.

A new B16 Technical Committee on pressure and temperature (P/T) ratings has been established to provide ratings needed for all ASME standards.

**ASME B16.34 (2016) Valves:** An addition was published in 2016 in which the scope extension of flanged and weld-end valve sizes was changed from nominal pipe size (NPS) 24 to NPS 60 to match B16.47 flanges.

Paragraph 6.1.2 was balloted and approved for the next edition. The proposal was to revise 6.1.2c and delete sub clauses (1) and (2), which were revised in 2009. This caused some manufacturers of three-piece ball valves to substantially increase the wall thickness of the center body, resulting in additional weight of larger valves. Extensive discussions led to a compromise to offer both options—to use the old or the new methods to calculate wall thickness. A major review of needed material and P/T ratings corrections was conducted and will be included in the new edition. All the tables had to be revised to comply with the new titles and numbers for the materials.

A case to use increased ceiling pressures for creep-strength enhanced ferritic materials (F91, F92 and C12A) was approved. This can be used to increase the P/T ratings.

One of the problems with B16.34 was that it took a long time to add a new material. Because of this, a

case was developed and approved to add materials not currently listed in Table 1 of B16.34. This is more of an approval procedure than a case and must be supplemented with actual material strength data. It requires approval by B16 SC-N.

The new edition allows the use of ASTM Editions, other than those referenced in the B16 standard, with stated guidance and conformance. Additionally, International Organization for Standardization and MSS [Manufactured Standardization Society, see below] documents are referenced as guidance for construction of cryogenic bonnet extensions. The Subcommittee N continues to develop a similar standard for plastic valves, although progress is very slow because there are no P/T ratings for many of the plastic valves.

**B16.10 (2016) Face to Face, End to End:** A new edition of this was published in 2016. Major changes and additions include:

Sizes are extended to NPS 60 and new face-to-face dimensions including API 6D, AWWA [American Water Works Association] and MSS Standard Practice (SP)-135. Knife gate valve dimensions were adopted. These changes and additions were major revisions to B16.10.

**ASME B16.5 (2016) and B16.47 (2016), Pipe Flanges:** New editions were published in 2016. NPS 22 was added to complete the sizes range in B16.5, and P/T tables were reviewed to correct discrepancies.

**B16.11 (2016), Forged Fittings:** A new edition was published in 2016 that restricted production to disallow non-cylindrical fittings to be made directly from bar. This edition also added coverage for "branch outlet fittings" other than couplings.

**16.24 (2016), Cast Copper Alloy Pipe Flanges and Flanged Fittings, and Valves:** A new edition was published in 2016 and the title was changed to include "Valves" because it now covers cast copper alloy valves. The scope was incorporated to include

C95200 and C95400 copper alloy valve construction data and P/T tables were developed.

**ASME B 16.25 (2012), Buttwelding Ends:** The next edition will be published in 2017. It will include the addition of NPS 1/2–2 and NPS 50–60 in Table 1. There were some incorrect dimensions in Figure 1. The dimension described at  $t_{nom}$  in the figure is not shown correctly in the original so the symbol was eliminated and the requirements were clarified. Also, a ballot was approved to revise Figure 1 to add B36.19 SS piping BW end geometries.

### **American Petroleum Institute (API)**

API's main body is the Committee for Refinery Equipment. Two working subgroups are the Gate, Globe & Check Valves and the Quarter Turn Valves & Quality. The committee has a balanced membership and the standards are ANSI accredited.

**API 594, Check Valves:** It took a long time to get this standard through because several revisions were proposed and had to be included. The 8th edition has been approved and is in the process of being published. Sizes are covered to NPS 48. However, they were extended to include odd sizes such as NPS 26, NPS 28, NPS 32, NPS 34, NPS 38, NPS 40, etc., to be sure all the industry sizes were covered. Figure 1 has been revised concerning gasket interruption to align better with designs being manufactured currently on retainer-less products.

A new table was added listing new face-to-face dimensions to provide double flange valves in all sizes and pressure classes. Table 3 was created so that double flanged valves could be purchased in many sizes (they are only offered as lug presently).

One major discussion involved insisting that a pipe plug must be seal-welded when it is used as a pin retainer on type B valves (bolted swing check). Several major failures had been reported.

As of this publication, 594 is not

released yet, but it will come into force six months after publication of the standard.

*API 599, Metal Plug Valves:* The 7th edition was published in 2013, and a task force has been formed to update provisions. The committee is looking for comments from the field to develop the first draft for balloting.

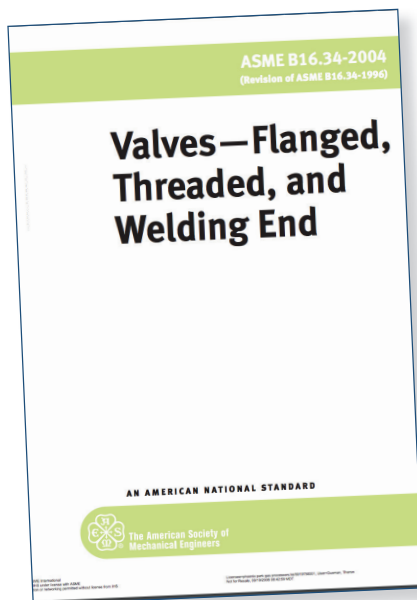
*API 600, Gate Valves:* The 13th edition came out in January 2015 and extended the size range to NPS 48 and included NPS 26, NPS 28, NPS 32 and more. The Trim Table was revised to eliminate Trim #1 (410 SS) and Trim #2 (304 SS).

A requirement in this latest edition is that valves must be capable of being installed and operated with the stem in the horizontal position and comply with API 624 on fugitive emissions. Those who do not conform cannot call the valve API 600 compliant. Gasket confinement in bonnet and packing chamber design was addressed.

*API 607, Fire Testing:* The 7th edition published in 2016 allows a valve to be in the closed position prior to testing. An open position test was evaluated, but not allowed. Material qualification remained in three groups: ferritic, austenitic and duplex. Also, the new edition allows the same through-seat and external leakage rate, which is higher during burn than the fourth edition allows.

*API 608, Metal Ball Valves:* The 5th edition was published in 2012 and a task force is working to update the next edition. A section is being added to note double-piston-effect seats are outside the scope of the standard, and an option is being added for parallel threads for plugs. Direct mounting of actuators will be addressed.

*API 623, Globe Valves:* The 1st Edition covering globe valves was published in 2013. Stem diameters increased and material requirements were improved over older stem valves that were having many problems. Operational requirements for stop check valves are described and hardfacing of seat and disc seating surfaces is required for



greater than Class 900. A task force has been formed to start the revision process for the next edition.

*API 641, Fugitive Emission Testing, Quarter Turn Valves:* The 1st edition was just published in October of 2016. It sets out requirements and acceptance criteria for type testing of valves based on EPA Method 21. The test medium must be methane with 97% purity; no helium is allowed in this particular standard.

Valves greater than NPS 24 and Class 1500 are outside the scope of this standard. There is a total of 610 mechanical and three thermal cycles beginning at ambient temperature and maximum leakage of 100 parts per million by volume, static and dynamic. No stem seal adjustments are allowed during valve testing.

#### **Manufacturers Standardization Society (MSS)**

Membership is comprised exclusively of manufacturers. Because of the lack of a balanced membership, the standards are not automatically ANSI approved. If MSS wants a standard approved by ANSI, it must go through an ANSI canvas approval process. Many technical committees are responsible for the updating of standards every five years as well as developing new ones.

*Steel Flanges (TC 110):* SP-44 steel flange standard was revised to com-

ply with API and other organization reviews. It was published in 2016, but a new SP for slip-on and lap-joint flanges is being evaluated.

*Quality (TC 304):* A newer standard, SP-147, Quality Standard for Steel Castings was issued in 2014, and the newest (for plastic-lined ferrous metal valves) is being finalized. The standard was requested by Exxon. It is nearly finished and going to ballot. If the results are positive, it will be published in 2017.

*Butterfly Valves (TC 407):* Two types of butterfly valves are covered. SP-67 is basically the common single-rubber-lined butterfly valve. No changes were made. However, SP-68 covers high-pressure butterfly valves with offset design, and it is being revised to align requirements with API 598 and ASME B16.34.

There is a new SP-150, valves for hydrogen peroxide service, issued in 2015. It is the only standard in the industry for valves in hydrogen peroxide service.

*Knife Gate Valves (TC 409):* SP-135, High-Pressure Knife Gate Valves was published in 2016 and a new SP-151, pressure testing of knife gate valves was also published in 2016.

New SP for class-rated double block and bleed knife gate valves is being evaluated and is in the process.

*MSS Active Projects:* The committee is working on a general review of SP-134, Valves for Cryogenic Service including body/bonnet extension requirements to be aligned more closely with industry requirements. Also in the works are new SPs for severe service valves, fugitive emission testing of instrument valves and for special leak-test methods and procedures for valves for high-pressure testing for gas.

The above are a few of the current events in the standards world. Stay tuned to **VALVE Magazine** and **VALVEmagazine.com** for updates. ■

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# Is it Time to Toss those Commissions?

BY FRANK HURTTE



It's tough to pinpoint exactly what and when developments happened in the distribution industry prior to the internet, but based on conversations with past leaders, the commission model of selling started in the early 1960s. By the end of that decade, commission-based compensation models were the norm.

Here we are a half century later and nearly everything about valve distribution has changed except the compensation plan. The whole concept of commissions for the sales team has become as comfortable as an old shoe. For all but a few of us, commissions have been around our entire lifetimes; yet our environment has changed dramatically. Should we be considering new ways? To look forward, let's take a look at how we're set up.

## OUR CUSTOMERS

First let's consider what's happened with end-user industries that heavily use today's distribution systems. Economic conditions have tossed and turned the petrochemical and process industries. In response, many companies have downsized engineering and technical resources. For the valve distributor, customer contacts within these companies have sometimes assumed the motto of "don't call us, we'll call you." Yet a great deal of the question-answering that gets done comes via the phone. Customers also report they are spending more time researching technicalities online rather than turning to a seller of a product for information.

Furthermore, the model of today in industrial manufacturing has changed dramatically in just the last decade.

Distributors have always existed

to serve customers; when customers' needs shift, distributors respond. Twenty years ago, however, distributor's outside salespeople were quite often the only link between the distributor and the end user of the product. Today, it's not unusual for customer connections to occur with a half-dozen folks. Product specialists, application engineers and application-savvy inside sales folks have been added to the payroll of valve distributors to provide timely technical answers and augment the selling process.

In the past decade, distributors have invested massive amounts of money in productivity tools, marketing efforts and software, all designed to make selling easier. Yet the commission rates have remained largely unchanged. In other words, the commission model lingers while, quite frankly, the time of easy fixes for technical issues is over. It may be time for radical change. To illustrate why, here are a few pieces of evidence commonly observed in many distributor's sales departments:

- *Sales teams resist customer relationship management (CRM) system implementation.* Progressive distributors have discovered team selling requires data; the kind that can only be found with CRM systems. The first order of business for such systems, however, involves accurate data on the customer (of the "name" and "functional position" variety). Yet many distributor managers report foot dragging and poor quality of information coming from some salespeople. Opportunity tracking helps management predict

the future and forecast more efficiently; but again, the information is often lacking. Salespeople may see very little immediate commission-centric value in all of these CRM activities. Simply put, their incentives don't align with business goals.

- *Salespeople are slow to introduce strategically important new products.* This phenomenon just doesn't make sense to some product managers within the distributor companies. They see the importance of the new technologies to the future, yet their very best sellers lag in launching the business. Again, commission probably has an impact. Commissions are needed now—the missionary work for long gestation sales opportunities produces nothing, at least for the immediate future.
- *Salespeople throttle the efforts of other team members.* In researching the book *The Distributor Specialist: Customer Champion, Profit Generator!*, specialists at over a dozen valve providers were surveyed. This research discovered a strange issue: Salespeople often resisted efforts to introduce a specialist to key customers. Candid conversations point to issues that include concern from the salesperson over sharing the credit for driving a sale. While this could be an ego issue, it's also likely caused by concern for income security based on commission dollars.

Some end-user customers have developed ties to the inside sales and technical support teams within the distributor that eclipse the relationship developed with the

CONTINUED ON PAGE 44

# Christmas Tree or Wellhead?

BY JESSICA LEE

In the complicated but vital industry of drawing oil and gas out of the earth and getting it to the surface, people often get confused about the difference between a Christmas tree assembly and a wellhead. Although the terms are used interchangeably, they are not the same piece of equipment. Each has valves and related equipment that help it control and guide the flow of this precious resource.

## WHICH IS WHICH?

A Christmas tree is an assembly of valves, spools and fittings used for oil, gas, water injection, water disposal, gas injection, condensate and other types of wells. It is named for its resemblance to a decorated tree at Christmas.

A wellhead must be present to utilize a Christmas tree and is used without a Christmas tree during drilling operations. The wellhead is the component at the surface of a well that provides the structural and pressure-containing interface for the drilling and production equipment. Producing surface wells that require pumps (pump jacks, nodding donkeys, etc.) frequently do not use any tree because no pressure containment is required.

The Christmas tree and the wellhead work together to bring oil and gas to the surface.

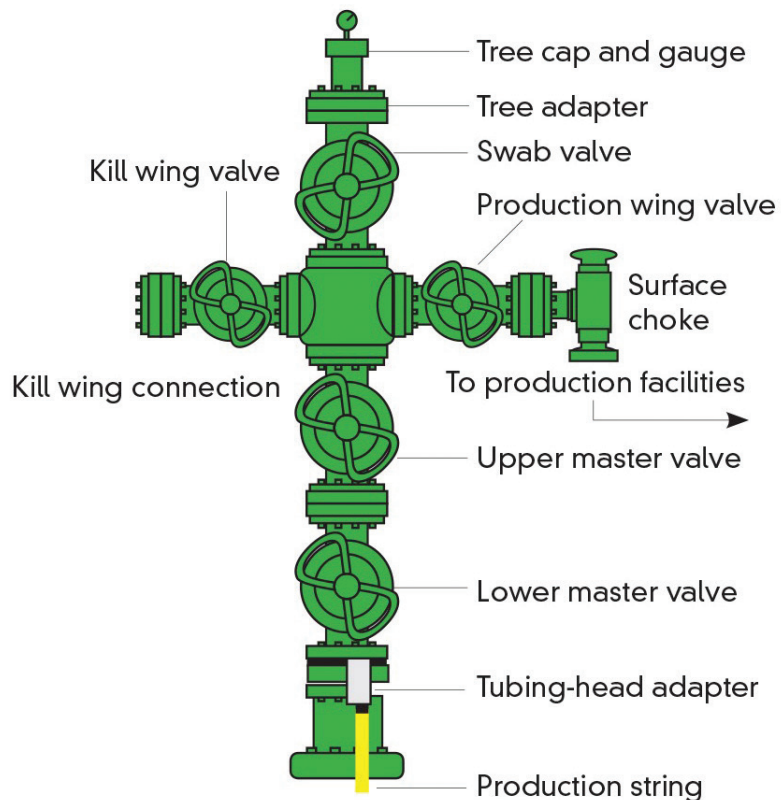
Tree complexity has increased over the last few decades. The trees are frequently manufactured from blocks of steel containing multiple valves rather than made from multiple flanged valves.

The primary function of a tree is to control the flow into or out of the well, usually oil or gas.

A tree often provides numerous additional functions including chemical injection points, well intervention means, pressure relief means (such as annulus vent), tree and well monitoring points (such as pressure,



□ Gas well with Christmas tree



□ Figure 1. Christmas tree diagram

temperature, corrosion, erosion, sand detection, flow rate, flow composition, valve and choke position feedback, connection points for devices such as down-hole pressure and temperature transducer.)

#### WHAT PURPOSE DOES A TREE SERVE?

Trees function for these purposes:

- On producing wells, injecting chemicals or alcohols or oil distillates to prevent and or solve production problems (such as blockages).
- Controlling the injection of gas or water on a producing or non-producing well to sustain economic "production" volumes of gas from other wells in the area (in the field).
- The control system attached to the tree controls the downhole safety valve (surface controlled subsurface safety valves, downhole safety valve or subsurface safety valve) while the tree acts as an attachment and conduit means for the control system to the downhole safety valve.

As Figure 1 shows, there are five valves: the kill wing valve, swab valve, production wing valve, upper master valve and lower master valve. When the operator, well and facilities are ready to produce and receive oil or gas, valves are opened and the released formation fluids are allowed to flow into and through a pipeline. It is important to understand where these valves are located and what role they play in getting gas from the well bore to the customer.

#### PARTS DEFINED

The two lower valves are called the *master valves* (upper and lower, respectively) because they lie in the flow path, which well fluids must take to get to the surface.

The lower master valve will normally be manually operated, while the upper master valve is often hydraulically actuated.

*Hydraulic tree wing valves* are usually built to be fail-safe closed, meaning they require active hydraulic pressure to stay open.

The right-hand valve is often called the *flow wing valve* or production wing valve, because it is in the flow path

the hydrocarbons take to production facilities.

The left-hand valve is often called the *kill wing valve*. It is primarily used for injection of fluids such as corrosion inhibitors or methanol to prevent hydrate formation.

The valve at the top is called the *swab valve* and lies in the path used for well interventions like wireline and coiled tubing.

The *choke* is the device, either stationary or adjustable, used to:

- Control the gas flow, also known as volume, or
- Create downstream pressure, also known as back pressure

Understanding the various parts of these assemblies can help oil and gas industry professionals see the differences between wellheads and Christmas trees. ❧

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# Sizing Electric Actuators for Use on Linear Valves

BY JUSTIN LEDGER

The valve industry is made up of many types of valves that are used in countless types of applications, locations and service conditions. Most fall into one of three operation types: multi-turn, quarter-turn or linear.

Along with this variety are a number of means to operate the valves either manually or via an actuator. These actuators fall into three types: electric, pneumatic or hydraulic. This column focuses on how to properly size an electric actuator for use on a linear valve.

## THE WORK OF LINEAR VALVES

Typical linear valves include gate, globe, pinch, diaphragm and needle valves. Depending on the application requirements, these valves may be used in on/off (open/close), inching, jogging or modulating service. A linear valve uses a simple design principal whereby an element is typically pushed and pulled to open or close the valve. This pushing and pulling operation is accomplished by an external force, which is defined as thrust. Thrust is typically measured in pounds (lbs) or newtons (N), and it can be generated by an electric actuator.

When sizing an electric actuator for use on a linear valve, several key inputs must be considered and provided to the actuator manufacturer. At a minimum, the manufacturer must know the thrust required to operate the valve, the required operating speed (typically defined in inches or feet per minute), stroke length of the valve, the available power supply for the actuator, plant control interface or communication scheme, type of valve operation (open/close, inching, modulating, etc.), and environmental and operational conditions of the valve and actuator. We'll take a closer look at each of these to further understand how they play a role in the selection process.



Figure 1. Direct mount linear actuator

The required thrust to operate the valve will help the actuator manufacturer initially decide what type of product may be best suited for the application. Depending on the thrust requirements, linear electric actuators can be configured in two basic ways:

Figure 2. Multi-turn electric actuator with a linear output drive



a direct-mount linear actuator (Figure 1) or a multi-turn actuator combined with a linear output drive (Figure 2). Typically, a direct-mount linear actuator is used for smaller thrust applications (up to around 3,000 lbs) while the multi-turn actuator with a linear output drive is used for larger thrust applications.

Additional inputs that must be considered are required operating speed and stroke length. Some linear valves must operate very fast—these speeds are typically defined in feet per minute—while others may require a much slower operation—typically defined in inches per minute.

Along with the speed of the actuator, the overall required valve stroke length must be considered. It is possible for an actuator manufacturer to create a product that operates at the desired speed; but if the stroke length is not considered, the actuator could reach its end of travel before the valve is full open or full closed. On the other hand, if the stroke length is considerably long and the operation is slow, the actuator may need to be sized and configured for an extended operation period or duty cycle.

As far as configuration, available power supply and plant control interfaces are critical for actuators. Typically, the power supply for linear electric actuators will be DC, 1-phase power (1-ph) AC, or 3-phase power (3-ph) AC. The specific voltage for the actuator motor (i.e. 120 volts AC [VAC] 1-ph, 460VAC 3-ph, 24 volts DC [VDC], etc.) must be provided to properly configure the actuator.

Along with the power supply, understanding the plant control interface or interfaces is critical. This control interface could be as simple as a 24VDC, contact closure signal sent to the actuator to tell it to run open or close. It also could be a signal sent via an analog signal (4-20mA) or a fieldbus protocol (i.e. Profibus, HART, Modbus, etc.) instructing the actuator what to do. The actuator control interface may also be required to send

a feedback signal back to the control room or programmable logic controller indicating various parameters such as valve position, fault indications or actuator diagnostic information.

### THE VALVE'S OPERATING CONDITIONS

Understanding how—and how often—the valve will be operated factors into the selection and sizing of a linear actuator as well. Will the service be an open/close operation where the actuator will only be required to operate the valve from full open to full close? Will the application require various starts and stops to inch, jog or modulate the valve to control the process? Another criterion that may need to be considered and discussed with the valve manufacturer is the differential pressure across the valve. This could impact the thrust requirements and operation of the actuator.

If the valve will be inched, jogged or modulated by the actuator, under-

standing how many starts within a specific time period is critical. A higher number of starts within that period (typically defined by the number of starts per hour) may require the actuator to be configured differently to support these operational requirements. If these numbers are unknown, the actuator manufacturer often can define starts per hour for which the selected actuator is rated.

Finally, the expected environmental and operational conditions of the application must be factored into the sizing and selection equation. Will the valve and actuator be installed indoors or outdoors? Does the product need to be submersible? In what ambient temperatures will the product be operated? Does the actuator need to be explosion proof? If so, to what standards and classifications? Does the product need any special corrosion protection? Will the available power remain constant or is there concern the available voltage

may experience under- or over-voltage conditions. These may seem like small details, but they often play a very important role in the overall selection of a suitable linear electric actuator.

### CONCLUSION

Sizing and selecting an electric actuator to operate a linear valve can be a very simple process provided the necessary information is communicated between the customer and actuator manufacturer. When this needed data is not provided, the selection process becomes much more difficult, which often will lead to field-related issues. When it comes to avoiding such problems, it's better to provide the actuator manufacturer with too much information instead of not enough. **VM**

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# Apprenticeships: A Long-term Strategy for Developing Skilled Workers

BY JESSICA BELLO

Most manufacturing and industrial companies agree that the search for talented young workers is a top priority today. This is because the skills gap for industry in this country has reached a boiling point as knowledgeable workers retire and reaching potential new employees grows more complicated and difficult.

While some manufacturers have discovered that internships offered to college students and others in their communities is a good tool, there is a second tool that may be underutilized today: offering apprenticeships.

Unlike with internships, which typically last a summer, a few months or a year, apprenticeships can be part of a longer-term strategy for employers. Like with internships, companies with apprenticeship programs connect high school graduates or other qualified candidates with hands-on training and valuable work experience. But with apprenticeships, these candidates are also prepared for a life-

long career in a trade or an industry. They also can provide employers with a means to help round out their workforces immediately.

## PUTTING TOGETHER A PROGRAM

For some companies, establishing a functioning and successful apprenticeship program can seem a daunting task. Luckily, there are sources to help. For example, the Robert C. Byrd Institute (RCBI) launched an initiative called Apprenticeship Works, whose mission is to ensure that apprenticeship programs are not only accessible to employees, but affordable for employers. The Apprenticeship Works initiative assists manufacturers in the Mid-Atlantic area of the U.S. in all kinds of trades and occupations, from robotics technicians to machinists to press operators and more.

RCBI's work is so highly regarded that in April of this year, the U.S. Department of Labor named RCBI a national leader in workforce development for its efforts in promoting

apprenticeship programs.

The value of apprenticing is easily grasped. RCBI's website notes that: "Companies that offer registered apprenticeship programs improve productivity and profitability, reduce turnover and attract better applicants." Lucinda Curry, director of Apprenticeship Works adds that, "Each day, we see the value of apprenticeships in the lives and careers of employees as well as how this strategy enhances the companies that employ them."

In the valve industry, apprenticeships are in place in several companies. VMA member company Richards Industries, a valve manufacturer based in Cincinnati, OH, has one such program. The company reports that it has been turning out skilled machinists through its apprenticeships since 2014. Cheryl Neiheisel, vice president for Human Resources at Richards Industries, says that the company's program is vital because the pool of candidates for machining jobs is very small.

"It is important to bring in new hires and train them on math, safety,



machining, etc., to help them become productive employees more quickly," she points out.

Her comments reflect how many feel about apprenticeships—that they are needed as a way to bring in new candidates and train them rapidly and efficiently to be more productive and better qualified. Neiheisel says the strategy has already proven to do just that for Richards.

"Before the [apprenticeship] program, new trainees typically took three years to become CNC [Computer Numerical Control] machinists. With the current program, they are typically promoted to a Level 3 CNC operator within 18 months," she says.

The apprenticeship program at Richards is a year-long program that includes one day of school per week while on-the-job training occurs over the course of a year. The apprentices work four, 10-hour days and then receive overtime pay to attend class on Fridays. At the completion of the program, the employees work towards a National Institute for Metalworking Skills certification.

As far as finding apprentices to hire into the program, Neiheisel says that Richards Industries works very closely with several local schools that offer machining during high school to find candidates. The company also partners with local trade and technical schools. These two steps ensure a good match, she says. Neiheisel says she has heard of other companies that form alliances with other employers, educators and workforce development groups to create a successful apprenticeship program.

#### HELP FOR EMPLOYERS

RCBI's Apprenticeship Works initiative has developed several ways to aid employers in navigating their way to creating apprenticeships. Curry stresses that one of the goals for the initiative is to create a return on investment. That return begins with decreased time to develop a program. RCBI provides guidance in this area as well as expert management of any new initiative program.

"We do the heavy lifting," Curry says, adding that: "We pull in the appropriate partners, fill any training

gaps that might exist, develop on-the-job training and ultimately take development time down to a few months, rather than years."

She says the first step in forming a partnership with RCBI is to set up a meeting onsite at a manufacturer's facility. At this meeting, critical needs and training requirements are identified and prioritized. Curry often asks the employers at that meeting: "If you had a wish-list, what would it be?" From there, the staff at RCBI customizes and tweaks occupational outlines for on-the-job training, formats a program based on the needs of the employer, and even helps assess possible apprentices.

After this is all done, RCBI helps the company officially register its program with the U.S. Department of Labor.

According to the Department of

Labor, "for every dollar spent on apprenticeship, employers may get an average of \$1.47 back in increased productivity and greater front-line innovation," while there is an estimated \$27 return on investment for every federal dollar that is invested in an apprenticeship program.

Curry points out that apprenticeships have been around since the middle ages.

Still, "apprenticeship is a good training model for any company," she notes. Even since the RCBI started its initiative, such programs have been updated and improved.

To inquire about partnering with RCBI and Apprenticeship Works, call 800.469.RCBI (7224) or email training@rcbi.org. ❧

JESSICA BELLO is VMA's careers program coordinator. Reach her at jbell@vma.org.



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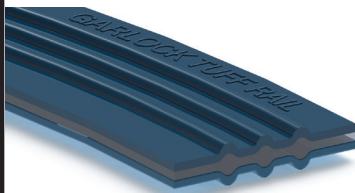
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For more information on joining the Valve Repair Council, contact Marc Pasternak at 202.331.0104 (mpasternak@vma.org).

**Mueller Company's** new H-306HP fabricated steel tapping sleeve is designed for hot tapping ductile iron pipe and thick-wall C900 plastic pipe. It is made from A36 fabricated steel and meets the requirements of AWWA C223. It features an integral bolt flange, Rilsan nylon coating, working pressures up to 300 psi, and is available in 4- to 16-inch sizes. The H-306HP is an economical tapping sleeve suitable for use with Mueller CL-12, C1-36 and Mega-Lite drilling machines in less corrosive soil environments.



**Garlock's** Gylon 3545 Tuff-Rail is manufactured from 100% pure polytetrafluoroethylene. The gasket is designed to address difficult installation and sealing requirements of manways. Formulated to compress and conform, the product is easily installed with excellent load retention, maintaining a tight seal even during heavy vibration and thermal cycling.

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**Metso** and Rockwell Automation teamed up to deliver a global industrial Internet of Things (IoT) platform that connects, monitors and performs analytics for Metso's equipment and services, resulting in improved efficiency and profitability for its mining and aggregates customers. The digital solution will securely collect and store data from Metso's equipment around the globe. It will provide predictive analytics, preventive maintenance and facilitate remote asset monitoring.



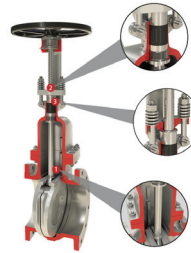
**Weir Oil & Gas** removed the guesswork from managed-pressure drilling (MPD) and flowback operations with more accurate, real-time measurements and automated controls, enhancing safety, reducing non-productive time and enabling operators

to make more informed, faster decisions. Engineered for high-pressure formations, Weir's line of pressure control intelligent systems replaces a rudimentary approach with an Internet of Things (IoT) approach. Each of the system's products connects to a control unit via sensors that send real-time information from the equipment back to the control unit.

**Victaulic** has launched the FireLock Innovative Groove System (IGS) for 1-inch fire protection piping. The line includes installation-ready fittings and rigid coupling, branch line outlets and adapters, as well as the VicFlex Series AH2-CC Braided Hose and the RG2100 Roll Grooving Tool. These IGS products feature a new, patented IGS groove specification, optimized for 1-inch pipe.



**Crane ChemPharma & Energy** designed the new PacificCSV line of cast steel gate, globe and check valves in accordance with the industry's latest standards to provide quality performance in demanding applications. The new line has several improved features that enhance reliability as well as operations and maintenance, including the gate



valve's fully-guided wedge, which ensures smooth operation in both horizontal and vertical orientations to deliver improved resistance to sticking. The swing check's disc fastener is restrained by the bonnet to eliminate the risk of a displaced disc and prevent damage to downstream equipment.

**Emerson's** water and steam detection system is the world's first single controller solution to be certified to IEC 61508 for safety instrumented functions up to SIL 3. The Mobrey Hydratect 2462 Water and Steam Detection System is used in a wide variety of applications where the detection of water or steam is vital for safe and efficient plant operation, such as boilers, steam drums and steam line drain pots. The product is a modern replacement for conventional float switches, and consists of a compact twin-channel electronic unit, connected to a pair of electrodes. By detecting low water level in steam drums, Hydratect helps prevent boiler tubes overheating, while detecting high water level prevents the generation of wet steam that could cause costly turbine blade erosion.



**DeZURIK** designed the APCO Smart-CHECK Pump Control Valve (PCV) for maximum performance and economy. This single valve combines the functionality of a full-featured electric motor-operated pump control valve with the best features of APCO's premium swing check valve.

The valve has been engineered to control pressure surges during normal pump startups and shutdowns, and to close positively upon power failure.



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*Modern Distribution Management Top 5\**

**Questions?** Contact VMA President Bill Sandler at [wsandler@vma.org](mailto:wsandler@vma.org) or call 202.331.8105 ext. 306.



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**THE DISTRIBUTOR CHANNEL** CONTINUED FROM PAGE 33

distributor's outside salesperson. In my mind, this should be celebrated and embraced, but sellers feel threatened by the situation and often engage in work more efficiently handled by an inside group, so they remain front and center stage with the customer.

A final point to make in this situation is based on research from a second book: *Drive: The Surprising Truth about What Motivates Us* (from chapters 1 and 2).

Author Daniel Pink lays out research indicating creative knowledge-based work is not enhanced by monetary rewards. In fact, over the long haul, it can inhibit performance. Considering the reality that selling is largely a knowledge-based activity and creativity is something we should embrace, commissions probably work against most distributor sales departments.

**IF NOT COMMISSIONS THEN WHAT?**

Instead of relying on a commission plan to drive behavior, an alternative approach would be management by objective (MBO)-based bonuses. Distributors using the MBO model are specific in prescribing activities, behaviors and objectives required of their sales teams. The plans are reviewed with each employee and typically paid out quarterly. They focus on which activities a manager feels is appropriate for both the salesperson and market conditions within a territory, and such plans replace the traditional gross margin-based commission model. They are reinforced with financial rewards for completing objectives.

A number of inherent strengths are built into an MBO-based plan beginning with the fact activities are closely matched to individual employees. A few points about how and why this works include:

- **Establishing management level contacts.** Distributor sales managers often point to opportunities lost because the competition jumped over the normal customer contacts and sold directly to the customer management team. This is an ongoing problem, but somehow sellers never find time to make the connection. With MBOs, manage-

ment-level contact activity is tied to the salesperson's paycheck.

- **Opportunity tracking.** Opportunities and the data associated with them provide a vehicle for distributors to forecast economic ebbs and flows of the valve industry. This is essential information for strategic direction and helps to align the salesperson and company.
- **Price deviation.** Valve distributors are discovering the power of price processes. According to David Bauders of Strategic Pricing Associates (SPA), the typical distributor using the pricing process that his company developed adds two points to the gross margin. Distributors who tie price deviation to MBO-style objectives have higher gross margin percentages for the bottom line.
- **Use of resources.** Instead of discouraging teamwork, an MBO plan incentivizes sales personnel to do more with inside sales, technical and marketing resources within the distribution company. The seller is rewarded and the company grows more efficiently.
- **Achieving sales goals.** All sales plans have goals of course. But with an MBO, an improvement comes into play. Most traditional sellers admit they accept the goals their managers hand down to them: If they make the goals, great; if not, it doesn't impact them financially. This creates little buy-in and most salespeople would rather give the impression of complacency. This does little to allow for improved business planning.

**CONCLUSION**

The distribution world needs to ponder the future of the whole commission "thing": It's been a good run, but everything comes to an end.

According to Alan Beaulieu, ITR Economics, who spoke at VMA's recent 2017 Leadership Forum, the economic outlook for the coming year looks good. Those distributors that make changes now may very well feel the winds of change at their backs helping them take advantage. **VM**

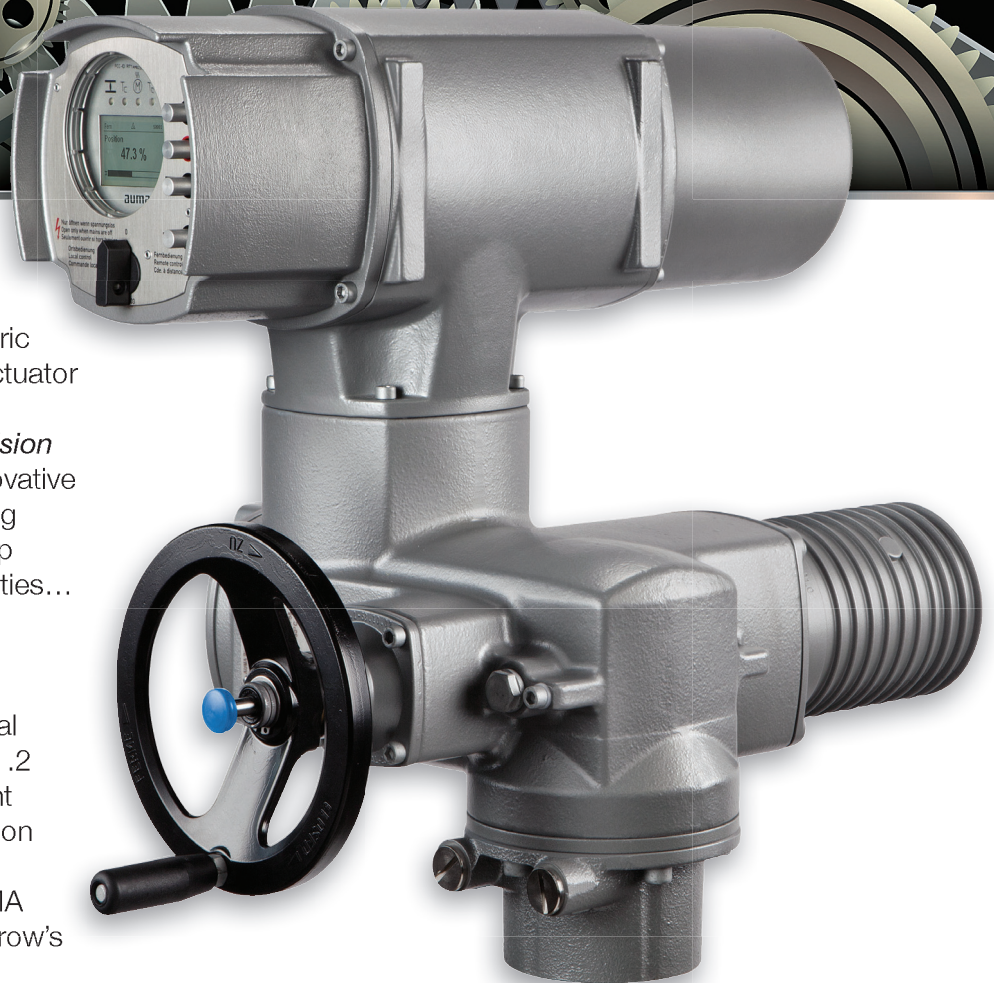
**FRANK HURTE** is a speaker and consultant on distribution. Reach him at [frank@riverheightsconsulting.com](mailto:frank@riverheightsconsulting.com), 563-514-1104 or [www.riverheightsconsulting.com](http://www.riverheightsconsulting.com).

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