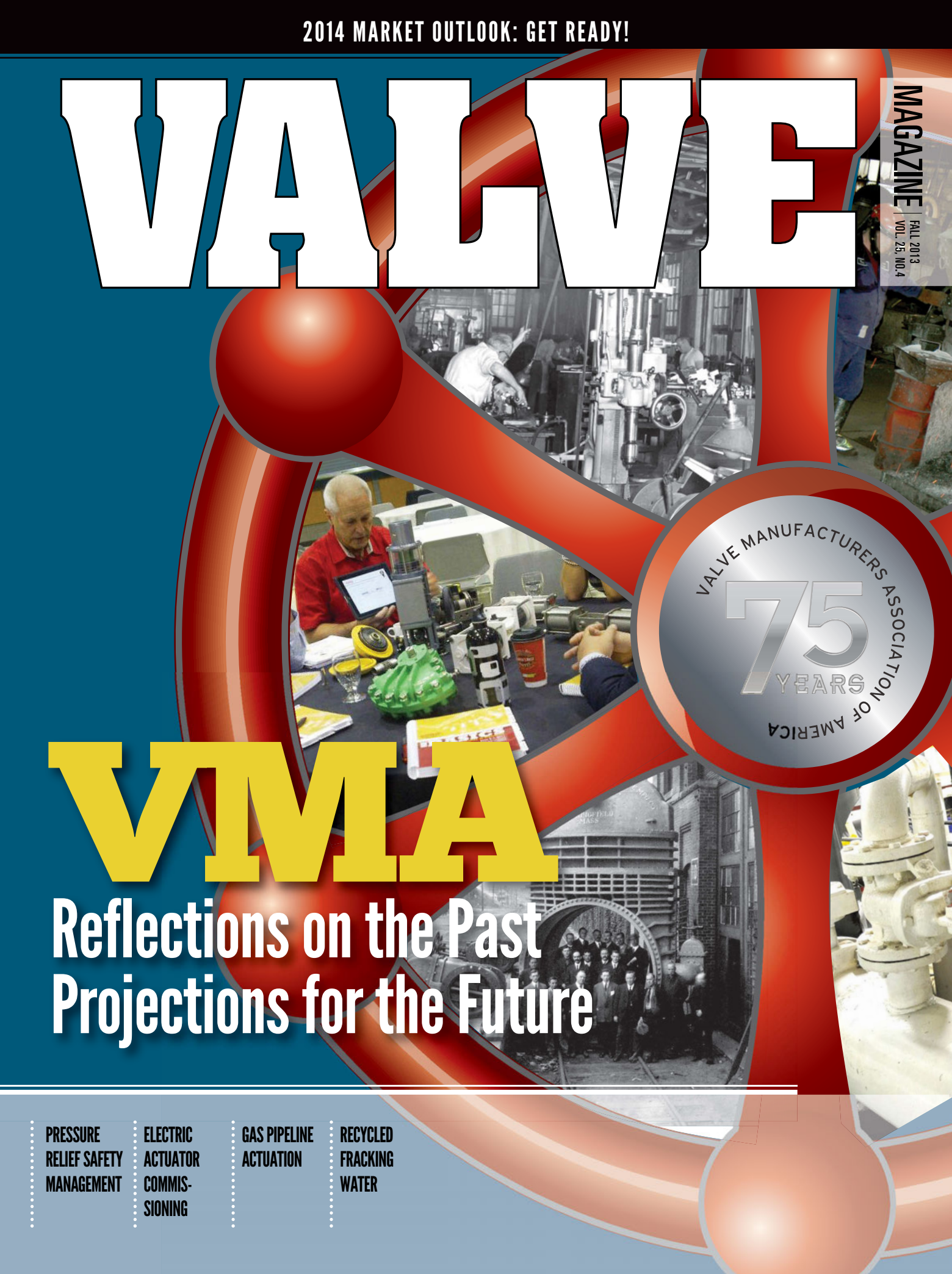
2014 MARKET OUTLOOK: GET READY!

VALVE MAGAZINE

FALL 2013
VOL. 25, NO.4



VMA

Reflections on the Past
Projections for the Future

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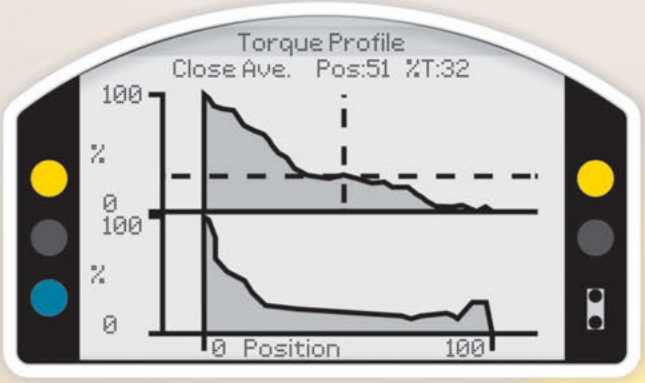

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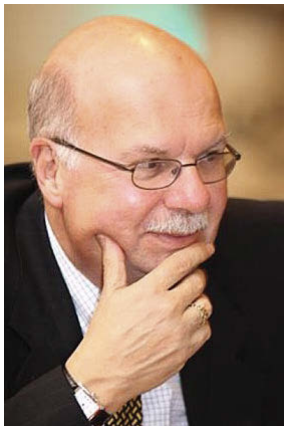
VMA's 75 Years of Growth



It's hard to believe I spent the last 37 years here at VMA, almost half of the association's existence and more than half of my life. Although the first staff leader George Cooper spent over 30 years at the helm, my presidency of 15 years ranks second among the six gentlemen who have held this position. What's more, my 37 years of service have made me the longest serving employee of the association. Although I can't personally speak for all 75 years, I think this longevity allows me to discuss what I see as major association advances during my time with VMA:

- The Valve Repair Council was created in 1969 to recognize the authorized independent repair facilities of VMA member companies as well as manufacturers with their own repair facilities. The VRC celebrates its 25th anniversary next June.
- Our membership expanded across the U.S. northern border to Canada, and we began to hold meetings in Vancouver, Montreal and Toronto.
- The associate membership category was added to include industries such as foundries, gasket and seal manufacturers and other suppliers to the valve industry. Most recently, we expanded even further to include distributors.
- The Friends of the Crawford Library was formed to assist in the development of a vitally needed new education program as well as provide scholarships to worthy engineering students throughout the U.S. and Canada.
- Our communications program was expanded and outsourced to provide top quality print and electronic outreach.
- The education and training program was developed to address the graying of our workforce through classes and through training products for sale.
- Our international presence was expanded through an outstanding relationship with CEIR (the European umbrella group of valve associations) as well as participation in international trade shows and presentations made at valve associations in other parts of the world.

It looks great to see these accomplishments as a list. However, the beauty of this association is that it doesn't rest on its laurels. We know that even with everything that the association has accomplished over the years, there is still more to be done. To get started, we are recruiting a new generation of volunteers to see us into the next 75 years and address the concerns of this ever-evolving valve industry.

But in the meantime, let's sit back and enjoy all we've been able to accomplish in our association's long history by reading this very special issue of VALVE Magazine. Turn to page 31 for a special section highlighting the history of the valve industry, the association and the people that have made it all happen. VM

Bill Sandler
President
Valve Manufacturers Association of America

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MERGERS & ACQUISITIONS

Forum Energy Technologies Acquires Moffat 2000, Closes Other Acquisitions

Forum Energy Technologies, Inc. (FET) announced it has acquired Moffat 2000 Ltd., a leading manufacturer of subsea pipeline inspection gauge launching and receiving systems and subsea connectors. Moffat is based in Newcastle, England.

On July 1, FET also closed the previously announced acquisition of Blohm + Voss Oil Tools and the joint purchase of Global Tubing in partnership with Quantum Energy Partners. The current annualized aggregate operating income contribution to FET of the acquisitions is about $32 million.

Rotork Purchases Flowco

In July, Rotork Plc announced acquisition of the entire issued capital of Flowco Ltd., a valve and actuator service company based near Rotork's group headquarters in Bath, UK.

Commenting on the acquisition, Rotork CEO Peter France said, "Flowco will further enhance our service offering in the southern part of the UK market."

NEW CONTRACTS

Metso Receives Major Valve Order from Yantai Wanhua Polyurethanes

Yantai Wanhua Polyurethanes Ltd. in China has awarded Metso a high-value contract for pneumatic ball valves and butterfly valves. The valves will be used in the MDI integration project (diphenymethane diisocyanate) at its existing factory site and a new epoxy propane and acrylic ester integration project under construction in China. This is the first partnership between Metso and Yantai Wanhua, which has invested about $5 billion in these two projects.

Emerson Supplies First Ultra-Supercritical Plant in the U.S.

The John W. Turk Jr. Power Plant in Fulton, AR, went into commercial operation Dec. 20, 2012, just four months after its first fire and several months faster than is typical for a new coal plant. The plant uses advanced control and simulation technologies from Emerson Process Management.


The first ultra supercritical power plant built in the U.S.

The 600-megawatt plant is the first ultra-supercritical power plant built in the U.S. By operating at elevated steam temperatures and pressures and using state-of-the-art emissions control technology, ultra-supercritical power plants can boost the efficiency of coal-based electricity generation by more than 50% while maintaining superior environmental performance.

CONTINUED ON PAGE 8

MARKET FOCUS: Is Coal Still Alive?

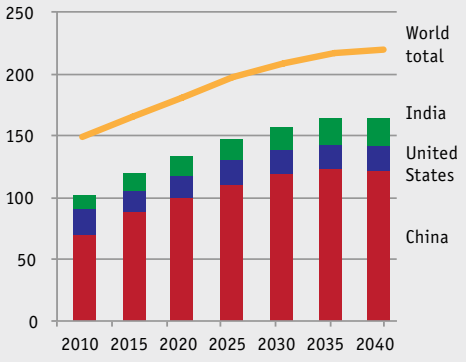
Although there are no new coal projects in the U.S. at present, coal is still the number one source of power in the developing world, and it's still in use in some parts of the U.S. However, natural gas and renewables are gaining a significant share of the business of electricity generation in the world.

Kevin Geraghty, vice president of Energy Supply, NV Energy, said at this year's VMA Market Outlook Workshop (see page 22) that by 2040, coal and nuclear in the world will lose ground, though only by a small share. Geraghty also said that if a carbon tax passes in the U.S. coal is "all but dead."

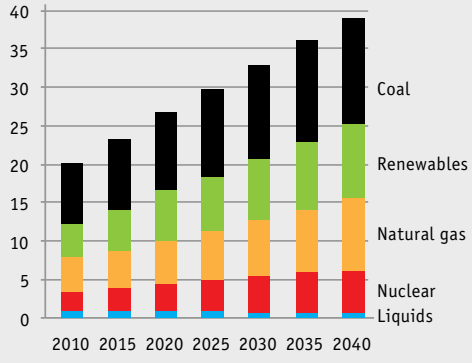
Meanwhile, both China and India use massive amounts of coal, and fossil fuels will continue to rule worldwide because they are cheaper. Also if the natural gas picture plays itself out, coal and fossil will remain.

However, Geraghty also said that greenhouse gas concerns are now a worldwide issue, an issue that China, the leading user of coal, will have to face. That could be good for those who deal in the retrofit business, Geraghty pointed out.

World coal consumption by leading consuming countries, 2010-2040 (quadrilion BTU)



World net electricity generation by fuel, 2010-2040 (trillion kilowatt hours)



Source: Energy Information Administration (EIA), International Energy Outlook 2013

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Getting high-performance valve automation components and assemblies delivered to you fast can mean a big difference in increased productivity, decreased down-time, and more bottom-line revenue.

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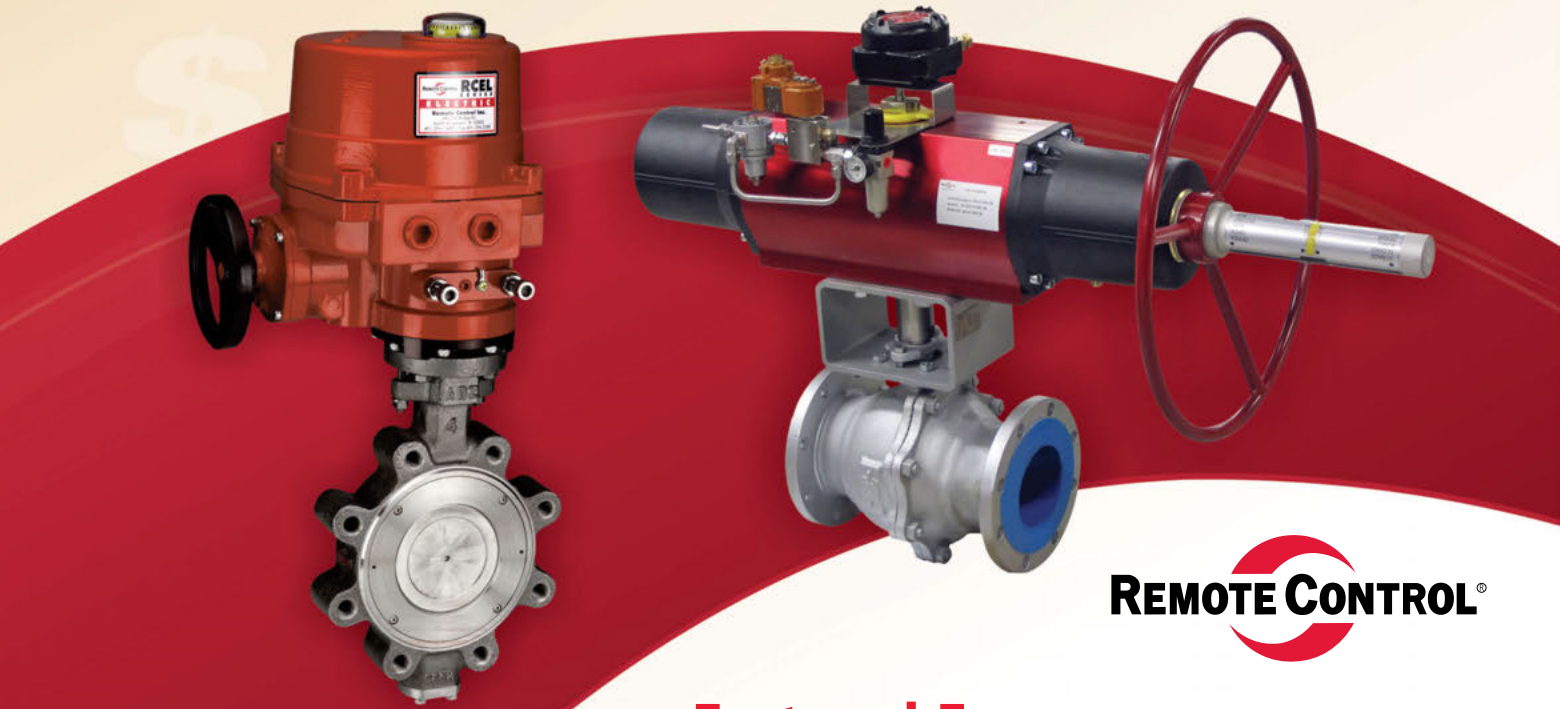

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VALVE Magazine welcomes articles, proposals, manuscripts, photographs and ideas from our readers. For a copy of the magazine's Author's Guidelines, contact Genilee Parente, managing editor, at gparente@vma.org.

Breaking ground on new facility for Watson

NEW FACILITIES

New Manufacture & Repair Facility for Watson Grinding & Manufacturing

Watson Grinding & Manufacturing, Watson Valve Services Inc. recently broke ground on an all-new 19,000-square-foot valve repair and manufacture facility. The campus will span several city blocks and encompass more than five buildings with over 84,000 square feet.

ValvTechnologies Opens New Facility in India

ValvTechnologies has opened a new assembly and global sourcing facility in South Indian Metro City, India to meet growing demand for its valves and to help reduce logistics costs for customers in the Middle East, Asia and Australia. The new plant will produce 100 to 120 valves per month with initial focus on the company's V1 Series valves.

Emerson Expands Minnesota Manufacturing Operations

Emerson Process Management will expand capabilities for its Rosemount operations with the addition of a 500,000-square-foot building in Shakopee, MN, a suburb of the Twin Cities. The expansion will be accomplished in phases over the next five years and will include a capital investment of up to $70 million. The expansion comes on the heels of the company's recent $40 million investment to upgrade Rosemount's existing Eden Prairie, MN and Chanhassen, MN facilities. The new location will become Emerson's global headquarters for Rosemount measurement technologies.

COMPANY CONNECTIONS

Emerson and SeaTec Form Cooperative Relationship

Emerson Process Management and SeaTec Repair Services, a part of V. Group, have formed a cooperative relationship to offer marine customers no-hassle installation of Micro Motion fuel measurement solutions on a global scale. Emerson's Micro Motion fuel measurement solutions provide accurate measurement of heavy fuel oil in bunkering and control of fuel burn to help customers save on operating expense and ensure accurate billing.

Franklin Valve Announces License Agreement with Microfinish

Franklin Valve LP of Houston, TX and Microfinish Valves Ltd. of Karnataka, India, have entered into a Technology License Agreement whereby Microfinish Valves will manufacture and sell the Franklin Duraseal DBB Plug valve in India, Pakistan, Bangladesh, Sri Lanka and Myanmar under the Microfinish brand.

Bernard Controls Signs Distribution Agreement with Armatec

Bernard Controls has signed an agreement with Armatec group for the distribution of electric actuators to four Northern European countries. Armatec specializes in the distribution of industrial valves, actuators and accessories for the heating, cooling and process systems and has been the official distributor of Bernard Controls in Denmark for more than 30 years. On July 1, both companies decided to expand the distribution agreement to Denmark, Finland, Norway and Sweden.

Furmanite Joins Pentair in California and Nevada

Pentair Valves & Controls announces the immediate appointment of Furmanite in Benicia, CA as a new channel partner and the exclusive sales representative for several Pentair brands.

Furmanite plans to extend its service center capabilities to inventory new Crosby, Anderson Greenwood and Varec products for immediate shipment. In addition, it will have access to the nationwide Pentair Valves & Controls distribution network, which will allow it to provide an even broader array of product configurations needed for short lead times.

CONTINUED ON PAGE 10

High pressure. Extreme temperatures. Volatile products. It's all part of the job in hydrocarbon processing. But so is the goal of maximizing safety integrity. We make the process more secure with our innovative valves and controls, which is why the industry relies on us to keep their workers safe and their plants running smoothly.

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CALENDAR 2013

NOVEMBER

6-7
Valve Basics Seminar & Exhibits: Valves & Actuators 101
New Orleans
www.vma.org

12-14
Power-Gen
Orlando, FL
www.power-gen.com

DECEMBER

10-12
The Chem Show
New York, NY
www.chemshow.com

2014

JANUARY

21-23
AHR EXPO
New York, NY
www.ahrexpo.com

MARCH

4-7
VMA Technical Seminar & Exhibition: Fugitive Emissions
Las Vegas
www.vma.org

18-20
INTERPHEX 2014
New York, NY
www.interphex.com

APRIL

2-3
VMA Basics Seminar & Exhibits: Valves & Actuators 101
Kansas City
www.vma.org

MAY

5-8
2014 Offshore Technology Conference
Houston
www.oftnet.org

20-23
AFPM Reliability & Maintenance Conference and Exhibition
San Antonio
www.afpm.org

CERTIFICATIONS & STANDARDS

Metso's Neles Flow Control Products Receive SIL Certifications

Metso has certified several flow control products from its Neles line to help process industry end users ensure their plants comply with technical standard IEC 61511, Safety Instrumented Systems (SIS), for the process industry sector.

Third-party certificates are in accordance with the newest version of IEC 61508. Metso has also introduced new safety manuals for its valve and actuator series to improve use and servicing of critical safety loop components.

MSS Publishes Six Revised, One New Standard

The Manufactures Standardization Society (MSS) has announced six revised standards and one new publication, MSS SP-145-2013, which establishes requirements for ball valves with CWP ratings, including pressure-temperature ratings, materials, design, dimensions, marking and testing.

All standard practices are available from MSS and through authorized distributors. A listing is available at: http://mss-hq.org/Store/orderinfo.cfm.

Watson Coatings Receives A2LA Accreditation

The Watson Coatings Laboratory, a division of Watson Grinding & Manufacturing, announces A2LA Accreditation ISO 17025:2005.

A2LA Accreditation ISO 17025:2005 is used by testing and calibration laboratories. The standard is specific in requirements for competence. A prerequisite for a laboratory to become accredited is to have a documented quality management system. Laboratories use A2LA Accreditation ISO 17025:2005 to implement a quality system aimed at improving the ability to consistently produce valid results.

AWARDS & HONORS

Cameron and Pentair Make List of Top 100 Most Innovative Companies

Two VMA member companies are among the top 100 Most Innovative Companies in the world, according to Forbes. Cameron came in at No. 85, while Pentair made its first appearance on the list at No. 96. Former member Tyco International—which recently sold its Flow Control division to Pentair—was ranked No. 69.

PEOPLE IN THE NEWS

SPIRAX SARCO... has appointed **Lorraine Wiseman** as president and general manager; she is responsible for the USA business. Wiseman brings more than 20 years experience in international and strategic management roles, having held a number of leadership positions in the Newman Hattersley and IMI's CCI severe service manufacturing business.

CURTISS-WRIGHT... announced that Chairman and CEO **Martin R. Benante** will retire in April 2015. As part of the formal transition plan, Benante will continue as executive chairman of the board of directors until his retirement, at which time he will leave the board. The board of directors announced that, effective immediately, **David C. Adams**, currently president and COO, has been promoted to president and CEO and will serve as a member of the Board of Directors. Upon Benante's retirement, Adams will assume the dual role of chairman and CEO.

DeZURIK...former CEO **Larry Korf** has appointed **Bryan Burns** as president and CEO. Korf will retain a position on the company's board of directors and assist in the CEO transition period for the balance of 2013.

Burns joined DeZURIK in 2010 as VP of operations and was promoted to COO in January 2012 and president and COO in March 2013. Previously he was employed by the Brunswick Corporation, where he was president of the Crestliner Division.

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One that masters everything: SIPART PS2

Intelligent positioner for unlimited flexibility

It is not without reason that the SIPART PS2 from Siemens is the most widely used positioner for linear and part-turn actuators. For almost twenty years, this globally proven all-round design has ensured safe and precise sequences in the process industry. A wide variety of mounting options for countless valve applications make it an extremely flexible all-rounder that offers outstanding performance in almost every industry: from chemicals, oil and gas to pharmaceuticals, food and beverages, or marine engineering.

Whether it is a matter of extremely precise control of valves or the reliable regulation of actuators, SIPART PS2 can be relied on to have everything under control. Even in terms of simple installation and fast commissioning, it scores highly in at every stage. By providing reliable diagnostic data about the valve and actuator, the SIPART PS2 also reduces maintenance requirements in the plant and ensures maximum functional integrity in emergency situations.

Answers for industry.

Valve Basics Online Training Set for Release This Fall

VALVE BASICS Online Training

Although VMA's in-person basics seminars have been extremely popular, the association has worked for a long time toward a broader way to reach people hungry for knowledge. That goal has been accomplished in the form of an online training program.

"When VMA's Education & Training Committee began developing the Valves & Actuators 101 program in 2009, we knew we wanted to offer the course in different ways. The first leg of that program was twice yearly, instructor-led seminars," says Greg Johnson, chairman of the committee and president of United Valve.

However, the sheer need created by a graying workforce and the broad desire for a way to train newcomers to the industry meant a tool was needed to reach many more people than could attend those seminars.

Since the younger generation is so attuned to working in a digital environment, creating an online channel was really a "no brainer," Johnson acknowledges.

Leon Brooks, director of international sales, Cameron's Valves & Measurement division, and vice chairman of the committee, agrees. "As the committee met over the years, we had many discussions on how to expand the program; an online program was the next logical step. In an ideal world, everyone could come to the live seminar to be able to interact with the instructors and have a chance to examine valves and actuators in our 'Valve Petting Zoo.' But a lot of folks—and companies—just don't have the budget or time."

Judy Tibbs, VMA director of education, estimates that by the time the New Orleans Valve Basics Seminar has taken place (Nov. 6-7), nearly 900 people will have taken the course.

"Imagine what will happen now that we are launching the Valve Basics Online Training (VBOT) program! Between individuals around the world and companies buying licenses to train their new employees, the numbers of people receiving basic education could go into the thousands," she says.

VMA is projecting an early November release date; those interested in purchasing the course can pre-register and will be notified once the VBOT goes live. In addition, VMA is offering a 5% discount to those who sign up before the product is released (see page 71 for details). To pre-register, send an email to Abby Brown, education & training coordinator, at abrown@vma.org.

NEW MEMBERS

ARI Armaturen USA L.P. has been accepted as a full member of VMA. The company's manufacturing facility is located in Houston, where it produces valves for control, isolation, safety and steam trapping of liquid and gaseous media. Visit the company's website at www.ari-armaturen.com.

New supplier members are:

Siemens Industry, Inc. specializes in electronics and electrical engineering, and operates in numerous sectors, including energy and infrastructure. With headquarters in Spring House, PA, the company focuses on automation and drive technology, as well as financial and industrial assistance for a variety of end users. Additional information can be found at www.usa.siemens.com.

Balluff has its North American headquarters in Florence, KY. The company manufactures sensors, mechanical limit switches, transducers, machine vision and industrial RFID systems and provides distributed modular I/O bus network solutions. Learn more at www.balluff.us.

Valve Industry Employment Report: Continued Growth

The Valve Manufacturers Association has just unveiled the 2013 Employment Snapshot, the results of a survey made of its nearly 100 U.S. and Canadian valve, actuator and control manufacturing members.

More than half of responding member companies reported domestic hiring was growing up to 5% this year. Nearly one-fifth expected growth up to 10% and another fifth plans to grow their ranks up to 16%. Only 3% of valve manufacturers did not expect any growth.

These workforce figures are consistent with the increase in shipments that members anticipated, as reported in VMA's annual market forecast released earlier this year. The forecast indicated that shipments for the U.S. industrial valve industry would grow 3% in 2013, increasing to nearly $4.3 billion. The increase would mark the fourth consecutive year of growth following the recession, exceeding the industry's previous 10-year peak in 2008.

Through the Employment Snapshot survey, VMA estimates the domestic valve industry (including Canada) employs more than 30,000 people—and that doesn't account for the many thousands who work for companies that support valve manufacturers by providing castings, seals and gaskets, repair services, and many other products and services. The new employment figure is up 50% compared to a decade ago.

Overall, the industry has a seasoned workforce—the typical employee is 43 years old and has 13 years of experience. A majority of these firms have international locations and employees and most have plans to grow their international workforce over the next five years.

Additional details will be posted by mid-October on VALVEMagazine.com.

Power-Gen Celebrates 25 Years

Just after VMA celebrates its 75th anniversary, Power-Gen International, the largest power generation event in the world holds its 25th event. PowerGen 2013 is Nov. 12-14 in the Orange County Convention Center, Orlando, FL.

More than 22,000 professionals in power and related fields from 75 countries get together for this event, which features 200 speakers and 50 educational conference sessions. The event draws people from a wide variety of levels of power involvement, from engineers to fuel suppliers, to project developers to IT specialists.

Keynoting this year's event is Peter Delaney, chairman, president and CEO of OGE Energy Corp., and James E. Rogers, chairman of Duke Energy Corp. Those two gentlemen will address planning for the future of the power industry.

In addition, 13 tracks of conference sessions cover topics in areas such as fossil technologies, gas turbine technologies, emissions control, environment issues, demand efficiencies, plant performance, on-site power and other areas of interest to power professionals.

The giant Orange County Convention Center exhibit hall will showcase 1,400 exhibiting companies featuring thousands of products that help the world's power companies from materials to consultants to new technologies for plants and power companies.

In addition, PowerGen is co-located with three other major power-related events: Nuclear Power International, Renewable Energy World Conference & Expo for North America and Power-Gen International Financial Forum. Access to Power-Gen's exhibit hall includes access to those other show events.

For information, go to www.Power-gen.com.

Report Bolsters ChemShow 2013

Professionals from a wide range of process industries that deal with chemicals, pharmaceuticals, petrochemicals, paper, foods and other areas will gather Dec. 10-12 at the Javits Convention Center, New York City for the 2013 ChemShow. There, they will learn about and share information on process technologies.

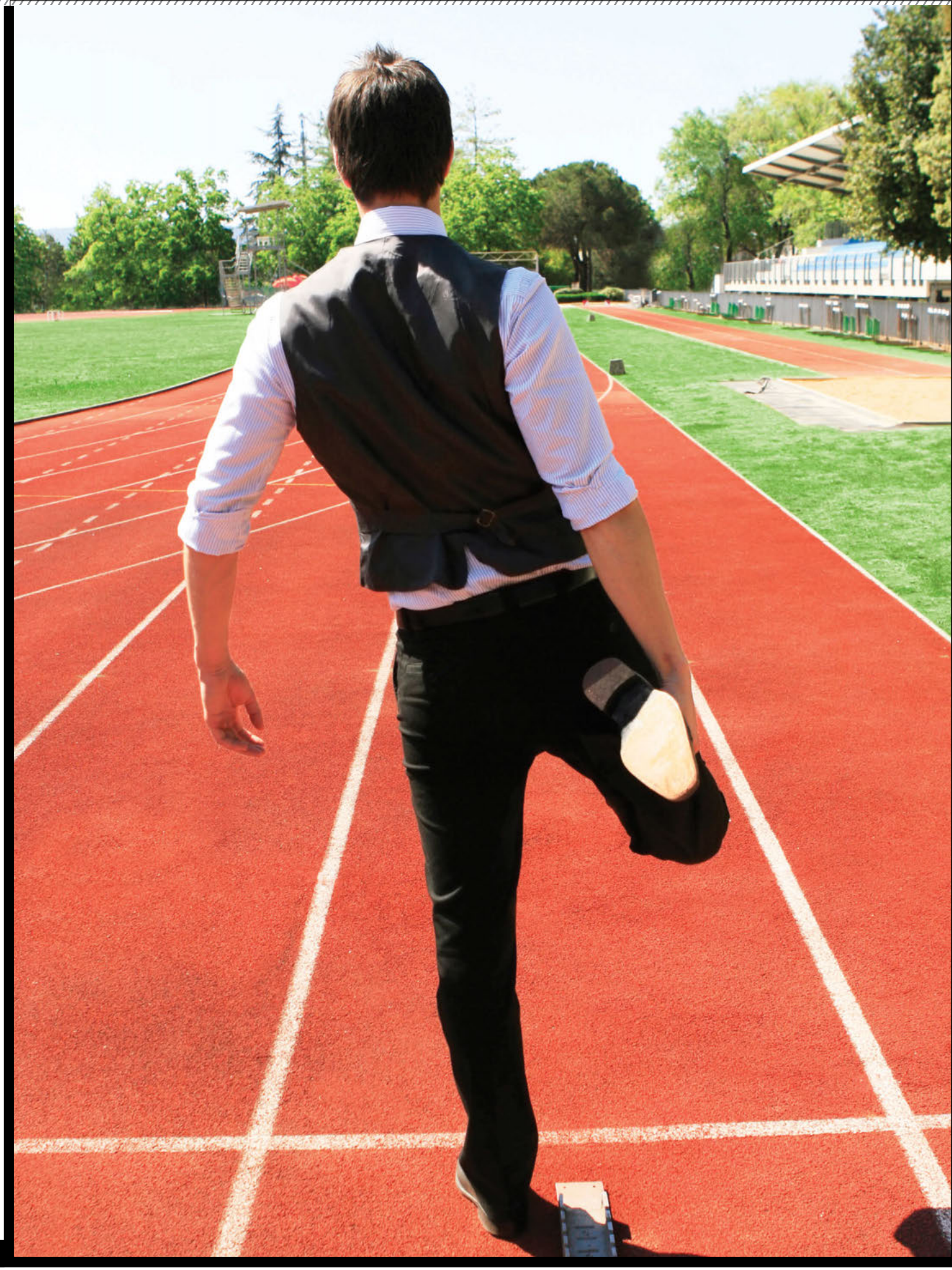
According to Clay Stevens, president of the International Exposition Company, which produces the event, the big news for 2013 is a new American Chemistry Council report that predicts $12 billion will be spent in this industry in 2014 and another $15 billion in 2015. The report says about 5% of that amount will be for valves and piping.

Attendees at ChemShow 2013, who are professionals involved in mixing, blending, heating, cooling, filtering or drying materials, will hear about cost-effective solutions and innovative technologies that increase process efficiency, reduce costs and encourage sustainability in operations. They will also wander an exhibit hall that features 300 vendors to the chemical industry.

For information, go to www.chemshow.com.

VALVE BASICS EVENT SET FOR NEW ORLEANS, NOV. 6-7

Check to see if the Valve Basics Seminar & Exhibits still has seats available for its two-day event, Nov. 6-7 in New Orleans, featuring VMA's popular Valves & Actuators 101 course and "Valve Petting Zoo." Find information on VMA.org > Meetings > Basics Seminar. Not able to attend the New Orleans event? The course will be held in 2014 in Kansas City (April 2-3) and in Las Vegas (Oct. 30-31).



USE 2014 TO GET READY FOR GOOD TIMES AHEAD

2014 MARKET OUTLOOK

BY KATE KUNKEL

Attendees at this year's workshop Aug. 8-9 in San Diego received mostly positive reports from speakers who agreed that, while the nation is in recovery, the road forward is filled with more than a few bumps. While abundance and availability of natural gas is definitely a major influence, speakers said North America's economic future will also be affected by the upswing in tight oil production. Those two factors could lead to energy self-sufficiency on the continent by the end of this decade and fuel a resurgence in the domestic petrochemical and manufacturing industries thanks to low feedstock prices and relatively inexpensive electricity.

Mark Peters of the *Oil and Gas Financial Journal* said the boom in shale gas production is leading the growth in hydrocarbon processing and the valve industry in the U.S. "Gas has great potential that we know how to use," he said, "and it has the capability to impact everything in the U.S. in manufacturing and in the petrochemical industry."

His remarks were backed up by several other speakers, including Mark Eramo, vice president of IHS, who added that abundance and low price are encouraging petrochemical companies to bring production back to the U.S.

But natural gas is just one driver. Many factors are affecting the current economic situation, including consumer and business attitudes.

Alan Beaulieu of the Institute for Trend Research said one of bumps for the immediate future is a mild recession that may occur at the end of 2014. However, he also said that, rather than considering the slight downturn a negative, smart business people should use the time between now and the expected boom years beginning in 2015 to prepare their companies.

GENERAL TRENDS THAT SPEAKERS IDENTIFIED INCLUDED:

1. Abundant gas, tight oil and potential energy self-sufficiency mean the world is looking at North America as a place to invest.
2. Companies should be looking overseas at opportunities from emerging countries, which still rely on coal and non-gas sources, and which have increased need for power, along with needs for water/wastewater and other infrastructure.
3. Companies that focus in 2014 on areas such as cutting costs, right-sizing, spending money on market research and new products, and hiring good people will benefit once the good years that will begin in 2015 arrive.

DOMESTIC ECONOMY: HAPPY STRESSES

According to Alan Beaulieu, ITR Economics, the nation is *not* in the recession that 40% of America still believes is occurring. In fact, Beaulieu said the economy is at record high levels and this year will be seen as a good year. He went so far as to say that if a company has not made money this year, something may be wrong with its business model.

At the same time, Beaulieu conceded that all is not smooth in this country. He said that by 2015, the nation will be "happy stressed" with increased demands on most sectors and inflationary pressures weighing in and that companies should use 2014 to prepare.

Meanwhile, Beaulieu pointed out that more Americans than ever are currently collecting food stamps—38% of Americans receive some form of assistance, which means a significant cash outflow that may translate into taxes.

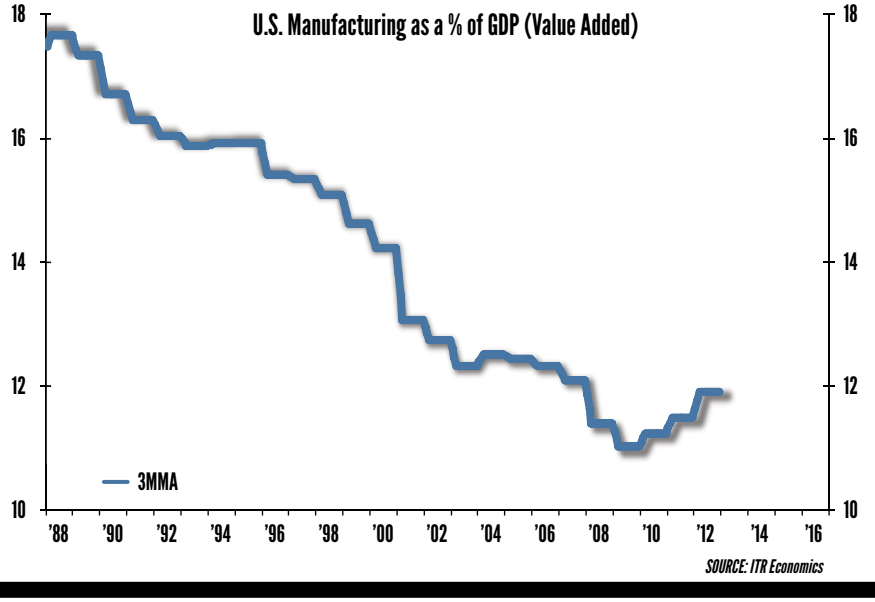
Other good news/bad news from Beaulieu:

Because the U.S. is a major producer of energy, firms are leaving other nations, including China and Europe, to come to the U.S. This is creating jobs and will continue until other countries in Europe decide to explore more options. The U.S. has a stimulative monetary policy for now with the Fed pumping $85 billion a month into the economy. However, he pointed out that the Federal Reserve is expected to wind down on that easing by the end of 2013. When the agency has done so in the past, the market sags. Without the flow of Fed money many have come to expect, the market will have a negative reaction and pull back. He also said that any massive amount of stimulus spending adds to inflation, which may show up in increased wages.

The Healthcare Reform Act is scheduled to come into effect in January 2014, which will raise costs for businesses and employees. When money drains from businesses and consumers, that means less spending so the economy will slow. In the long run, the economy will adjust, he said; but uncertainty and shock will make for a tough 2014.

Beaulieu is certain that interest rates are going up 400 basis points next year, which means today's mortgage rate would go up from 3.5-7.5%. He also pointed out that, depending on how quickly the new Fed chair raises interest rates, inflation could get a stronger hold on the economy. He predicted a mild recession in 2014.

Employment is rising, but it probably won't continue at this pace because there is gross uncertainty coming into 2014 so executives will slow down on hiring. Europe is recovering and will do well until about the middle of 2014, but because of the U.S. recession in 2014, Europe will have a mild recession that will be psychologically damaging for its nations. He also pointed out that manufacturing is improving in the western part of Europe, which helps the U.S. export market.



SOURCE: ITR Economics

Alan Beaulieu's advice on preparing for 2013-2014

1. **Create a positive leadership model (culture turns to behavior).**
2. **Invest in customer market research (know what your customers value).**
3. **Use training programs for people, processes and internal metrics.**
4. **Review and uncover competitive advantages.**
5. **Spend money on new products, marketing and advertising.**
6. **Improve efficiencies with investments in technology and software.**
7. **Check systems for readiness to accommodate increased activity.**
8. **Add sales staff and hire top people.**
9. **Lock in costs.**
10. **Judiciously examine company credit standings.**
11. **Work on "what's next."**

LOOKING AHEAD

Trends for the future include:

- **An aging, sick population:** The U.S. government spends more per person as a percentage of GDP than any other nation, he said. There will be double the number of people over 65 in the next 25 years, with more people over 55 than under 18 for the first time. Taxes could be raised on young workers, but that won't be popular. An alternative to raising taxes would be to increase the working population through immigration, but that may not happen in this country in the current climate, Beaulieu said.
- **Huge debt:** The Europeans and Canadians will have balanced budgets by 2020 and soon will begin paying down debt. The U.S. debt, however, continues to increase because of aging, health care and

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federal spending. The debt will continue to incur interest, and since interest rates will be going up, this nation will continue to pile on debt.

FORECAST:

In the second half of 2014, the U.S. economy will go negative on GDP and industrial production. Inflation could rise 3.5-4% in 2015 to 2016.

The economy in 2015 will heat up; there will be more demand for gas and oil and just about everything, but there will be inflationary pressures as well. Beaulieu predicted growth will continue from 2015 until the middle of 2018. Then in 2019, it all unravels—there are both high interest and high inflation rates ahead, and when that happens, the nation will know it's getting close to the cliff that will lead into the great depression of 2030.

WALL STREET: ADDED VALUE, RIGHT SIZING ARE KEYS

According to Michael Halloran, Baird and Company, the uncertain macro environment continues to challenge both U.S. and global industrial production growth. There are pockets of strength in oil and gas; however, demand in most markets remains challenged and choppy, he said.

Coming out of the downturn, companies who aggressively cut costs and right-size traditionally improve margins by finding money internally vs. externally, Halloran said. While some employees might lose jobs because of this, most margin improvement comes from better efficiency, which results in stronger balance sheets even though returns are on a smaller scale, Halloran said.

Overall, U.S. industrial production growth decelerated through the second half of 2012 and the first half of 2013. Short-cycle U.S. industrial trends remain volatile amid the uncertain macro environment, and companies remain conservative with respect to near-term industrial outlook given limited visibility into inventory levels, customer/channel demand and new order expectations.

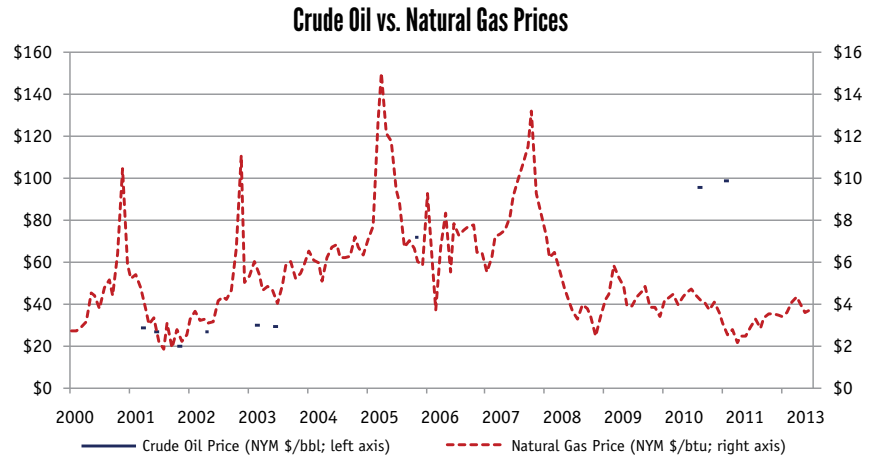
While industrial stocks remain soft currently, he sees improvements in the last six months in the European and U.S. markets. Halloran said people are expecting modest growth in the mature markets as they work off the bottom.

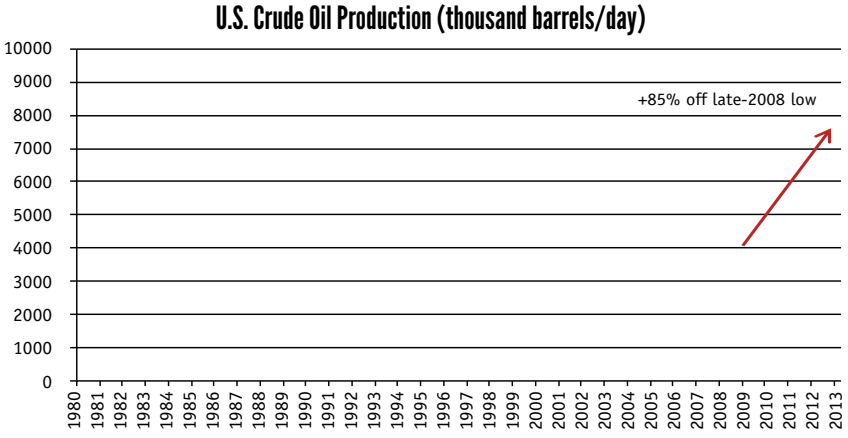
In terms of specific industries, Halloran said end markets with soft demand trends entering the second half of 2013 include mining, commercial construction, municipal infrastructure, power infrastructure, and upstream oil and gas. Later-cycle infrastructure projects continue to be pressured by macro uncertainty and limited visibility, but bidding and quoting activity remain positive (particularly in downstream oil and gas, and chemical), which implies improved order progression through year-end. Agriculture and commercial aerospace remain stable, and they are seeing gradual improvement in demand trends driven by

stricter environmental regulations and upward shift in energy efficiency (i.e., HVAC, power, municipal water/wastewater, general industrial applications).

Also:

- **Upstream Oil and Gas:** Rig counts appear to have stabilized and still remain at healthy absolute levels. The U.S. Energy Information Administration (EIA) is projecting output to reach an average of 7.3 million barrels/per day (mbpd) in 2013 and 7.9 mbpd in 2014. Though oil production is forecast to decline after 2019, output is likely to remain above 6 mbpd through 2040. Halloran expects high oil prices will contribute to the sustained drilling trend, with oil prices above $80 typically offering attractive project investment.
- **Midstream Oil & Gas:** The long-term outlook for refining and production across the board is very healthy although the near-term outlook is somewhat softer. Projects are going out of feed and into the quoting phase. While that trend is not a guarantee, manufacturers of valves, pumps and seals should see these





Source: EIA, IEA

projects starting to come into quoting stages by the end of 2013, which could continue in 2014 and 2015.

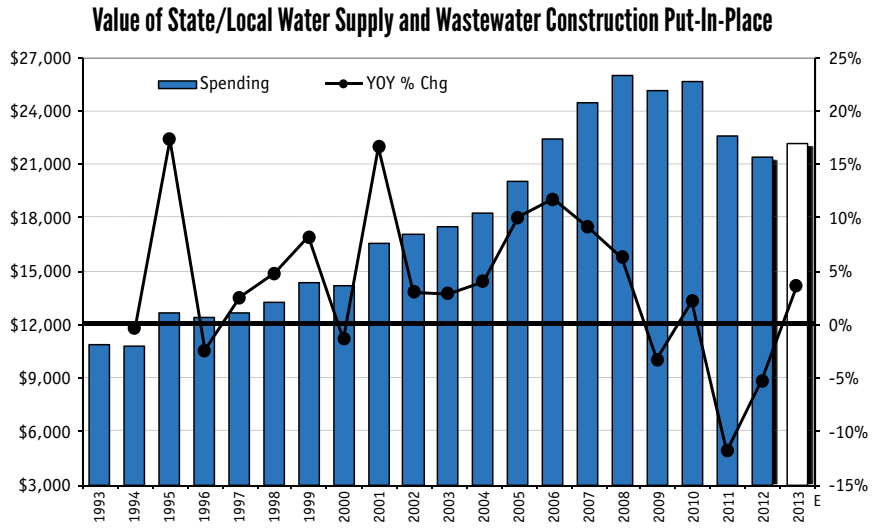
- **Downstream Oil and Gas:** Global downstream capital expenditures are expected to increase 4% in 2013/2014 and 5% in 2015. North America and emerging markets are expected to be the main drivers of project activity for the second half of 2013 and beyond. Continued strength in shale activity and persistent use of natural gas from shale plays as a low-cost feedstock, along with potential for LNG export infrastructure, likely will drive more meaningful refinery capacity additions in North America.
- **Chemical:** Low production costs thanks to low feedstock prices are likely to remain, providing a strong incentive to invest in the U.S. chemical industry. However, capacity utilization remains pressured as project orders continue to be pushed along, and maintenance, repair and operations (MRO) activity slows. Quoting/bidding activity for larger projects remains strong, and many industry participants are confident larger project orders will be released later in 2013.
- **General Manufacturing:** While investors are excited about the opportunities, many are maintaining a wait and see attitude. Companies are moving manufacturing out of China, and manufacturing jobs are growing faster in the U.S. than other job sectors; however, those jobs are not so much in standard manufacturing but in tougher positions such as those in oil and gas.
- **Power and Water/Wastewater:** There is little order activity in either sector right now but recovery could occur later in 2014 or in 2015. Near-term power trends remain constrained by global economic uncertainty and government fiscal issues and delays. Halloran says that, for any kind of meaningful growth, water and wastewater need debt and government stability. However, year over year growth should start to happen at the end of 2013, partially because tax receipts and residential building are getting better.

FORECAST:

The anticipated recovery in U.S. industrial demand continues to get pushed out to later in 2013 and maybe early 2014.

Thomas Decker, PE, BCEE, Brown and Caldwell, walked the red carpet with market outlook attendees this year, extending his tradition of linking a presentation to popular culture by using a movie theme. For example, Decker began by saying "The Best Years of our Lives" were 2005/2006 when the industry experienced 12-14% growth, but that turned into "The Sting" in 2011 when the recession finally hit this industry dropping off 4-5%. The industry then remained in "The Hurt Locker" in 2012 and 2013, and is still in a "Rocky" situation going into 2014.

The 2-3% decline experienced in 2012 carried over into 2013 at the time



Source: U.S. Census Bureau

of the workshop. However, while the market saw double-digit declines in January and February of 2013, an uptick occurred each month after that. By the end of May, the water construction part of the market was up by about 1% over 2012. Also, at the time of the workshop, there were 35 projects covering over $100 million in engineering design, which Decker says is a "stunning" number and signs of a comeback.

The water and wastewater markets worldwide can't help but grow because of sheer need. More than $1 trillion needs to be invested in the next 25 years in the water side of the business in this nation. America will be using 65% more water by 2025, not because of population growth but because of the growing energy business, which consumes 49% of the water produced, treated and generated.

Decker said macroeconomic factors are improving for water markets. For example, while the population growth in the U.S. is expected to slow down, it will still grow 7.3% between 2010 and 2020. Meanwhile, residential construction is up 28% in 2013 over 2012, and utilities are inching toward full cost pricing, which means more money for improvements and repairs.

But Decker also said surveys show the public supports water and wastewater work. Meanwhile, the American Society of Civil Engineers' annual report card gives water and wastewater a grade "D" for its condition, and the Environmental Protection Agency (EPA) says 55% of stream and river miles in the U.S. are still in poor condition while a $500 billion funding gap exists. Decker said $384 billion will be needed for the next 20 years to keep drinking water infrastructure up to pace.

DRIVERS OF OPPORTUNITY

In the western U.S., the issue is supply—76% of the western U.S. is abnormally dry with serious drought conditions in many places. Several large water schemes such as The Bay Delta Program in Northern California and multi-billion dollar pipelines for Col-

orado and Nevada attempt to address these needs.

In the east, infrastructure breakdown is the big issue—more than 700 pipe breaks occur every day in the U.S. and many of those are on the east coast. Even without the breaks, the systems are in such bad shape that one out of every six gallons treated and sent out is lost to leaks.

Meanwhile, Decker pointed out that only 0.5% of pipelines are replaced yearly, which means it takes 200 years to go through an entire replacement cycle, far longer than the life of a piece of pipe.

The regulatory environment for water and wastewater continues to be a main concern of the industry. Currently, more than 65% of the largest wastewater utilities in the U.S. are either operating under a consent decree or in talks about a consent decree, which means tremendous dollars are needed for upgrades. New developments include:

- **EPA's new stormwater rule:** This rule would apply to runoff and discharges from all new developments after they are up and in operation—requiring them to meet certain levels of water quality that are often pre-construction. For equipment companies, this creates more opportunity for infrastructure work.
- **Integrated planning:** EPA came out with a new framework in June 2012 that allows utilities/agencies to plan the storm water and wastewater sides together. This would allow utilities to better balance improvements and incorporate green infrastructure.
- **Energy conservation/generation:** President Obama issued an executive order for an additional 40 gigawatts of energy to be derived from cogeneration—combined heat and power—by 2020. Water and wastewater will be a big part of the system.

THE FINANCIAL PICTURE

Minimal inflation and construction costs that rose only 2.5% in 2012 could help the infrastructure situation. Also, water rates are up an average 6.6% while wastewater is up 7.2%, which is good for potential business.

One point of concern is that municipal bonds, which are the main source of funding for water/wastewater, are in the bull's eye of the current administration, which is threatening to take away deductions.

Another possible challenge is the move to green infrastructure, which includes porous pavement, rain gardens and other tools for attenuating storm water and keeping it from running off and getting into either combined systems or separate storm water systems. These programs do not use a lot of valves or pipes.

FORECAST:

The water and wastewater industry will remain flat for the remainder of this year with the second half more robust than the first and some improvements in 2014.

Power is a two-sided story involving mature economies and emerging economies. To understand what is

going on in those economies requires looking at three major factors: supply, demand and the factors that promise to change the game, according to Kevin Geraghty, vice president, Energy Supply, NV Energy.

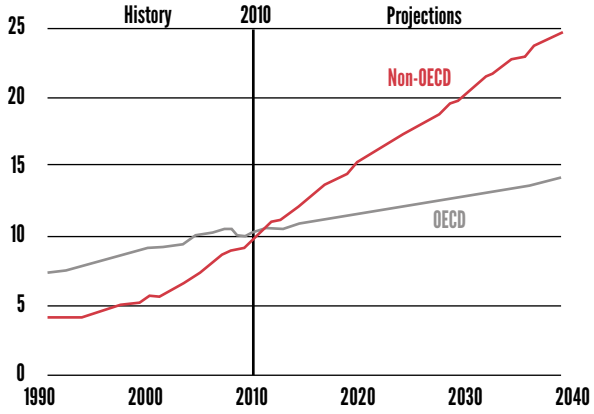
CUSTOMER NEEDS AND BEHAVIORS: DEMAND

In 2010, net generation from non-OECD and OECD areas of the world was equal. However, by 2040, non-OECD demand will be double that of OECD.

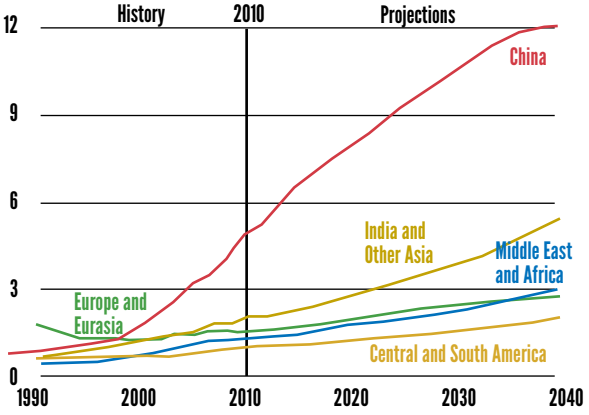
Geraghty says that over the next quarter-century, the demand for power in mature economies will stay flat. He pointed out that the recession brought, for the first time ever, contraction in U.S. electricity demand. This contrasts with the EIA's prediction of a 28% increase in demand from 2012 to 2040. But Geraghty pointed out that in five of the last six years, consumption has fallen, and as energy becomes more costly and more efficient products are created, demand will continue to fall.

Internationally, a different story can be seen. For example, while China's energy demand is starting to taper off and population growth in that and OECD countries slows down, other parts of the world continue to grow. Africa's population is growing by 75% over that quarter century and India by 40%. Geraghty said by 2040, three-quarters of the world's population will reside in Asia Pacific and Africa.

OECD and non-OECD net electricity generation, 1990-2040
(trillion kilowatt hours)



Non-OECD net electricity generation by region, 1990-2040
(trillion kilowatt hours)



Source: U.S. EIA, International Energy Outlook

EXISTING AND FUTURE RESOURCE MIX: SUPPLY

No new coal projects are currently underway in the U.S. while the dominant changes in the energy mix are toward natural gas and renewables. Unfortunately, those renewables are mostly wind and some solar, which do not use valves. By 2040, wind and solar capacity will nearly triple from what it is today in the U.S., he said.

Meanwhile, nuclear is at a standstill in the U.S. The big problem there is the economics of building a huge power generating facility, Geraghty said. What's more, because the price of gas is so low, nuclear will remain challenged on costs alone. Not only will there be no growth, current plants will be shut down because nuclear is so expensive to run, he predicted. Even after a facility is built, it requires many people to operate the plant. Geraghty expects there will be only four nuclear plants in this country, all in the southeast. Neither nuclear nor coal will survive unless the plant is a regulated utility in a non-regional transmission organization (which is mostly in the Southeast).

The energy story in the U.S. is all about natural gas. If the prices stay low, manufacturing should come back, he said. The ability to prove and deliver on natural gas also will determine how much electricity is derived from this resource. He said power operators will proceed with natural gas plants if they are comfortable that $10 (or less) gas will be available.

POLICY AND REGULATORY DRIVERS: GAME CHANGERS

Some of the current game changes are:

- **Greenhouse gas (GHG) taxes:** All information the EIA releases assumes there will be no GHG taxes. But Obama recently said he is telling the EPA to put in rules for greenhouse gases for existing facilities, Geraghty said. If a tax of $25 per ton is set on GHGs, much of the current 314 gigawatts of coal generation would be retired immediately, and natural gas will not rise to its full potential, he said.
- **Renewable energy:** The part renewables will play in the U.S. and in the developed world is tied to policymakers. Tax credits, efficiency standards and GHG taxes can dramatically level the playing field for renewables versus gas and nuclear.
- **Energy efficiency:** Technological advances have greatly reduced consumption of power, and efficiency is the big story with everything from LED lights to smart phone apps that handle the power in a residence. In industry, the use of 3D printers could reduce power use.
- **Demand side management:** There are ways to interrupt the loads of residential units, big plants and manufacturers by controlling demand, which is now a high tech boom industry for power—new tools are constantly adding flexibility in managing usage.
- **Distributed generation:** The world is learning that large central plant generation of power is no longer the only choice. Rooftop solar, backyard wind and small modular can all contribute to local power generation.

FORECAST:

GHG management and energy efficiency will be the story for the power sector in developed economies over the next 25 years. Cheap power will be the story in developed economies and China. But the most fascinating story line to watch is energy efficiency and management tools.

U.S. producers are well aware they drilled themselves into an over-supply situation with gas, and they don't want to let the same thing happen with oil, John Spears, Spears & Associates, Inc., told attendees. At the same time, U.S. refineries have restraints about the kinds of crude they can process. Currently, a tremendous level of production of light sweet crude is taking place, but many of the refiners are better suited to processing heavier, sour crudes, which creates a mismatch in this country, he said.

More refiners need to address this imbalance in the types of crudes they can handle, he said. For the individual markets:

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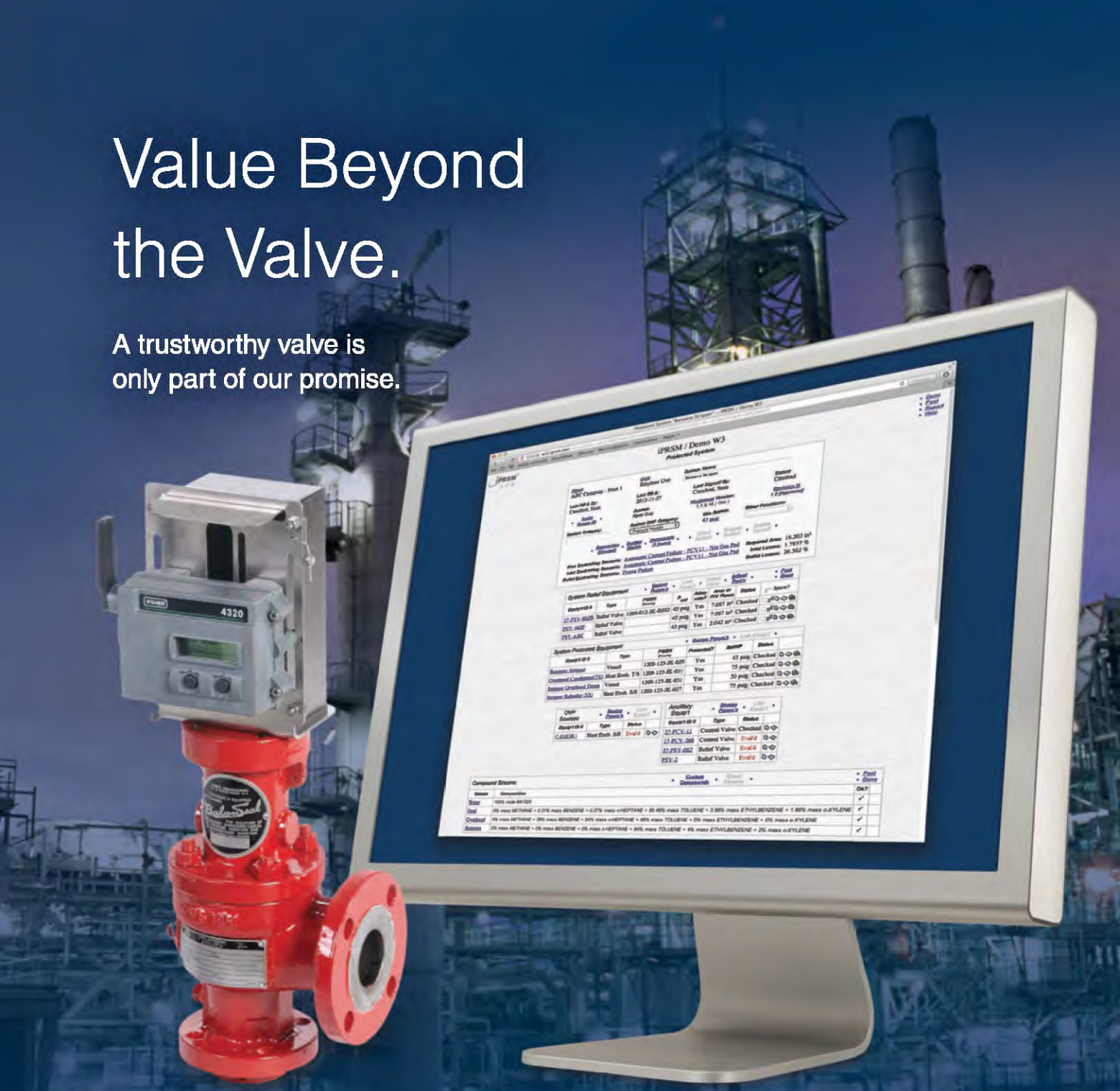

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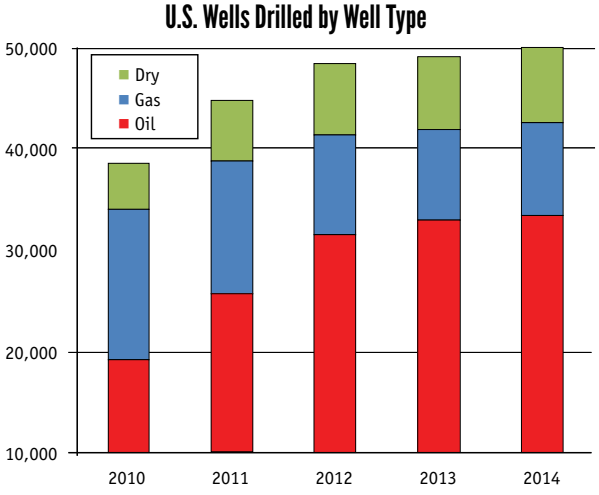
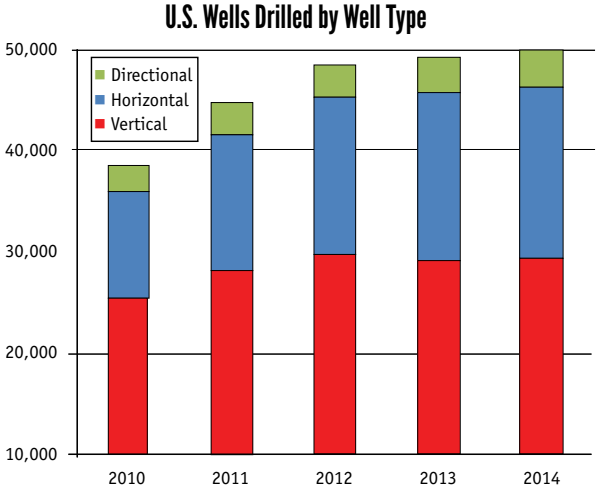




Source: Spears

OIL

While global crude oil use grows about 1% per year, supply from non-OPEC countries is projected to increase to an average of 53.9 million barrels per day (mbpd) per country. Last year, the U.S. produced about 6.5 mbpd, and currently it drills about two-thirds of the oil wells in the entire world. By 2014, the Energy Information Administration predicts the U.S. will produce about 8.25 mbpd, much of it from the Bakken shale in North Dakota and the Permian Basin in west Texas. In 2014, non-OPEC output is expected to increase to an average of 55.5 mbpd.

Changes in U.S. rig and well counts have uncoupled over the past two years as the efficiency with which horizontal and directional wells are drilled has improved by almost 20%, Spears pointed out. Going forward, however, rig count and well count are expected to resume moving in tandem as rig efficiency improvements moderate.

Oil prices should decline 5% in 2014 as new supply additions exceed global demand growth—Spears said prices are likely to reach $90 in 2014. If the price falls below $70, rigs could be retired as those wells would not meet profitability requirements.

GAS

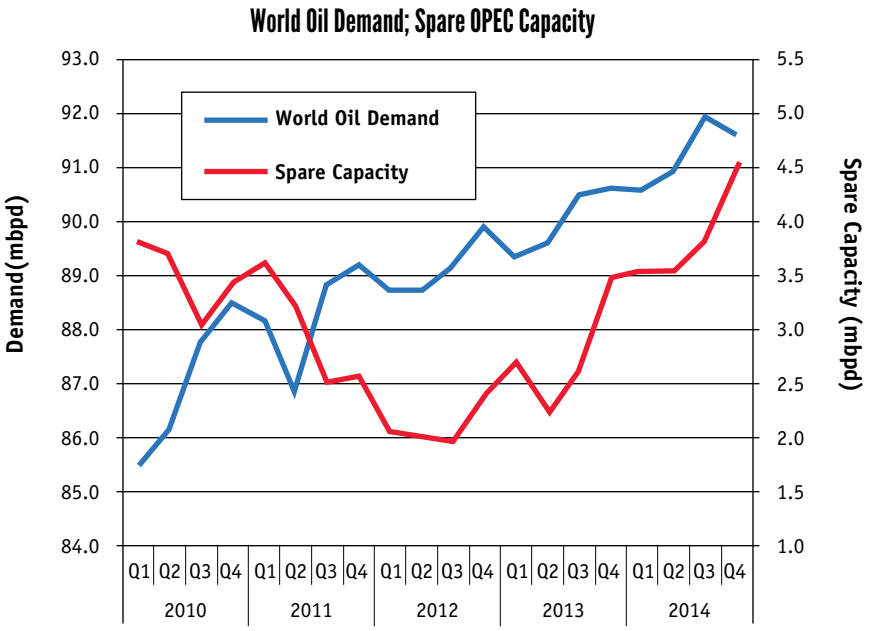
Natural gas production in the U.S. has decoupled from rig activity partly because of rig efficiencies, but also because of the significant backlog of gas wells waiting to be tied to pipelines. The cost to drill and complete new wells in the U.S. may continue falling at 2-3% per year through 2014. The one area that has not seen price reduction is the production equipment category (which includes valves) where cost is actually growing about 4% per year, Spears said.

Overall rig efficiency is up about 9% in 2013, offsetting an 8% drop in rig count. Because of a 10% drop in the number of new gas wells drilled (the most valve-intensive segment of the market), Spears estimated that overall valve demand in the upstream sector of the U.S. petroleum industry fell 1.3% in 2013. However, expected recovery in gas well drilling in 2014 will see valve demand rise again in that year.

MIDSTREAM AND INFRASTRUCTURE

In the Marcellus shale, pipeline capacity is expected to increase further to about 2.8 billion cubic feet per day (bcfd) in 2013, which would allow gas production to grow almost 40% even though the number of new wells drilled in the Marcellus fell about 30% in 2012. Marcellus is currently benefitting from drilling done a couple of years ago.

An important factor for equipment manufacturers is that midstream companies in the U.S. spend $17-$18 billion per year in capital projects. One-half of that is for facilities, which include gas processing plants, storage caverns and oil terminals. The other half is for pipelines. Companies on both sides will have total revenues of $85-$90 billion per year, and their



Source: EIA

capital spending is about 20% of their revenue.

LNG EXPORTS

In December 2012, the LNG market benefitted from a report concluding that exports of natural gas would be positive for all sectors of the U.S. market. That report has been key to the Department of Energy (DOE) approval of export proposals.

Currently, 20 proposals to build LNG export terminals in the U.S. are in the works; three have been approved by DOE. Each terminal could handle 2 to 3 bcfd. Spears expects that, even if just four or five of the facilities are approved, that would mean 8 to 10 bdfd that currently does not exist in the market. At the same time, Spears pointed out that producers must recognize approval is just the first step in getting a facility built: The first terminal won't even come on-stream until 2016.

Much more important in the near term is how much gas this nation can send to Mexico, Spears said. Mexico has the fourth largest shale reserves in the world, but has done almost nothing to take advantage of this resource. The country has a gas shortfall at the same time its power sector is growing, so the short-term strategy is to build pipelines to the border and import gas from the U.S. Currently Mexico buys 1.7 bcfd, and they are building 5 bcfd of pipeline capacity over the next couple of years to handle imports from the U.S.

Spears predicts U.S. gas exports will increase first to Mexico via pipelines, then by LNG terminals to the rest of the world. This could bring the price up to $5 or $6 at the wellhead here, which is still below the trigger price of $10 (the break-even price between gas and nuclear). If gas goes up to $5 or $6, it also could also extend the lives of some of the older coal plants.

FORECAST:

There probably will be another year of spending in the midstream sector to build pipelines and storage for new gas. Based on the expected recovery in gas well drilling in 2014, overall valve demand will rise 2.3% in 2014.

The North American petrochemical industry took about a decade off, but the situation has changed dramatically in the last half decade, according to Mark Eramo, vice president, Chemical Insights, IHS Chemicals. Growth in natural gas and hydrocarbon processing, which feeds into the chemical industry, has created this huge shift, and the big spread between the price of oil and natural gas is fueling the growth.

Also, with the economy growing again, demand is increasing, so Eramo says the North American chemicals and plastics industry is moving into a sustained period of expansion limited only by feedstock capacity and capital.

CAPITAL INVESTMENTS

The capital flowing into North America is roughly 50% foreign and 50% domestic, Eramo pointed out. Investors who used to look elsewhere are now happy to look here again because of increased resources.

New assets in petrochemicals take multi-billion dollars of investments and four to five years to show up as facilities and production, but these trends began about 2010, so projects were starting to come about in 2011-2012. Currently, companies are making plans, doing the engineering and ordering equipment. By 2016-2018, the investments will begin to come into play.

Eramo pointed out that investments are driven by cost advantage or proximity to demand centers. At the same time North America is experiencing advantages, massive investments still are occurring across Asia partially because that area continues to be the manufacturing floor of the world. Demand growth is also accelerating in developing regions such as India and China.

COSTS

Hydrocarbon energy, crude oil and natural gas account for 65-70% of the cost of producing petrochemical products, which is why petrochemical investment

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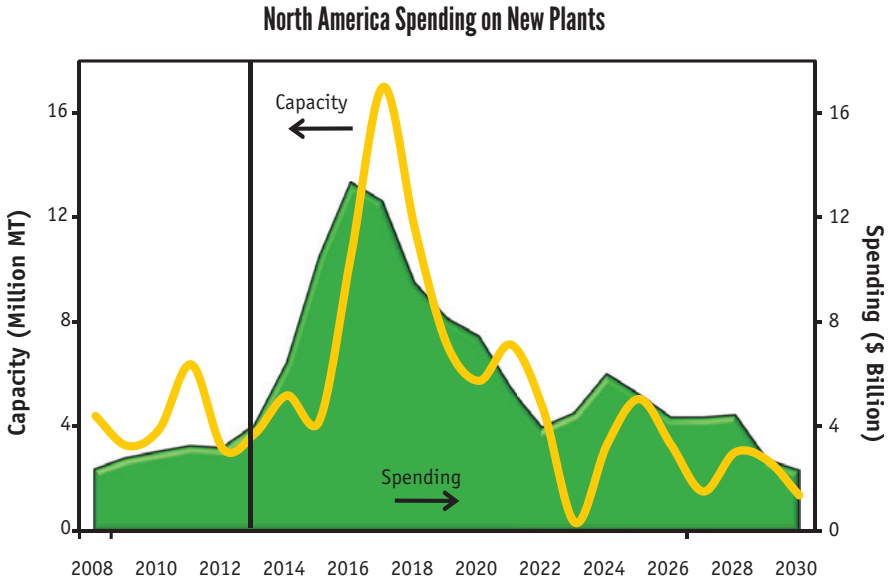
goes where the feedstock is least expensive, Eramo said.

What is important for the North American petrochemical industry is the ratio between oil and gas prices. In the early 2000s, when crude and gas were trading at the same level, plants were shutting down. Current investments in petrochemical are higher because natural gas liquids left over from the natural gas that goes to fuel are very competitive now in comparison to the price of crude oil feedstock.

While abundant shale gas now available on this side of the ocean is also available all over the world, the question is whether it can be developed. North America currently has a head start of 10 to 15 years before even the most aggressive plants in places such as China can bring the gas to the market.



Note: Spending from 2013 to 2017—$48 billion. Total spending 2018 to 2030—$68 billion. Spending only includes ISBL and OSBL for new capacity. Source: IHS, Inc.

MARKETS

All discussion about the economy around the world ultimately is based on the value chain and the demand for plastics and petrochemicals, Eramo pointed out. Demand for basic chemicals is driven by end-user demand.

While opportunities from good feedstock supplies and processing knowledge in North America make the future bright, the question is whether the makers of durable goods will want to bring manufacturing back here, which is not a certainty. North America currently has a stagnant market for chemicals and plastics, but as capacity ramps up, there will be opportunities to get the plastics offshore. Eramo said tomorrow's chemical market will be more globally interconnected.

Accelerating demand growth in developing regions will outpace capacity growth, which means those regions will increase imports. Eramo said that by 2020, 50% of the world's ethylene products will have to be put on a boat and shipped elsewhere to be turned into products. Polyethylene and vinyls will be pushed offshore in the form of plastic pellets and powders.

He said the message to producers (and manufacturers supplying to them) is clear: Do not ignore the absolute size of the North American and European markets, but for rapid growth, look to the emerging world.

FORECAST:

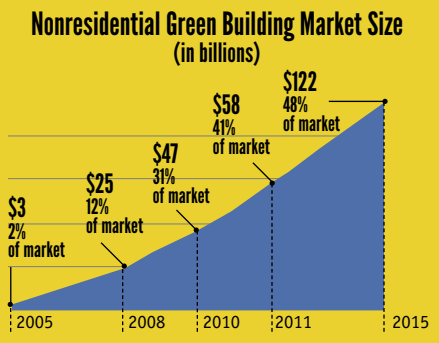
North American spending on new ethylene plants from 2013 to 2017 is projected at $48 billion to 2017. It will peak early in capacity at 16 million megatons in 2018, but that level is sustainable. Investment could be $68 billion by 2030. Comparing this to growth around the world over the next decade, Europe will be flat, but there will continue to be investment in the Middle East and Asia.

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

CONSTRUCTION: GROWTH AND A FOCUS ON GREEN

The non-residential building market has definitely grown in the past year and is expected to continue in 2014, according to Harvey M. Bernstein, F.ASCE, LEED AP, vice president, Industry Insights and Alliances, McGraw Hill Construction. Much of what is happening has implications for manufacturing as well as valve end-user industries.

The biggest percentage of growth in non-residential starts will be in "green" building, Bernstein said. This trend makes a big difference when valves are being specified, so this is definitely an area that manufacturers should monitor carefully.



Source: McGraw-Hill Construction, as of April 2012

Another trend is the move to modular construction, which will increase and change distribution, manufacturing and sales strategies. In the future, prefabrication of mechanical, electrical and plumbing building systems and much more will become standard, which will affect valve, actuator and control manufacturers because there will be more centralized procurement practices. Bernstein said this means volume opportunities but this trend also will necessitate more immediate marketing and communication strategies (for example, if dimensional changes in a ball valve will impact a model, this information must be immediate.)

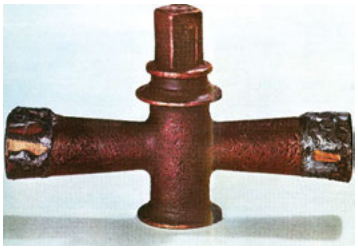
The changes in markets and technology are so far reaching that a special construction market feature has been published on VALVEMagazine.com.

SPECIAL ANNIVERSARY SECTION

Milestones in Valve History

2000 years ago

Romans used the predecessor of the valve to control flows in aqueducts and water distribution systems.



1788

James Watt and Matthew Boulton design the first centrifugal governor.

Late 1700s

Steam power is harnessed and with it, the need to control this powerful new source of energy.

1825

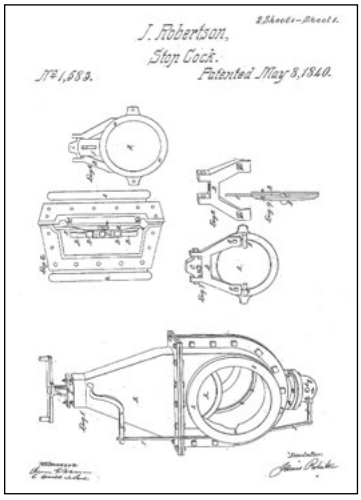
First shale patch discovered in Aqueduct, NY.

1839

Charley W. Peckham files a patent for sluice gate control liquids.

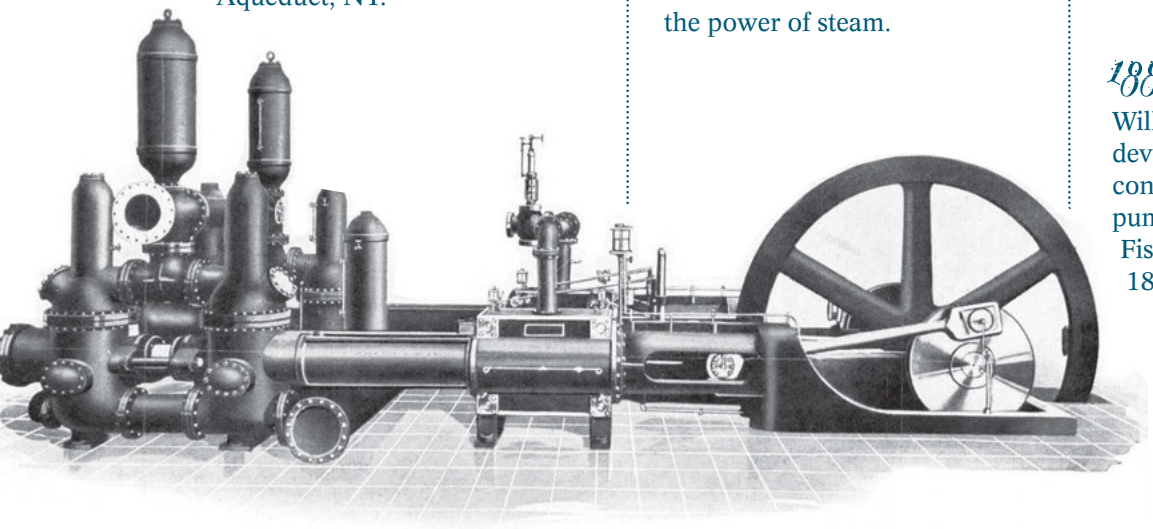
1840

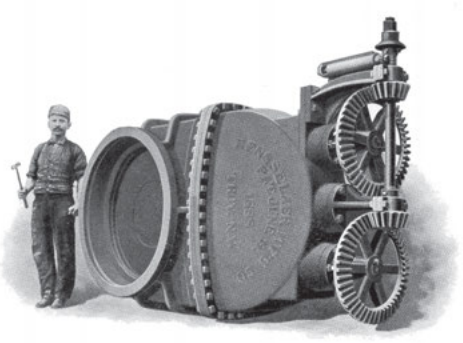
James Robertson files the first real "valve" patent in the U.S.



Mid-1800s

The Civil War exponentially increases the need to harness the power of steam.



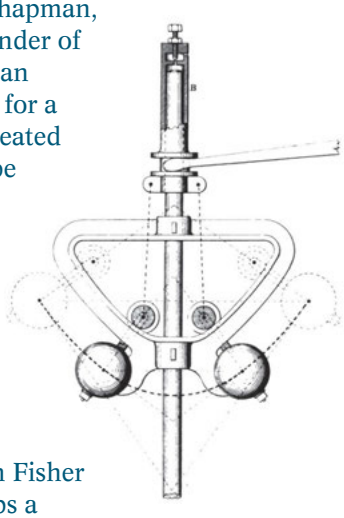


Late 1800s

Boiler explosions result in public outcries for better control.

1871

A patent is issued to John Warren and John Chapman, the founder of Chapman Valves, for a metal-seated ball-type valve.

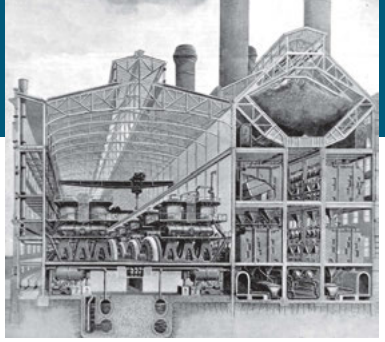


1880

William Fisher develops a constant-pressure pump regulator and forms the Fisher Governor Company in 1888.

1901

Spindletop Gusher starts an oil processing and refining boom.



1907
Stellite is introduced.

1910-20s
Stainless steel is developed as a material.

1914
The first Boiler & Pressure Vessel Code covering safety valves is approved.

1912
The Committee of Manufacturers on Standardization of Pipe Fittings and Valves (now the Manufacturers Standardization Society or MSS) is formed and publishes a pamphlet on pipe schedules of flanges and flanged fittings.

1929
The first supercritical power plant is built.

1930s
Power plants push the limits of pressure and temperatures. Classes 900 and 1500 created.

1932
German inventor Kurt Bredtschneider patents a pressure-seal joint.

1934
MSS develops the first valve testing standard, MSS SP-24T Service Rating and Test Standard

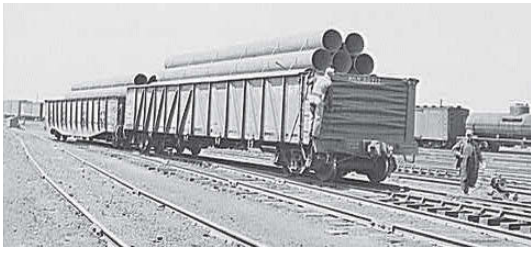
1936
The first valve positioner is created.

1938
Roy Plunkett stumbles upon polytetrafluroethlyne (PTFE), later named Teflon.

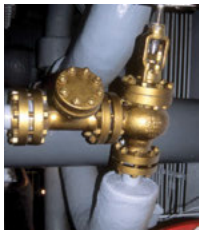
1938
The first meeting of the organization that would become the Valve Manufacturers Association takes place.

1939
The API 600 gate valve standard is issued.

1942
Big Inch pipeline is first to replace oil tankers as a way to move petroleum through the country.



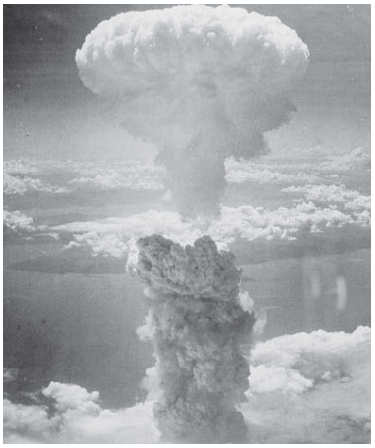
1939 to 1945
World War II creates an abundance of new markets for valves. More than 10 million valves are produced for ships alone.



1942
The War Production Board (WPB) issues stringent requirements for what can be made in factories and how, including valves and related equipment.

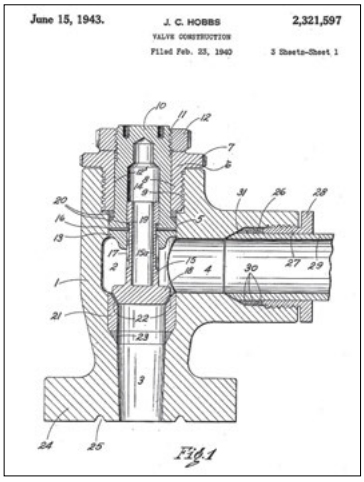
1945
The WPB releases a statement calling the growth of the valve industry during wartime "One of the Production Miracles of the War."

Milestones in Valve History



1945
The first atomic bomb is dropped.

1946
James Hobbs files patent for high pressure valves.

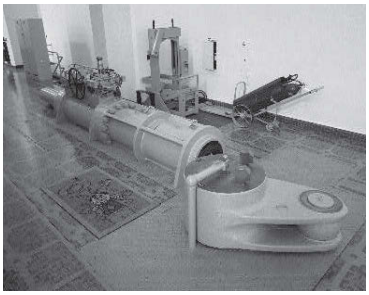


1950
Howard Freeman creates the first bidirectional, zero leakage ball valve.

1950-1953
The Korean War is fought.

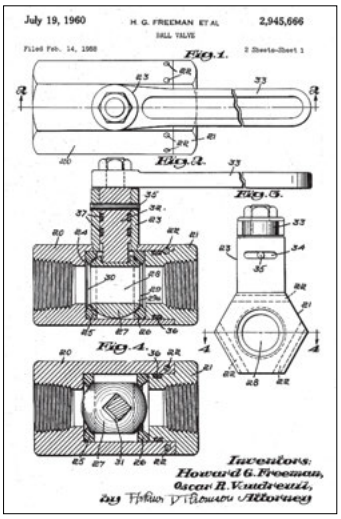
1952
Computer Numerical Control machining is introduced.

Mid-1950s
The first butterfly control valves are created.

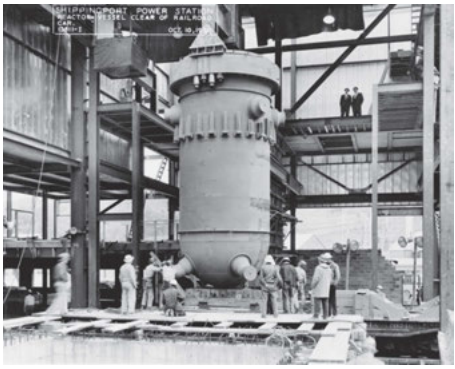


1957-1975
U.S. involvement in the Vietnam War lasts for 18 years.

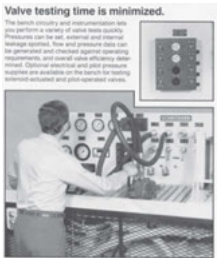
1958
Freeman files for a patent (the "666" patent) for his bidirectional ball valve and "Teflon wars" begin.



1958
The first commercial nuclear power plant goes online in Shipping Port, PA.



1961
MSS creates SP-61 Pressure Testing of Valves to cover all types of valve testing.



One of the first seawater desalination demonstration plants to be built in the U.S. is in Freeport, TX.

1964
SP-66 Pressure Temperature Rating for Steel Butt-welding End Valves is created.

1968
API 598 Valve Inspection and Testing supplants SP-61.


St. Petersburg Times

Moon, We're Onto You

Americans Walk On Moon's Plain

Man's Boundary: Always One Step Away

Kennedy Faces Accident Charge

1969

U.S. lands its first man on the moon.

1970

Oak Ridge National Laboratory develops new alloy system, 9CR-1 Mo-V.

The Environmental Protection Agency is formed.

The Clean Air Act is enacted.

1972

The Clean Water Act is enacted.

1974

ASME B16.34, Valves Flanged Threaded and Welding End replaces SP-66.

1975

The first triple offset valve debuts.

The VMA bylaws are changed to allow actuator manufacturers to join the association.

1979

The Three Mile Island nuclear disaster shuts the door on the U.S. nuclear industry.

1980

Jamesbury wins a suit against the federal government on the 666 patent.

1983

Intel creates Bitbus, the predecessor of fieldbus.

1995

Canadian companies are invited to join VMA.

Late 1990s

Analog systems give way to control valve control systems and protocols, including smart valves.

1999

VMA adds the associate member category for U.S. and Canadian companies that offer supplies and services to valve and actuator manufacturers.

2000s

Fugitive emissions becomes a top issue.

2001

The events of 9-11 affect the entire world and change the face of security.

2009

To help train newcomers to the industry, VMA creates "Valve Ed," and begins conducting seminars around the country to teach the basics.

2013

VMA expands membership to include distributor/channel partners.

VMA: 75 Years Representing the World's Best Valve Manufacturers

Coming Together for the Common Good of the Valve Industry

BY GREG JOHNSON

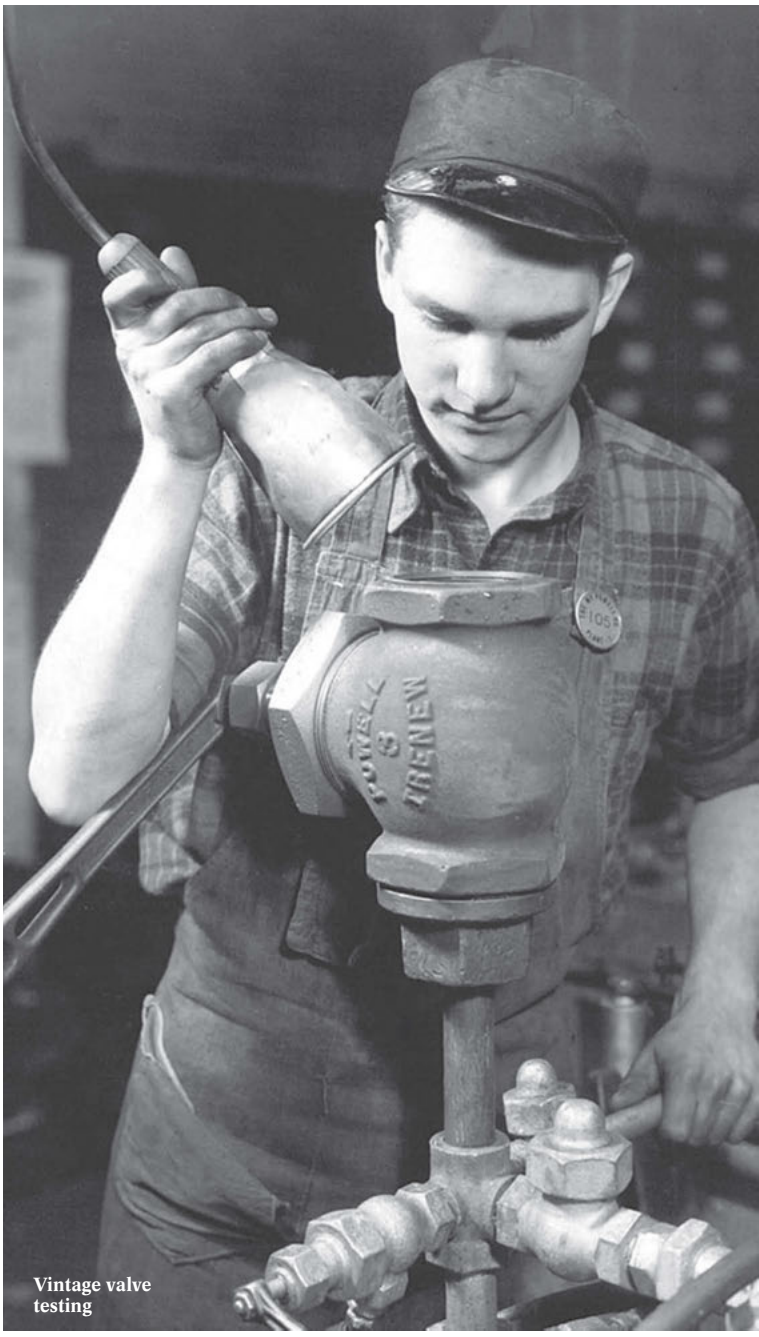
In a small room at The Biltmore Hotel in New York City, smoke from Cuban cigars, briar pipe tobacco and unfiltered cigarettes combined to create the 1930s aroma of business and opportunity. The first meeting of what was to become the Valve Manufacturers Association of America (VMA) was called to order with all the big players in attendance: Representatives from Crane, Fairbanks, Kennedy, Lunkenheimer, M&H, Ohio Injector, Wm. Powell, Reading-Pratt & Cady, Stockham and Walworth sat side-by-side. They were not there as aggressive competitors, but rather as partners with the goal of creating an organization for the common good of the industry in which they were so deeply vested.

The organization they fashioned would have great impact on American valve manufacturers, especially as the winds of war gusted, eventually blowing the United States into the fray and requiring every bit of industrial output the country could muster. The date for this organizational meeting of VMA was Sept. 14, 1938.

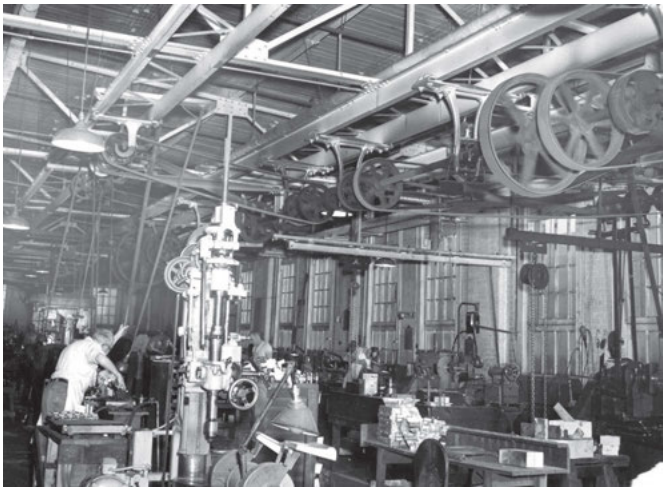
The Origins

The industry actually made its first strides toward organization nearly a decade earlier with the merger of the Valve Institute and The National Association of Fitting Manufacturers. The marriage was not to last, however, and the group split up in 1937. The fittings makers formed the Fitting Manufacturers Association, while the valve manufacturers created VMA in that smoky room.

A look back at the decade preceding this first meeting reveals that the situation for the industry had not been so good for this important segment of America's industrial economy. The depression and ineffective government economic corrective actions created a harsh situation for the industry. Sales were down, employees had been laid off and work weeks had been slashed in an effort to stay afloat. The only real high spot



Vintage valve testing



Lunkenheimer plant 1948

was product output in 1937, which showed a distinctive spike in sales. Despite the setbacks, however, these companies felt strongly about the future of their industry. Their feelings are expressed well in language from the memorandum of agreement for the organization:

> *Whereas, we, the undersigned companies, engaged in the manufacture and sale of valves, believe that we can render a more efficient and economic service to the community if we are associated together to collect and disseminate trade statistics, to correct trade abuses, to eliminate waste, to promote knowledge of costs, and to do things which are legal and proper to help promote fair trade practices.*
>
> *Therefore, in consideration of the above and of the agreement each to the other moving, we severally agree as follows:*
>
> *That we will join together in setting up an association to be called The Valve Manufacturers Association which will have four subdivisions: 1) Iron Body Valves, 2) Bronze Valves 125# and over, 3) Bronze Valves under 125# and 4) Steel Valves and Steel Fittings.*

At the meeting, the companies agreed on a dues assessment fee that would defray the proposed yearly budget of just $50,000. The first order of business for the fledging organization was tackling the Fair Labor Standards Act, also known as the Wage-Hour Bill, which was passed on June 14, 1938. Like other manufacturers, VMA members knew they had to deal with that law's impact immediately. Their response marks the association's first entrance into the legal and legislative lobbying arena as they set aside $2,000 to pay a general counsel. The Wage-Hour Bill, with its minimum wage and maximum work week, was a vital issue for many manufacturers, even though some had compensation and employee benevolence already far exceeding the minimums demanded by the new bill.

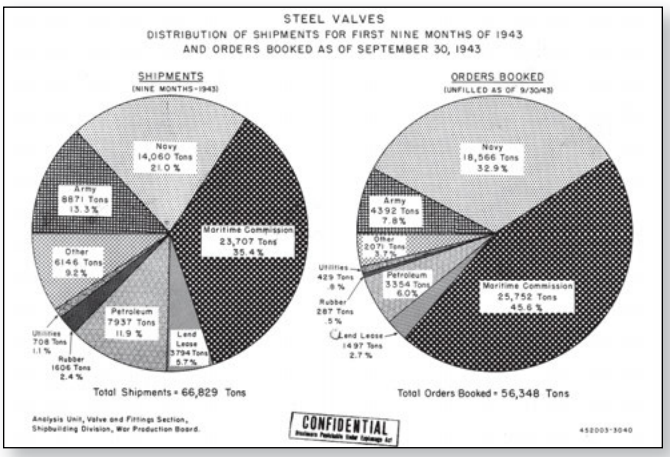
The first statistical report of the VMA, which was issued in February 1939, shows the rough seven years preceding the creation of VMA as well as the spike of 1937.

That was soon to change because of the approaching war. In a letter to the membership dated Nov. 30, 1939, VMA secretary-treasurer W. H. Norrington said the following in regards to an upcoming December meeting: "The Valve Manufacturers Association is entering into the new year faced with many new unusual conditions created by the European war, which will undoubtedly have an important effect on the operations of this industry." Norrington appealed to members to provide their companies' latest statistical information. This information would be vital so that the industry would have a picture of both its current output and ultimate capacity over the coming two years.

By mid-1941, VMA membership had increased to 29 with many additional companies providing statistical information or input on various committees. This newly empowered band of companies with similar interests was now in uncharted waters as they began to navigate the highly government-directed production of World War II; the collar of production controls would not be lifted until 1946.

In addition to production controls, the industry also was forced to comply with product simplification requirements. These requirements restricted what some companies could produce to specific types of valves and prohibited all producers from making selected sizes and pressures. The industry responded with production that exceeded all the government's valve requirements. A War Production Board press release in 1945 called the phenomenal growth of the (VMA-led) valve industry during wartime "One of the Production Miracles of the War."

The industry marched through the war-borne red tape and regulations to emerge from the conflict with many new valve manufacturers along with a huge production capacity that would not be maximized again until the 1950s. When the war was over, the government still put restrictions on many key



One of the first goals of the association was to disseminate information. These charts show steel valve shipments in 1943.

materials used in alloy valve manufacture. In fact, because of the industry's important relationship to national defense, the government did not loosen its reins on valve manufacturing until after the Korean War.

By 1953, a domestic building boom was in overdrive, pushed forward by baby-boomer births, residential growth and the expanding energy industry. VMA kept pace with this growth, expanding to meet the ever-increasing demand for valves. During the mid-1950s, VMA dealt with issues such as tariffs, labor and freight increases as well as the impact of new valve materials and new sources of energy. The fifties also saw the organization increase its statistical information-gathering activities, including the reporting of imports and exports of valves. The report for 1957 listed U.S. exports at $69,759,457, while imports were $753,956. Although the import percentage seems small, that was an increase of 1,000% from 1956—a portent of things to come in 30 more years.

The 1960s were a time of steady growth for the valve industry. Many new refineries and petrochemical plants were being built for the oil and gas sector, which created a need for huge quantities of valves. Modern power plants were constructed with new, more efficient higher-pressure boilers. The residential boom also continued, requiring huge increases in water and wastewater flow control products. VMA continued to add new members as well as expand member services, with statistical information a top member need.

Economic Challenges

In 1971, inflation reared its ugly head, and all manufacturing industries faced challenges they hadn't seen in decades. The Richard Nixon-imposed 90-day freeze on wages, prices and rent received much attention from VMA members. The association's Government Affairs Committee responded to the pressure of inflation by keeping the Federal wage and price boards abreast of the valve industry's positions and concerns in this area.

In response to an increasing need for input on legislative matters, VMA moved from New York City to a northern Virginia suburb, McLean, VA, to be closer to the political action in 1973, and then moved to its current downtown Washington, DC location in 1982, putting it in the center of federal agencies, Congress and many other trade associations.

VMA held numerous table-top product shows during the late 1980s and into the 1990s, including this one in Mexico.

Although there was much industry optimism in the 1970s as far as the marketplace, there were issues that received focused VMA attention. The most significant of those was the energy crisis and subsequent legislation to deal with shortages. When 1980 was just over the horizon, the industry found itself at odds with public demands for environmental protection, stricter government regulations on business and a halt to nuclear projects. All these issues directly affected valve production and sales so they were the focus of association efforts.

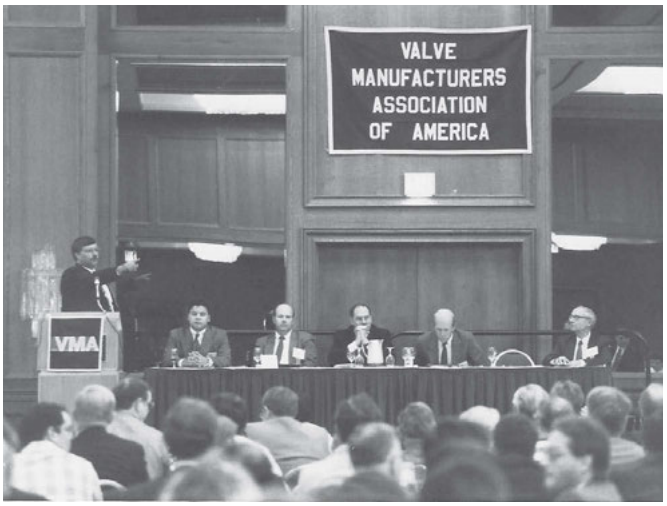
Meanwhile, another barometer that continued to rise was the percentage of valve imports. At one point, the valve industry was caught off-guard from an upsurge in worldwide business that left the domestic valve market vulnerable to imports because of the lack of available domestically produced products. For example, the total value of imported valves in 1978 rose more than 43% from the previous year. VMA's Import Task Force, which was established in 1977, was at the forefront of the battle to fight subsidized imports and halt the increase of imports in general. Unfortunately the import situation only worsened in the 1980s.

For those in the valve industry during that decade, the period was viewed as the dark ages of the valve business. Almost overnight the oil crash and subsequent recession took an enormous toll on American durable goods production. Many valve manufacturers did not survive the decade, along with many raw material suppliers, especially steel mills and foundries. The gloomy industrial reality of this period was aptly described by Bruce Springsteen in his song *My Hometown*. "Foreman says these jobs are going boys and they ain't coming back…". Despite the dark skies, however, VMA emerged stronger and leaner with a new sense of direction. The year 1985 also would see the birth of VALVE Magazine, the organization's new communications centerpiece, which was designed to inform and educate end users about the domestic valve industry. (See sidebar on the evolution of VALVE Magazine.)

Also during the mid-decade, China became a topic of interest for VMA. Several American valve companies negotiated licensing agreements and created joint ventures with entities in China. By the end of the 20th century, the Chinese entrée would indeed turn into a true main course.

Major Issues

By this time, the biggest technological issue to face the industry in decades would appear in the form of asbestos and its replacement. VMA was vital to what happened because the soon-to-be huge financial liability issue could not be effectively fought by individual valve manufacturers. It would take a concerted effort by VMA representatives, committees and counsel to reduce some of the shark-frenzy of litigation that was to come. VMA was also at the forefront of information disseminated on this issue, holding two asbestos seminars in 1985 and 1986, with the latter event attracting 250 attendees.



Hundreds showed up for VMA's first fugitive emissions seminar in September 1991.

Also about this time, VMA began hosting a series of "tabletop" product shows around the country to better educate end users and distributors about valve products. These shows would help bring the VMA message to attendees by coming to their regions to attract a larger audience.

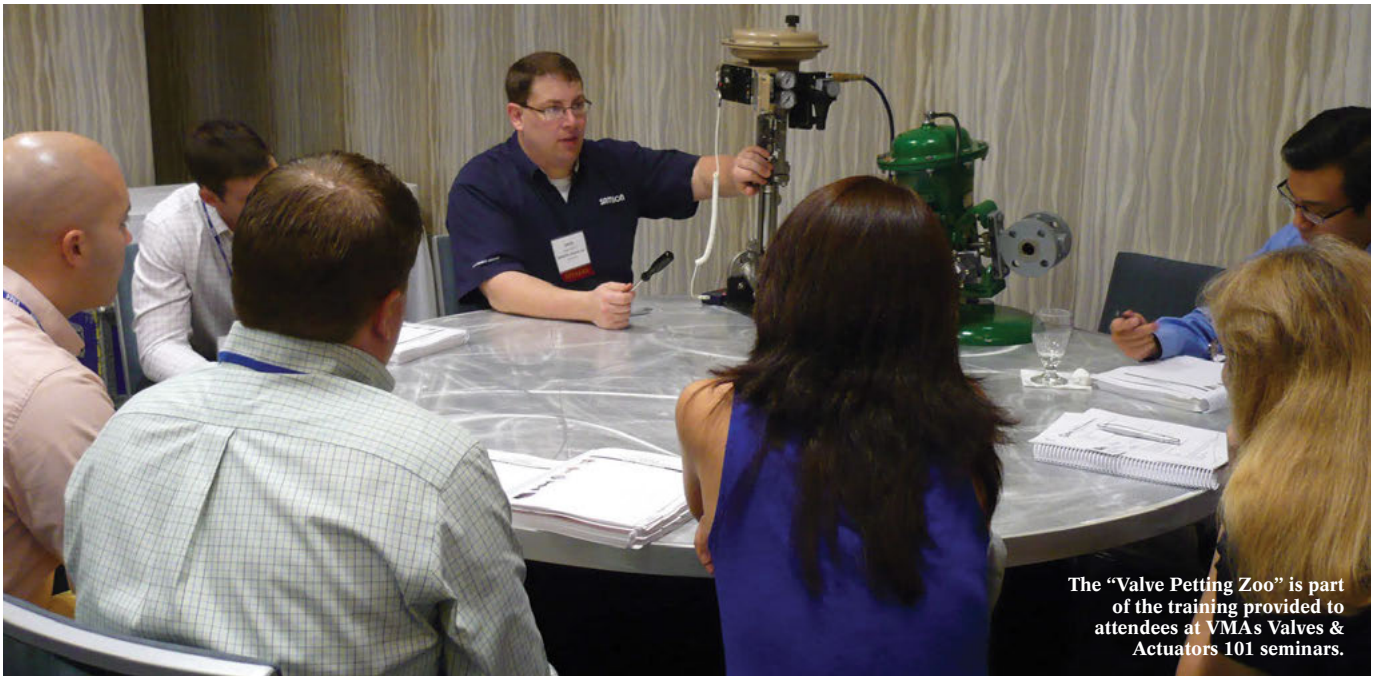
Another issue that came to light in the late 1980s was the topic of bogus valves—fraudulently marked products by a number of less-than-honest valve repair companies. These companies would rebuild a used valve, install a new fake tag and sell the product as new. The situation cost the industry hundreds of thousands of dollars in down time for end users as well as endangered plant property, personnel and the general public. A number of successful lawsuits were brought against the perpetrators, but a bolder response was needed.

VMA established a Service Council to address the aftermarket service issue in 1988. This was followed a year later with the creation of the Valve Repair Council (VRC), a subgroup under the VMA umbrella. For a facility to become a VRC member required VMA member authorization as well as a quality audit.

In the early 1990s a new phrase became part of the valve industry lexicon: fugitive emissions. This had nothing to do with Dr. David Janssen chasing after a one-armed man, but a lot to do with the Environmental Protection Agency (EPA). EPA's Clean Air Act of 1970 was amended in 1990, providing sharp teeth to sink into the offending air-polluters. Concern over the revised act forced much action on the part of the valve industry. Again, VMA was at the forefront, providing valuable information to its members. Early alerts on the situation were followed up by two VMA-hosted seminars that focused on the new regulations California was imposing on all industry in the Golden State. VMA members and other industry leaders made the correct assumption that the legislation created in California would eventually spread eastward to the rest of the country.

The first fugitive emissions seminar was held in Houston in September 1991. VMA prepared for a crowd of about 200, but nearly 450 keenly interested valve industry professionals showed up. This highly successful event was followed in November 1992 in King of Prussia, PA in November 1992, and then in September 1993, VMA held a seminar on "Coping with California Valve Fugitive Emissions," which took place in Long Beach, CA. The issues discussed at these three VMA meetings would become industry keynotes and remain hot topics two decades later.

The valve industry greeted the dawn of the 21st century with optimism. Amid the false fears of the Y2K "bug," valve manu-



The "Valve Petting Zoo" is part of the training provided to attendees at VMAs Valves & Actuators 101 seminars.

facturers continued to expand and merge as the era of international manufacturing matured into the norm for the industry. However, there were still major issues, including a residential housing bust that adversely affected the water, wastewater and general construction valve manufacturers. Housing starts would not begin to crawl out of the red until 2012.

Today's Organization

VMA is now in its golden years, but retirement is not an option for this strong and viable organization. Membership is high and interest in North American-made products continues to stay strong. This is partly because of the organization's strong efforts to promote its members' products worldwide.

And while the organization itself won't retire, many of its experts are. The maturity of valve industry professionals has threatened to delete a vital part of the hard-drive of the current industry—the experience, expertise and wisdom that have been input. Still, the industry is seeing an influx of young newcomers that bring fresh ideas. To move that generation along, VMA created an Education & Training Committee in the spring of 2008 to develop a "Valve Ed" program. The committee presented its first Valves & Actuators 101 Seminar in Houston in November 2009. Since then, the committee has put on at least two training events each year at locations all across North America. This training has been very well received by the industry and is heavily used by VMA member companies, end users and valve distributors to help train new hires.

As an adjunct to the training seminars, the VMA Crawford Library Fund has sponsored engineering students located in the areas where seminars are held. The response from the young men and women has been enthusiastic and helpful.

Looking back on 75 years of VMA means recognizing how many hard-working volunteers and VMA staff have made the

The Evolution of VALVE MAGAZINE

People born in the middle of the last century remember how the nation used to send messages to large groups of people such as association members. It typically involved a typewriter, mimeograph machine and postage stamps. And so it was in the beginning of VMAs efforts to communicate with the membership.

Flash forward to 1968 and we see the unveiling of Valviews, the first formal publication issued by VMA, with Andrew Kaye as editor. What started out as a mem bers only publication that consisted of meeting reports, board activities and lots and lots of snapshots from social events transitioned to a neat and consis tent layout and a more polished look as VMA entered the 1980s. Content spread beyond member events and association news to include business topics, technol ogy, materials and industry trends. The cover article for the Fall 1981 issue, edited by William Pietrucha, addressed: CAD/CAM systems: Are they really worth it? (I guess we now know the answer to that question) and another article, Nuclear electric companies expect a revitalization of the U.S. nuclear option, gives us a sense of déjà vu.

By then, VMA President Malcolm O Hagan was look ing to reach a broader audience and further step up VMAs publishing efforts. Thus was born the early version of VALVE Magazine, published in 1982 and edited by VMAs first communications director, Pam Nazaruk (now Pam Valenzuela). The two color publication was re designed, modernized, used professional writers and was mailed to several thousand individuals, including the VMA membership, end users and members of Congress.

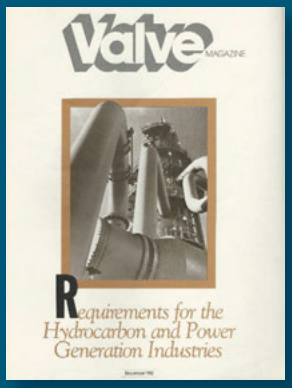
As VMA approached its 50th Anniversary, O Hagan had even grander plans and charged then communi cations director Judy Tibbs (who served on staff for two years during the late 1980s), with determining whether the magazine could take an even further leap forward and reach a substantial number of members customers. Staff determined that members would be receptive to an advertising program and would generously provide VMA with cus tomer lists (kept confidential) in order to

Mechanical engineering students at a recent Valve Basics Seminar & Exhibit learn about actuators at a tabletop exhibit.

association work so effectively for nearly eight decades. That was true in 1938, and it is still true today. North American valves and actuators are still prized all over the globe, even in countries that have strong domestic valve manufacturers.

There have been many trials to the valve industry along the path to today, but they've helped to forge the organization into the strong institution it is. Wars, economic downturns and foreign competitive threats have all enriched the organization. The one constant from 1938 to 2013 may be that the Valve Manufacturers Association of America is comprised of the very best valve manufacturers in the world. ■

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

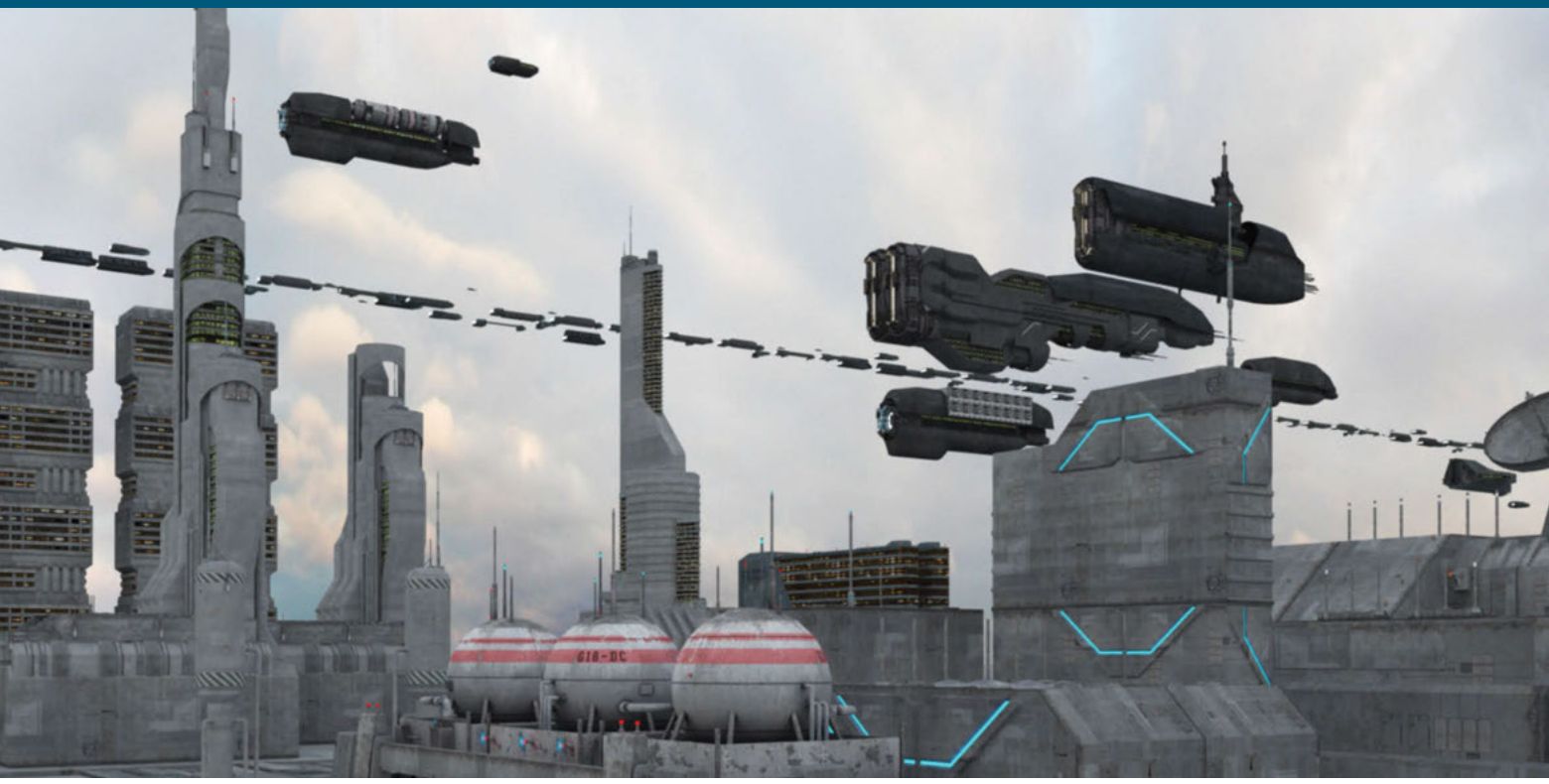


expand the circulation from 3,000 to 25,000. The editorial direction of the magazine shifted even further toward educating end users about valves and actuators, as told from the viewpoint of the VMA membership.

The changes to this new VALVE Magazine were so dramatic, that when the first issue was published in 1988, issue dates started over with Vol. 1, No. 1. Twenty five years later, the magazine is thriving, having survived a couple of severe economic downturns, multiple editors through the 1990s and an eventual switch 10 years ago from in house to outsourced production by Publications By Tibbs, Inc., with Judy Tibbs serving again as editor in chief. The move to make the association leaner resulted in an annual savings of $100,000.

In addition to the quarterly print magazine, the VALVE Magazine family has expanded during the last decade to include a website (www.ValveMagazine.com) with daily news updates and Web only articles posted weekly, as well as a digital version of the magazine (www.VALVEmagazine digital.com). When combining the print and pass along circulation and digital magazine readership, more than 70,000 individuals view the magazine each quarter, while some 80,000 visitors stop by the website annually for additional news and articles.

Even more important is how the magazine s online presence has resulted in a huge upswing in international readership approximately 40% of website and digital magazine readers are from outside the U.S. and Canada. Not only is VALVE Magazine an excellent tool for educating world wide valve users, it provides us with the opportunity to convey an important message to a global audience: The U.S. and Canadian members of the Valve Manufacturers Association of America with their engineering know how, quality assurance and reliability offer the best flow control products in the world.



Where Will We Be in Another 25?

BY KATE KUNKEL

When VMA was formed in 1938, transatlantic flight was just being pursued, and jet aircraft had not yet lifted into the skies. The concept of a "personal computer" was part of science fiction—in fact, it wasn't until three years after VMA was created that the first working programmable, fully automatic computer began operation.

In the ensuing 75 years, man has flown to the moon, dived to the bottom of the ocean and figured out how to smash two proton particle beams into each other to probe the very structure of the universe.

Valve technology has kept pace in all of these wondrous events, and in fact has made possible everything from nuclear power to space flight.

But what will the world be like when VMA celebrates its 100th anniversary? Will we be sharing experiences in person at valve education seminars or will seminars be outdated because everything is downloaded into our brains? How will valves and the industries that use them be different? How will they be the same? To gaze into the crystal ball, we approached VMA members, end users and consultants to see what they imagine for our industry—and our world—in the year 2038.

"Intelligent software in the cloud will coordinate much of how daily life and work operate—and losing your Internet connection will be as serious as an electrical blackout."

—Michael Rogers, Practical Futurist

Connecting in 25 Years

Twenty-five years ago, the word "cloud" brought to mind fluffy white things in the sky that brought precipitation. Today, we have a generation that sees the word "cloud" and thinks only of the space where software and data are stored.

Indeed, says Michael Rogers, the Practical Futurist (www.michaelrogers.com). "Twenty-five years from now, we'll need to teach kids what 'offline' means—because online will be the normal state of things. Wearable computers—special eye glasses or wrist devices, for example—will connect us constantly to the Internet. But more importantly, everything around us will be connected as well: cars, appliances, roads, bridges, utility infrastructure, parking places, even babies' diapers. This is because simple mechanical parts will increasingly come with tiny sensor chips that connect to larger networks. Intelligent software in the cloud will coordinate much of how daily life and work operate—and losing your Internet connection will be as serious as an electrical blackout."

David M. Plum, president of Emerson Valve Automation, also reflected on the incredible speed with which technology has affected human interaction. "Very few people could see back in 1988 how the Internet, the World Wide Web, Facebook, iPhone, iPad, LiveMeeting or Webcast might create instantaneous global communications. The rate of change is accelerating exponentially and nothing suggests it will slow down."

"Marketing is going digital, that's certain," says Steve Rogers, national sales manager at Richards Industries. "I think that trade shows could easily be a thing of the past. Younger people don't seem to want that personal contact."

Tom Decker, vice president at Brown and Caldwell, wonders what the prevalence of technology will mean to human interaction in 25 years. "Will we even have meetings?" he asks. "Or will we just be sitting in our own little cubes in our caves watching people present ideas? It seems the digital age is cutting out personal interaction. We are such a people business right now, but what will it be like in 25 years? It will be less people oriented. The question is, is that a good thing?"

"Will we even have meetings?… It seems the digital age is cutting out personal interaction. We are such a people business right now, but what will it be like in 25 years? It will be less people oriented. The question is, is that a good thing?"

—Tom Decker, Brown and Calwell

However, while some people ponder the potential loss of human interaction, others point out that the personal touch will remain critical.

Tim Fries, vice president of Sales & Marketing, North American & International, The Wm. Powell Company, says that: "One constant will remain. The human element of this industry will always be a large part of the process. People will continue to rely on people to fulfill their valve needs."

Valve Technology Driving the Future

Fries also is looking forward to the changes in the valve industry itself. "The next 25 years in the valve industry will be one of growth and excitement. There will be so much growth it will be cool and attractive to the young and talented who will *drive* innovation through technology and creative thinking. This generation will design, construct, sell and market in ways the industry has never experienced."

"The valve industry of the future will be monitored by new, less expensive hardware and software systems that automate detection and repair processes and continuously censor system activity to detect potential leaks before they even occur."

—Mike Brausch, CRANE ChemPharma & Energy

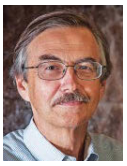
Many veterans of the valve industry are looking forward to the technological improvements that are already in the concept stage.

"As the world heads towards Star Trek and 'The Jetsons' style of everyday living and working," says Gobind Khiani, director 1, Piping Systems and Material Engineering, Fluor Canada Corp., "the future of the valve industry is moving fast towards new technology. Testing with phased array is the next generation of non-destructive testing. Also, the latest development in the field of diagnostics—referred to as the 'third generation of diagnostics'—is now playing an important role by facilitating the transition from traditional corrective and schedule-based maintenance to predictive maintenance, which will reduce plant turnaround time."

Mike Brausch, senior product engineer, CRANE ChemPharma & Energy, points out that compliance with the increasingly stringent regulations mandated by the U.S. Clean Air Act and other environmental agencies worldwide will drive much of the innovation. "The valve industry of the future will be monitored by new, less expensive hardware and software systems that automate detection and repair processes and continuously censor system activity to detect potential leaks before they even occur."

Bill Sandler, president of VMA, marvels at the changes in valve technology and says things will only get faster going for-

"We have an industry where the product life cycles are very long compared to industries where a two-year old product can be obsolete. Still, there have been many advances made in materials for higher temperatures, coatings, fugitive emission improvements and severe service designs, and these advancements will continue to happen in the future."



—Tom Velan, Velan, Inc.

ward. "The technological gains that have come over the last 75 years are unbelievable, from a small hand-operated crank to valves operated from a computer screen, where you can make repairs and not even be anywhere near them. Major strides have been made, and I think that will continue into the future. There will be valves that you will never have to touch again, once you put them into operation. We've seen valves even today that have been in place and operational for more than a hundred years. This durability will only get better."

Tom Velan, president of Velan, Inc., agrees and says valve components are headed for even more durability. "A good starting point to look at the next 25 years is to look back at the last 25 years," says Velan. "The changes in the valve industry have become evolutionary rather than revolutionary. We have an industry where the product life cycles are very long compared to industries where a two-year-old product can be obsolete. Still, there have been many advances made in materials for higher temperatures, coatings, fugitive emission improvements and severe service designs, and these advancements will continue to happen in the future."

Anthony Taylor, CEO and president of Rupture Pin Technology, is convinced the current investment in research and development will pay off in the future. "There is an increasing demand for products in drilling, fracking, production, pipeline and chemical plants, and there is success in partnerships where technology can solve unique problems," he says. "For instance, a high-pressure rocket relief problem for NASA [National Aeronautics and Space Administration] might sell only one valve. However, the R&D invested in that project could solve the problem of drilling mud relief, mine slurry relief and fracking fluid relief. As long as we react rapidly with new technology to changing needs and conditions, the future is bright."

"Engineered resins—carbon fibers—will be the material of choice. These technologies and economies of scale can drive the valve industry to expand its use of automation by having 100% of its on/off or multi-position valves actuated, monitored and controlled."

—Dave Plum, Emerson

Certainly the ongoing quest for technological advances is common for advancement in all areas of manufacturing, but the idea that the very nature of metal itself could change is one that could have incredible benefits to the valve industry, people point out.

"By the time VMA celebrates its 100th anniversary, severe service ball valves and components will be regenerative with no need to be replaced by humans," ventures Kelly Watson of Watson Grinding & Manufacturing. "This is possible due to development of super alloy materials that regenerate in-service and newly developed super alloys."

While that might sound futuristic, Watson's predictions are not out of range. In 2010, University of Wisconsin-Milwaukee scientists developed self-healing metals that could be useful on the battlefield or for quick repairs in machines ranging from automobiles to power plant turbines. The healing is accomplished by including microscopic 'balloons' in metals while they're still in liquid form. The balloons burst if the finished metal product is damaged, causing the materials inside to leak out and fill the cracked area.

Watson predicts that, "By the VMA's 100th anniversary, a valve's regenerative base metal will be selected to manage the mechanical stress of the process while the regenerative process will take place concurrently. Both the base metal and coatings can be regenerative, while the advanced coating never gets eroded to the point that leads to base metal regeneration. The degrading valve could regenerate enough to create a new valve over time, enabling it to replace itself."

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—Kelly Watson, Watson Grinding & Manufacturing

Going forward 25 years, Emerson's Plum also predicts, "The use of carbon fiber, long-life batteries and computing power in the airline and auto industry will create giant economies of scale for these technologies and serve as a catalyst for adoption by the valve industry. Many industry devices will rely and be powered by solar/battery storage while valve position monitoring via wireless communications will become the norm."

He predicts that: "Engineered resins—carbon fibers—will be the material of choice. These technologies and economies of scale can drive the valve industry to expand its use of automation by having 100% of its on/off or multi-position valves actuated, monitored and controlled."

Global Business in 2038

While virtual meetings, online purchasing and an increasingly global marketplace have already changed the way we do business, businesses 25 years in the future will face challenges and opportunities we can scarcely imagine. It will be as amazing to us as it would be to our grandfathers who could never have imagined clicking a button to place an order and having a part delivered from halfway around the world within 24 hours.

"Virtual technology is how customers find us today, how we often respond to them," Rogers says. "Everything is electronic—an order comes in, the product is shipped, and the only communication is via e-mail. In the future I think you'll see a lot more of that."

While the physical plant will be different, organizational structure will also see changes, according to Plum. "Going forward, one of the greatest challenges will be leadership, organizational structure and management. There is no denying the mega trends of an aging population, growing scarcity of resources or an environment under attack. Work is more connected today because workers are more mobile than ever before, and safety and security are principles needing to be stewarded rather than simply enjoyed."

Jim Gray, global sales leader, GE Energy, agrees that the world will be tied together by technology.

"Today, we are moving into the industrial Internet era connecting people, data, and machines to work better, faster and safer. In the next 25 years, machines will communicate with machines to make valve lifecycle management more precise and simpler to manage the overall health of your assets. Plant operators will focus on supervising the system through intuitive user interfaces and reduce their exposure to hazardous situations," he says.

The global nature of business will also change the source of the workforce. "As today's offshore manufacturing countries (China, India, Asia, Eastern Europe) continue to mature, and suffering economies become emerging economies, manufacturing has the opportunity to shift once again as skilled labor develops in the next set of emerging countries," says Plum. "Countries in Africa such as Zambia, Uganda, Ethiopia, Angola, and countries in Central America could have the potential to be sources of new trained labor for manufacturing, assembly and back office jobs."

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—Jim Gray, GE Energy

"Through telepresence, technology robots will be controlled remotely from the home or office and walk a site observing what is being done. Smart machines and robots will perform more low-skill tasks."

—Harvey M. Bernstein, McGraw Hill Construction

Velan is also keeping an eye on the global market and says, "Asia will grow both as a manufacturer of valves and a market for valves, driving growing energy demands. Nuclear will have a larger share of power generation with a surge in small modular reactors and new reactors designed to use 'spent' fuel."

Changes in business models will go far beyond e-mail and online ordering. Younger generations have a very different attitude toward work/life balance, and this will be reflected in the very buildings in which we work, according to Harvey M. Bernstein, vice president, Industry Insights and Alliances at McGraw Hill Construction. "Everything will center around building occupants. Right now, you build a building and move people into it. In 25 years, I think the building will be built for the people who will work so that they can achieve higher productivity and a better work environment," he says. "Also, through telepresence, technology robots will be controlled remotely from the home or office and walk a site observing what is being done. Smart machines and robots will perform more low-skill tasks."

New materials and technology are going to change not just the way products are manufactured. These changes will change the actual way buildings are constructed, says Bernstein. "Automation, modular building and prefabrication will be the norm. Biomimicry [finding solutions through what occurs in nature] will contribute to innovative new products and materials, making buildings more efficient and adaptive. It will be applied in designs, allowing for significant reductions in resource use and enhancing sustainable design. There will be thermobimetals inspired by human skin that encase buildings and allow them to 'breathe.' Metal strips will bend to shade buildings or open to release heat. Future HVAC systems will need to take into account these new energy-efficient, passive methods of ventilation," he says.

Energy and Resources Evolve

Back in 1988, at VMA's 50th Anniversary, it would have been impossible to imagine how much technology would change the industry, Plum says. "They did not see that oil and gas would be extracted in ultra-deep water (pre-salt), the ultra-cold Arctic or from shale rock sitting under the grasslands of the Great Plains. We didn't know manufacturing and raw materials would shift from maturing to emerging economies, and engineering would be a discipline on the decline."

Plum feels the energy and process industries will continue evolving with new sources of fuel, power, materials and spe-

"Our analysis estimates an increase of 85% in electricity demand by 2040. Except for oil-based power generation, we expect all types of power generation to increase worldwide to meet the needs of the expected population of about 9 billion people in 2040."

—David Khemakhem, Exxon Mobil Corporation

cialty products. "Pulping will be less as the 'paperless society' passes the tipping point, limiting the need for paper to specialty products. Water will be the natural resource in greatest demand for treatment, storage, preservation and movement for both processing and consumption. But, with the unprecedented demand for clean water for the process industry comes a benefit received by all—low cost availability of clean fresh water for emerging economies to greatly reduce thirst and sickness that plague many emerging countries and nations from the shortages felt today."

David Khemakhem, energy and technology advisor, Corporate Strategic Planning at Exxon Mobil Corporation, is very specific about what his company anticipates for energy demand and supply in the next quarter-century. "Our analysis estimates an increase of 85% in electricity demand by 2040. Based on the International Energy Agency, about 1.3 billion people do not have access to electricity today. Except for oil-based power generation, we expect all types of power generation to increase worldwide to meet the needs of the expected population of about 9 billion people in 2040."

"Natural gas and renewables will see the most growth," he says. "We expect to see distributed renewables where no infrastructure is in place, for example, in some areas of Africa. The valve industry should flourish following expected large increases in nuclear and gas power generation, both of which are expected to more than double in this period of time."

While most of the electricity in the U.S. will be provided by natural gas, energy will be significantly more expensive in the next 25 years, driving complete cultural changes, according to Kevin Geraghty, vice president, Energy Supply, NV Energy.

"Efficiency and demand side management powered by technological advances will mean that industry and individuals will become increasingly integrated into the real time operation of the grid thanks to technology and 'Big Data.' By the time VMA celebrates its 100th anniversary, coal will be dead in the U.S."

—Kevin Geraghty, NV Energy

"Efficiency and demand side management powered by technological advances will mean that industry and individuals will become increasingly integrated into the real time operation of the grid thanks to technology and 'Big Data.' By the time VMA celebrates its 100th anniversary, coal will be dead in the U.S," he says.

Education and Training

And what of industry education? Greg Johnson, president of United Valve and chairman of VMA's Education & Training Committee, predicts that over the course of the next quarter-century, the association will become synonymous with valve education. "While manufacturers are always going to take the lead in training their employees and customers on the specific features and benefits of their own products, I see VMA being the leading educational resource for the industry."

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—Greg Johnson, United Valve

Johnson envisions the development of a VMA Valve University, including a permanent learning center outfitted with a wide range of equipment and sample products so that instructors can demonstrate the various types of valves, actuators, controls and valve accessories. "Students will be able to learn onsite, or participate in the classes from their homes or offices, while interacting with instructors and other students." In addition, he expects VMA to offer dozens of online courses that can be taken individually or packaged together and offered as certification programs so those in the industry can become "Certified Valve (or Actuator or Control) Specialists."

VMA president Bill Sandler believes basic valve education must be incorporated into mechanical engineering and related programs, as well as in technical schools. In 2038, he predicts, companies will require all new hires who will work with valves and related products to have industry certification. "As our industry's products becoming increasingly sophisticated and complex, appropriate training will be absolutely essential. I believe VMA will be on the forefront of providing this education."

While it may not be that the Jetson's vision of flying our cars to work from our apartments in the sky comes true by 2013, when VMA turns 100, it seems certain that the organization will be celebrating its anniversary with a vibrant, exciting new valve industry.

Kate Kunkel is senior editor of VALVE Magazine. Reach her at kkunkel@vma.org.

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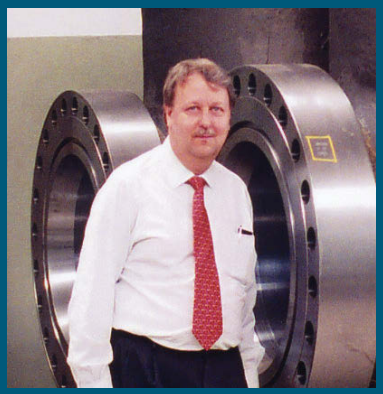

"I rely on information from companies that are well integrated into their markets and use strategic knowledge networks to stay in the loop. Having access to such trusted sources is critical in my work, and I view a VMA membership as the 'seal of approval' providing additional assurance and validation that a company possesses the knowledge I need."

Ron Merrick, PE
FLUOR | Director, Piping Material | Energy & Chemicals

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The disaster in Bhopal illustrated the need for safety management standards.

JULIAN NITZSCHE/WIKIMEDIA COMMONS

Relief System Management Software: Helping Companies Achieve PSM Compliance

BY SEAN CROXFORD AND STEPHEN D. SAUNDERS

On Nov. 15, 1990, the Occupational Safety and Health Administration (OSHA) made into law the standard for process safety management (PSM) of highly hazardous chemicals (29 CFR 1910.119), as well as section 304 of the Clean Air Act (CAA) amendments. The PSM standard and CAA changes were enacted in direct response to the Union Carbide India Ltd., Bhopal, India disaster that occurred on Dec. 2, 1984 and resulted in the deaths of 3,787 individuals. For the many valve and actuator users that operate processes involving hazardous materials, the changes mean analysis of PSM and creation of programs that should ensure a similar tragedy does not occur. Because pressure relief can be a last line of defense, PSM must address pressure relief systems.

Executive Summary

SUBJECT: The days of stashing binders on shelves as a means of having a process safety management system for pressure relief are long gone. Today's software offers many tools for better management.

KEY CONCEPTS:

- The Bhopal disaster and OSHA response
- What standards require
- Software considerations

TAKE-AWAY: Because pressure relief systems are the last line of defense, the best software tools are vital.

A TRAGEDY ANALYZED

Analysis of the Bhopal incident revealed a myriad of equipment and human failures. Outcry over the preventable tragedy promulgated a response by OSHA that culminated in passage of the PSM standard and CAA law. Since implementation, the PSM standard has been adopted in one form or another throughout the worldwide process community. While PSM programs vary from one geographic location to another, the basic tenets of an effective program are similar in nature.

The OSHA PSM standard is comprised of a number of individual program elements. Each of these elements, when combined into a whole, is designed to reduce the likelihood that a process will experience an unwanted hazardous chemical release. In the event that a release occurs, the standard also requires that plans be in place to mitigate the impact on the surrounding community. These program elements include process design, process safety information, process technology, process changes, operational and maintenance activities and procedures, non-routine activities and procedures, emergency preparedness plans and procedures, training programs and other elements that affect the process. Implementation of elements is done through a layered approach. A single element of the PSM program by itself would not prevent a catastrophic release, but in combination with all the program elements, the elements greatly reduce the risk that a single failure or even multiple failures would result in a catastrophic release.

PRESSURE MANAGEMENT

Pressure management systems are a significant part of the OSHA PSM process safety information (PSI) element of the standard, and they play a significant role in the implementation of that standard. In most cases, pressure management systems are the last line of defense in averting a release. They require considerable emphasis on design and maintenance to ensure availability when called upon.

Despite this critical nature, many operating companies historically considered pressure management a low priority engineering system. In fact, typically, a newly graduated engineer could expect to spend a brief stint as the resident "relief valve" expert until the next new engineer was hired to replace him or her. It was rare for a company to dedicate a senior staff engineer to fill this role. Pressure management programs languished under this mindset, and the processing industry was slow to respond even after the implementation of the PSM standard.

Experience performing sizing basis audits for numerous clients in a diversity of process industries highlights the disadvantages to this approach. These audits showed that after the PSM standard was implemented, there were instances where processors were generating pressure management system sizing basis documentation for the very first time. Audit findings show that when a client's existing sizing basis is properly scrutinized using American Petroleum Institute (API) recommended practices and American Society of Mechanical Engineers (ASME) Codes and Standards, between 25-50% of existing pressure protection systems are deficient and require some level of mitigation to bring them into compliance. The deficiencies range in severity from an incorrect relief valve mounting orientation to more serious infractions such as a system having inadequate relief capacity.

Another commonly discovered deficiency is a relief device that has set pressure greater than the maximum allowable working pressure of the equipment the relief device is protecting. The reality is pressure management systems are extremely complex, requiring a significant amount of knowledge and technical discipline to properly analyze and size for a given application. In many cases, individuals with pressure management system responsibilities are not properly equipped or trained.

Another aspect of pressure relief system management is the arduous task of performing relief system calculations and archiving these for documentation. Historically, the common scenario was that operators used spreadsheet formats to perform these calculations. In many cases, a single process change resulted in multiple spreadsheet input changes to fully evaluate and recalculate the sizing basis of a relief system. A physical paper file where copies of relevant equipment documentation were assembled to document the inputs for a given calculation is usually an element of this spreadsheet approach. Relief sizing basis calculations typically were assembled in three-inch-thick binders placed neatly on multiple shelves to document a given facility's sizing basis documentation. In more robust pressure management programs, sizing basis documentation was scanned into a PDF file placed on a shared drive so that everyone could access the information. These types of systems, while far superior to those they replaced, only captured a snapshot in time and were prone to input error.

Another commonly discovered deficiency is a relief device that has set pressure greater than the maximum allowable working pressure of the equipment the relief device is protecting.

In today's environment of significant OSHA fines for each instance of non-compliance with the PSM standard, operators need better methods for documenting and maintaining pressure management sizing basis documentation. Modern PSM management is fortunate that specialized computer programs have been designed specifically to manage relief system calculations and the effects that changes to equipment and process variables will have. Several vendor-supplied pressure management software platforms are now commercially available. The following paragraphs discuss considerations for purchasing and implementing any one of these state-of-the-art pressure management software platforms.

PROGRAM CONSIDERATIONS

A calculating platform should be comprised of a database that has the capacity to analyze the impact of a process change on the affected system and on any associated upstream or downstream pressure management systems. It should be able to flag those systems needing additional engineering review, informing the user of associated pressure management systems that will be impacted by a process change. Most importantly, it should tell a user if the process change will render the affected relief system inadequate.

Outdated technologies such as spreadsheet software systems are not capable of evaluating these interrelationships and are fully dependent on engineering judgment to make determinations. In many cases, because of the complexity of these systems and the subtle interactions between related systems, the effects of process changes on systems or equipment are missed or ignored.

Another factor to consider is that pressure management software should have an integrated thermodynamics modeling capability. This allows evaluation of physical properties from one set of thermodynamic conditions to the next layer of conditions. Output from models should be a direct input into calculation equations to avoid transcription errors. The thermodynamics package should also be able to support a diverse list of organic and inorganic compounds, including boiling point curves and custom compounds, and should be capable of supporting hydraulic calculations using standard single-phase flow, as well as more robust two-phase piping flow models.

Pressure management software should include the capability to evaluate complete relief device hydraulics from the protected system through the relief device's discharge piping, including collection header and disposal system piping. Although several excellent standalone software packages exist for evaluating header and disposal system piping hydraulics and capacity, incorporating the standalone packages into a real time or near real time assessment of process changes is not feasible. Because they depend on a large volume of data input, standalone header sys-

tem packages are unwieldy and time consuming when evaluating multiple what-if strategies. Changes to the header or disposal system will invariably cause changes in the relief load, which in turn will demand changes in the header and disposal calculation. These standalone header and disposal system software packages are not capable of performing iterative calculations quickly and cost effectively.

MAINTENANCE ISSUES

A pressure management software system should have the capability to manage all maintenance aspects of a pressure management system including scheduling relief devices for maintenance and flagging pressure relief devices for engineering review based on historical maintenance records. They also should be capable of showing as-found test results, recording and archiving relief device maintenance records and creating an interface between engineering and mechanical integrity disciplines as they relate to pressure relief devices. Maintenance documents should not only pertain to the relief device but also to the location in the process where that device was installed. It's important not to lose the maintenance history when replacing a worn-out pressure relief device or swapping a valve from a pool of spares.

Having the history of a given relief valve from the date of its first sizing basis to present time is invaluable to understanding the maintenance history of the pressure relief device and process change activities that impacted the sizing basis of the device.

The pressure management software system should be programmed such that calculations proceed through a strict adherence to API-recommended practices, ASME codes and standards, or other overarching regulatory requirements. Deviations from standard calculation methods should be readily observable with appropriate warnings and error messages brought to the attention of the reader. Additionally, pressure management software should be able to assess the impact that proposed or enacted regulatory changes will have on existing pressure relief systems. For example, if the definition of allowable inlet losses changes, the software should model how this change affects the overall state of compliance for existing relief systems in the facility.

From a documentation perspective, the software platform should include the capability to archive preceding revisions of calculations as process changes are made. Having the history of a given relief valve from the date of its first sizing basis to present time is invaluable to understanding the maintenance history of the pressure relief device and process change activities that impacted the sizing basis of the device. Additionally, the software platform should provide task management capability so that tasks can be assigned in support of calculation or maintenance activities. The software should also contain a project manage-

ment tool that can assign work, assess workload assignments on individuals performing calculations, assess the progress of calculations and the volume of mitigation work needed to bring systems into compliance.

A last major item the pressure management tool should contain is the capability to show that mitigation is required after a calculation has been performed. In addition, the tool should be able to clone the recent calculation while leaving the original calculation intact. This cloning function allows operators to modify existing pressure management system calculations using a what-if strategy to determine the most cost-effective solution for resolving the identified deficiency. It is imperative that any software tool be capable of maintaining documentation of the existing 'as-built' or 'as-installed' pressure management system because this is the existing sizing basis required per the PSM standard. The benefit of having a pressure management software tool that can manipulate a copy of the existing calculation is that operators can show regulatory authorities the plan of action to resolve identified deficiencies while fully complying with the PSI requirements associated with the PSM standard.

Once a mitigation strategy is selected, the modified clone is a pressure management system in waiting. Given the length of turnaround schedules today, it is entirely possible that a pressure management system deficiency might not be resolved for several years. When the mitigation pressure management system is implemented, it then becomes the system of record, showing the sizing basis of a given pressure management system. The previous system then becomes an historical archive and is retained for documentation purposes and reasons described above concerning maintenance. Identifying deficiencies and having corrective action plans in place using this type of an approach gives operators the best opportunity to demonstrate compliance should they become subject to a compliance audit by regulatory authorities.

Modern pressure relief system management is finally emerging after years of sub-optimal practice in legacy systems. Efforts to adhere to the PSM standard and create safe operating environments have been greatly aided by software technologies that are replacing fragmented and unrelated technology solutions. Processors now have to evaluate significant changes to industry codes and standards, and changes to process design with "evergreen" engineering practices and tools (those that are continually updated). This keeps pressure relief systems in compliance and functioning as intended when called upon to be the last line of defense. VM

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Actuator Commissioning Made Simpler

BY DAVID MONTGOMERY

There is something about opening a box labeled "some assembly required" that causes one of two reactions—the joy of the challenge or dread. In actuator commissioning, the dread comes from not being an actuator expert, in which case installing and commissioning that actuator may appear at first glance to be difficult.

But even though the task may look daunting, actuator manufacturers have taken great care to simplify the setup of both simple and robust feature sets so that the commissioning process can be as smooth and error-free as possible. How to make that a reality is the subject of this article.

STORAGE PROCEDURES

One of the first tasks faced in commissioning comes from the fact not all actuators are installed as soon as they are received. In many cases, they need to be stored for an extended period of time. Short-term and long-term storage procedures are found in the actuator installation-operation-maintenance manual (IOM) or are available from the manufacturer in a separate document. It is critical that these procedures be followed so the actuator is properly protected and ready to work when the installation takes place. Also, product warranties are normally voided if the procedures are not followed, so taking the time to read and follow the steps is critical.

Executive Summary

SUBJECT: Commissioning electric valve actuators may seem like a challenging task but manufacturers continue to make the process as uncomplicated as possible.

KEY CONCEPTS:

- The steps involved
- Importance of safety
- Mechanical, electrical and non-intrusive technology considerations

TAKE-AWAY: By understanding the steps needed and following manuals and guidelines, commissioning becomes a problem-free task.

PRODUCT IDENTIFICATION

Once the box is opened and contents removed, there are a few basic steps to walk through. Like any product in a box with "some assembly required," the first step is to ensure you have what you ordered, including all the parts promised. Electric actuators are supplied with a product nameplate on the gear housing that provides the model, size, motor information, lubrication type and often tagging data that identifies its installation location or provides other information relative to the actuator's place in the plant process. Check that data against the purchase order or similar document. Not all valve torque, thrust or speed requirements are the same; the actuator needs to be mounted to the correct valve, and the valve and actuator assembly needs to be mounted in the correct process location to perform properly.

SAFETY PRECAUTIONS AND PRACTICES

Safety precautions and practices identified in either the product IOM, on the actuator itself or in other documents need to be followed. Such procedures are typically listed near the front of the manuals and are associated with the installation instructions. Read through the warnings, cautions and notes and become familiar with them. Failure to follow precautions can cause a serious safety risk to personnel or permanent damage to the equipment. Follow all outlined practices to keep people and equipment safe.

OUT OF THE BOX, INTO THE PROCESS

Both mechanical and electrical considerations guide the commissioning process. The mechanical steps include mounting the actuator to the valve or mounting the valve/actuator combination into the plant or pipeline system. Follow the valve manufacturer's guidelines provided or made available for the installation of the valve/actuator combination.

Mechanical Considerations

For multi-turn valve applications such as gate or globe valves, or slide gates, it is important to pay close attention to the stem and stem nut connection when mounting the actuator to the valve.

For a threaded stem nut, the stem to stem-nut engagement should be smooth with a good, close fit. The stem should be lubricated, suited to operating requirements and environmental factors. Some actuator designs allow top entry of the stem nuts. Once the actuator is bolted into place on the valve adapter with the proper length, the stem nut can be installed by hand-threading onto the valve stem until it engages with the drive sleeve. After that, rotate the actuator hand wheel until the stem nut is seated in the proper position within the drive sleeve. Thread the lock nut or similar locking hardware into the top of the stem nut and stake into place.

Some actuator designs require the stem nut to be mounted into an actuator thrust base, which is then bolted to the actuator gear housing. When the thrust base is disassembled to install a separately supplied stem nut, be careful to reassemble the bearings and other components in the correct location and order. Consulting the actuator IOM provides help with this step.

There are two ways to mount the actuator to the valve mounting adapter:

1) Once the thrust base is reassembled with the machined stem nut in place, hold the base steady and thread the stem nut within the base onto the valve stem (or thread the thrust base assembly) until it comes into contact with the valve mounting adapter. Bolt the thrust base to the valve mounting adapter. Lower the actuator onto the thrust base, ensuring that the actuator thrust base stem nut lugs properly engage and align with the drive sleeve slots in the actuator gear housing. Bolt

□ Staff opens a box in preparation for commissioning.

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the actuator to the thrust base.

2) With the thrust base containing the machined stem nut attached to the actuator housing, suspend the actuator above the valve stem and align it vertically with the stem. Lower the actuator until there is contact between the stem and the stem nut. Rotate the actuator hand wheel to engage the stem threads with the stem nut threads. Continue to lower the actuator until it contacts the valve mounting adapter. Bolt the thrust base to the valve mounting adapter.

Pay attention to the stem-to-stem-nut engagement when the valve is in the fully closed position. At a minimum, the engagement length should be 1.5 times the stem diameter.

In butterfly valve, ball valve, plug valve or damper applications, electric actuators come in two designs: a direct mount, part-turn or multi-turn actuator in a single housing or an electric actuator coupled to an external gearbox. In these designs, the stem adapter is bottom-entry, with bore and keyway dimensions that mate to the valve shaft. Typically, the stem adapter is installed on the valve shaft and the actuator or gearbox is lowered into place, engaging the external splines on the stem adapter with the mating splines on the actuator or gearbox drive sleeve. Take care to align the stem adapter to the valve shaft so that the full-open and full-close valve disk positions can be set correctly.

For electronic, non-intrusive actuators, the commissioning process is much different because of the digital technology used for setup and operation.

Electrical Considerations

For electro-mechanical actuators, there are a few basic steps that should be followed to achieve favorable results.

First, the power supply needs to be brought into the control compartment and connected to the terminals on a terminal strip marked for these leads. Give careful attention to the conduit connections to the actuator conduit entries. Improper conduit sealing can result in moisture entering the control compartment or terminal housing. In some cases, moisture can be introduced into these areas from inside the conduit. A thorough inspection of the conduit piping and the conduit installation on the actuator can eliminate short-circuiting caused by moisture on the contacts, which can in turn cause actuator failure.

Second, set the open and close position limit switches or position limiting device. Depending on the manufacturer, up to 16 contacts allow for setting the end limits, for position indication, and for sequencing or interlocking with other plant equipment. The IOM serves as a guide through the setting procedures. The valve can be moved from the open to closed position by the hand wheel or by electricity. If the actuator is operated electrically, it is important to move the valve disk well off the valve seat in case the actuator runs in an opposite direction to the intended direction because of phase reversal of the power supply. If the phase rotation is incorrect, disconnect the power leads and rewire them to the power terminals. This process normally will correct phase reversal conditions. Recheck the rotation of the drive sleeve to confirm that the phasing is correct.

Third, set the actuator torque switch or torque limiting device. Consult the IOM for proper setting to ensure the actuator and valve are properly protected during electrical operation.

NON-INTRUSIVE TECHNOLOGY

For electronic, non-intrusive actuators, the commissioning process is much different because of the digital technology used for setup and operation. For these actuators, the setup is achieved by answering a series of questions visible on an LCD display installed in the actuator control compartment cover.

Simple, trouble-free commissioning is achieved for some manufacturers' products through use of the locally

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mounted control station, where the selector switches serve two functions: local or remote operation of the actuator, and actuator commissioning by toggling the same switches to step through the setup menus in the display.

Other manufacturers use hand-held devices to accomplish the setup, in which case care must be taken to ensure the batteries are fresh in the device and that it can be secured so it is available when needed.

As with electro-mechanical actuators, the IOM for non-intrusive actuators will serve as a guide through display options such as languages, calibrations, settings and option selections. Some considerations include:

The power supply needs to be brought into the control compartment and wired to the proper terminals on the terminal block. For most manufacturers, the terminal block is housed in a separate compartment rather than in the controls compartment. The precautions mentioned above for conduit connections on electro-mechanical actuators also apply to electronic, non-intrusive actuators. Improperly installed conduit poses a serious risk to actuator performance.

As with electro-mechanical actuators, the IOM for non-intrusive actuators will serve as a guide through display options such as languages, calibrations, settings and option selections.

Once the actuator is powered up, follow the on-screen instructions to select the language. Up to 15 languages can be made available, depending on the manufacturer. The display screens vary by manufacturer, using either normal language or symbols. Language-based displays provide the user easy-to-understand menus and selections. But symbol-based displays also can be effective once the symbols are understood. In either case, understanding the choices in the setup routines is critical to obtaining the desired operation of the actuator.

Calibrate the position limits, following the same precautions as required for an electro-mechanical actuator relative to valve disk positioning. Most non-intrusive actuators employ encoders for accurate and repeatable positioning. Absolute encoders with redundancy have an advantage in that the design does not require batteries to maintain position information on loss of power, providing the user with maintenance-free and reliable setup.

Enter the setup mode by operating the control station knobs or similar device, as described in the IOM. Once in this mode, questions to complete the commissioning process can be answered. The software guides users through the menus based on how the questions are answered. Non-intrusive actuator IOMs are normally supplemented by or include guides that provide detailed instructions on the menu selections. Manufacturers have tailored these documents to address the wide range of features available in electronic actuators. The easy-to-follow formats are important to provide clear, step-by-step instructions that enable the user to commission the actuators with confidence.

Operate the valve from fully open (100% open) to fully closed (0% closed) or reverse to confirm the position and torque limit settings are accurate and the desired features are working properly. If the power supply is three-phase, checking for correct phasing is not needed. Non-intrusive actuators correct electronically and also notify the user if a phase is lost

The oft-heard phrase: "first, read the instructions" certainly applies to successful commissioning of an electric or electronic actuator. This is because success relies on understanding the product purchased, following safety precautions and practices, and following instructions explicitly as described in the manufacturer's IOM. Following these steps can remove the "dread" and result in proper actuator performance. VM

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Valve Service Shops are not Created Equal

BY GARY OSTROWSKI

Not long ago, a common practice for companies in the chemical, power and refining industries was to have personnel on staff to handle many valve maintenance and service activities. Today, as skilled professionals of the baby boomer generation retire and companies face increasing pressure to contain costs, a growing number of firms are turning to outside vendors to help them manage the health of their valves.

One territory can have dozens of firms that offer valve maintenance and repair services. Stories shared by customers over the years clearly illustrate, however, that these shops are not all created equal. The specifics about how they differ vary, but the plotlines have been essentially the same: Valves coming back from the repair shop looked great. Testing, however, told a different story. Many of the valves have not been repaired correctly and are not performing to OEM requirements. This usually results in higher maintenance costs and/or lost production. It also can mean compromised product quality and unnecessary safety risks.

Careful consideration and a bit of homework are required in selecting a valve maintenance and repair provider. This article outlines criteria to consider.

When interviewing a potential service partner, ask whether the technicians are trained in the latest OEM standards and other necessary performance standards. Also ask what ongoing training the technicians receive.

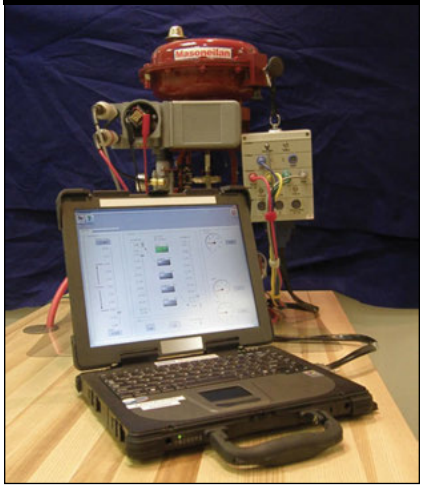
OEM-AUTHORIZED

Most valve OEMs have a list of authorized service providers. No one is required to choose one of these providers, but the credential of being listed as authorized is one sign of a quality shop.

To become an authorized service provider, a shop must meet specific criteria the OEM sets in areas such as integrity, safety and environmental compliance. Plus, the team is required to complete the OEM's training program. Usually, OEMs hold certified shops to high standards when it comes to facilities, equipment and personnel. Knowing that a service provider meets these criteria, however, gives companies added confidence that they are dealing with a reputable shop.

OEMs regularly audit their authorized service providers to ensure they are meeting the necessary performance standards. While ISO 9000 is a good standard to be followed, it is not a valve operating guideline. When it comes to valve assembly/testing and repair, the OEM is the body best equipped to conduct the detailed review necessary and is willing to share audit reports.

To diagnose control and line valves, the shop should have a unit that can compare current valve data to "Day One" baseline data.



Additionally, OEM-authorized service providers have access to important details regarding the properties, construction and workings of a specific valve or part. This is because OEMs build their products to rigorous specifications. While it's true that a valve or part can be re-engineered, only the OEM knows the original specs with certainty.

An OEM-authorized service provider also receives extensive product training from the OEM and can consult with the OEM's engineers to diagnose problems. An authorized shop will use OEM parts, rather than re-engineered parts, helping to ensure that the valve performs as expected.

Finally, not using an OEM-authorized service provider may void the manufacturer's warranty.

ASSET MANAGEMENT TOOLS

A significant differentiator between valve service shops today is the ability to provide asset management tools. These tools put valve records—including repair data, repair records, test documentation, wiring diagrams and "before" and "after" photos"—in a single, easy to use, accessible database. The customer owns the data and can

To diagnose pressure relief valves, technicians should have electronic valve testers that can test a valve in situ.

access that information 24 hours a day.

This added capability can simplify record-keeping for inspections and make it easier to meet reporting requirements. But asset management tools can be so much more than just a document management tool—they can be a plant manager's best friend. Some, for example, provide analysis features and can assist in detecting trends for repairs, some manage inventory for optimization, others provide features such as "turn-around management" clouds where one can drag and drop valves for planning a turnaround. Others help with diagnostics and provide recommended solutions for resolving issues.

TRAINED TECHNICIANS

When a person chooses a physician, he or she is likely to consider degree of education, specialized training and other credentials. The same criteria should apply when choosing a valve service partner. Those choosing should ask to see a firm's training certificates; and find out whether the technicians are trained in the latest OEM standards, as well as relevant standards from organizations such as the American Society of Mechanical Engineers. They also should ask whether the technicians' certificates are up-to-date because training is not a one-time task, but a continuous process.

A good service provider has OEM valves and parts in stock and can quickly configure, assemble and test a replacement valve.

DIAGNOSTICS CAPABILITY

Today, when your car has an odd noise, your mechanic uses computer-based tools to diagnose the problem. A solid valve service provider will have similar tools in its collection.

For example, a technician working with pressure-relief valves should have electronic valve testers that can test a valve in-line and in production (in-situ). For control and line valves, technicians should have a diagnostic unit that can compare current valve data to "Day One" baseline data. With a significant number of analog positioners still in use, such devices can help remove the guesswork from assessing valve health.

ACCESS TO INVENTORY

Even the best technician cannot get a process running again without the necessary parts, replacement valves and other devices. When something is

needed to get that process going, the best providers of maintenance and repair services will simply pull from their well-stocked shelves the necessary OEM parts, valves, positioners, etc.

Certainly, it is impossible for a service provider to have every SKU in its warehouse. But affiliation with a network of service facilities can provide access to millions of dollars of inventory that can be on hand in days, and sometimes even hours. A prospective service provider needs to belong to such a network.

TECHNOLOGICAL EXPERTISE

A growing number of facilities are adopting digital technologies such as wireless communication, valve diagnostics, the HART Protocol, the FOUNDATION fieldbus and PROFIBUS. A strong service provider will have a "digital champion" on staff or accessible who can guide users and who has the technical expertise to advise on when to upgrade to digital technology.

THE FACILITY

A tour of a prospective service provider's facility can reveal much. Such a tour should include stops at areas in the shop for sandblasting, machining, welding and painting. Take note of whether the shop is neat, clean and well-lit; organization of that shop is closely correlated to quality. After all, would anyone hire an accountant whose office was wall-to-wall stacks of paper? As an added benefit, some providers also have onsite facilities where they offer training for their customers.

☐ Visit a prospective service provider's facility. Take note of whether the shop is neat, clean and well lit. Organization is strongly correlated to quality. This photo shows the DMC Carter Chambers facility in LaPorte, Texas.

Choosing a valve service provider requires time and effort. But given the importance of valves to any process facility's performance, the decision cannot be taken lightly. The key is: Do your homework; it will be time well spent. VM

GARY OSTROWSKI is director of product management–aftermarket with GE Oil & Gas. Reach him at gary.ostrowski@ge.com or 339.987.5008.

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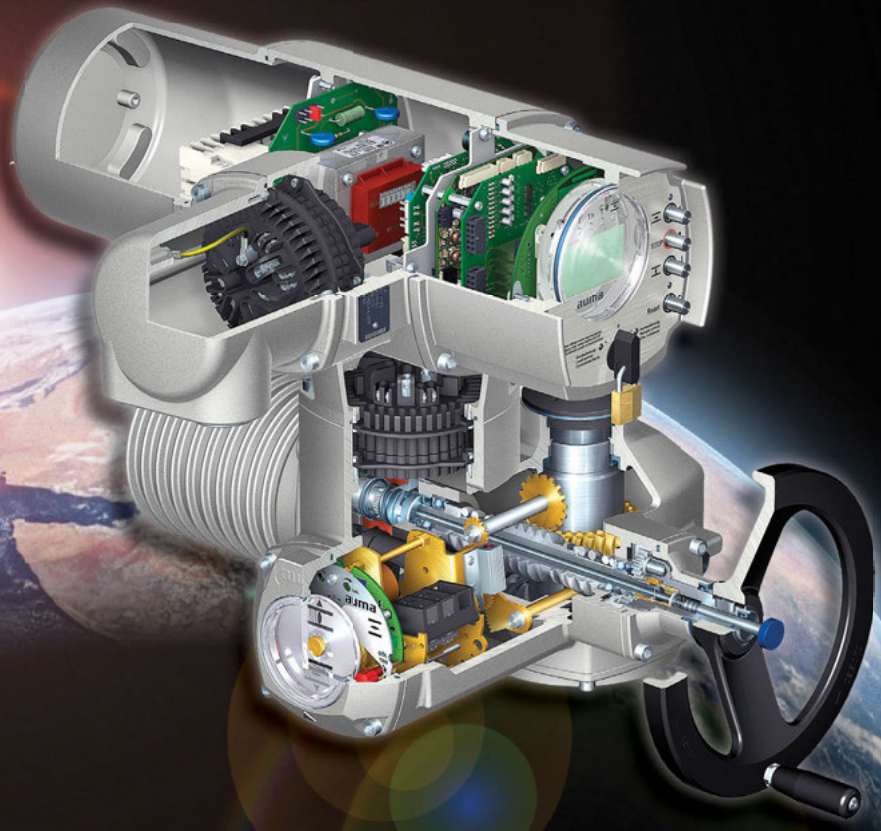

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Market Drives Actuation in Natural Gas Pipelines

BY ROSS WOLKART AND DANIEL MYERS

More than 200 pipeline systems in the United States alone transmit natural gas through more than 300,000 miles of intrastate and interstate pipelines. What's more, 1,400 compressor stations operate in the U.S. to transfer the gas through the transmission pipelines to ultimate distribution points[1]. As the industry continues to grow, pipeline operators seek alternatives to traditional equipment to ensure pipeline safety and reliability. That includes new types of actuators.

(From left to right) Electric actuators on suction 12 inch 600 pound plug valve, on a bypass 6 inch 600 pound plug valve, on a discharge 12 inch plug valve, on a 12 inch 600 pound ball valve at Kinder Morgan White Castle Station.

VALVE APPLICATIONS

The greatest numbers of valves on a pipeline system are in compressor stations, placed at intervals of 40 to 100 miles along the pipeline. These stations contain banks of as many as 25 (or more) engine-driven compressors fueled by gas taken from the pipeline. Each engine/compressor has a suction line and one or more discharge lines between 10 and 24 inches and one bypass line from 4 to 8 inches; each line in turn has its own valve. These are mostly ball valves with some gates in older installations. In addition, each compressor station will have a mainline valve and a blowdown valve, both designed to blow open or autoclose. They also have pig-launching valves and manifolding valves.

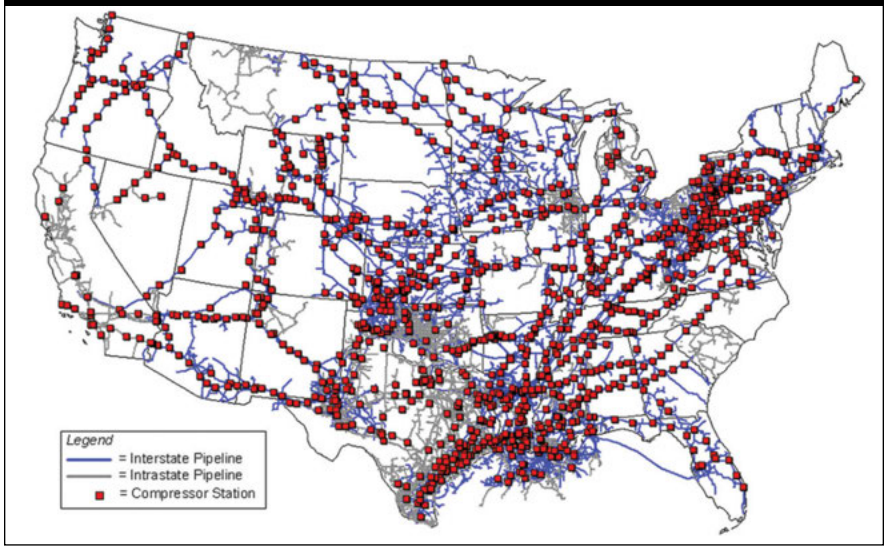
Meter stations will have flow control valves (with isolation ball valves), automatic shutdown valves, manual bypass valves and pressure-regulating valves. Finally, the pipeline itself has shutdown/isolation valves every five to 20 miles. This situation means there are also many actuators doing heavy-duty work.

TYPES OF ACTUATORS

Pipeline operators have a choice of actuator types: gas hydraulic (gas over oil), pneumatic (either direct or air over oil), direct gas motor-operated, electric, hydraulic and electrohydraulic. Each has advantages and disadvantages.

For gas-powered actuators, the pressurized gas in the pipeline provides the power to operate the valve, either directly or via hydraulics. Since pressurized gas is always available, no other energy source is needed to run the actuator; power lines don't have to be run; and air compressors don't have to be installed. New problems crop up in populated areas, which are steadily encroaching on pipelines. For example, when a gas-operated actuator cycles, noise levels can alert neighbors not accustomed to the controlled discharge, which may require that mufflers be installed to provide noise abatement.

U.S. Natural Gas Pipeline Compressor Stations Illustration, 2008. *Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Natural Gas Transportation Information System.*



[1]Source: Cleveland, Cutler J. (January 16, 2013) Energy Transitions in the United States, retrieved June 3, 2013. www.trunity.net/the-energy-library

Some pipeline operators choose to install a compressor and operate valves on compressed air instead of gas. The compressor feeds a storage tank that, in turn, provides the air to run the valve actuators. This requires a reliable source of electric power and does nothing to reduce the operating noise of the valves.

WHEN ELECTRIC IS RIGHT

Electric actuators have several important advantages in this application, and are popular in pipeline transmission and compressor stations. While pneumatic actuators are capable of faster stroke times, electric actuators are generally capable of meeting stroke time requirements for most gas pipeline applications. They are considerably smaller than gas-operated actuators. A gas actuator for a 24-inch rising stem gate valve can be 8 feet long, while an electric actuator will be 12 inches tall and 26 inches long. This compact size makes electric units much less susceptible to vibration created by the engines in a compressor station. The compact footprint keeps the unit closer to its center of gravity and minimizes the effects vibration has on actuator internals and controls. It also means the equipment can be put in tighter locations (such as through a manhole).

Many lines for compressor stations and pipelines date back 50 years. While some infrastructure has been upgraded, older technologies for compression are still in service. Compressors of all types cause vibration, but older reciprocating compressors generate the most because their suction valves take in gas from upstream gathering lines, compress it internally and discharge it into the main transmission pipeline. Valves and actuators operating subject to vibration can separate piping from the bodies, loosen power connections and do irreparable damage, rendering the equipment inoperable. Because of their inherently smaller size and design, electric actuators may be less susceptible to the damages of vibration.

When electrical power is not readily available, options exist. For example,

Electric actuators at a Williams natural gas pipeline facility

electric actuators can be used when commercial electric power is not available through use of a solar panel to charge a storage battery, which can then power an electric actuator. This is a favorable option when frequency of operation is low but bringing in electric power would be expensive or impractical, or when it is impossible to guarantee sufficient gas pressure at all times to operate a gas-driven actuator. But this method has also found favor in some urban areas. In Denver and Pittsburgh, for example, installations with solar panels and storage batteries are mounted on utility poles and DC-powered electric actuators on plug valves are placed in manholes.

Electric actuators also make sense on new construction of gas compressor stations since electrical infrastructure cost is absorbed in the overall project, and the lower installed maintenance cost justifies the initial expense. For modulating services in areas where environmental concerns are heightened, electric actuators serve as an actuation alternative.

WHEN ELECTRIC IS NOT RIGHT

While electric actuators have many advantages, they are not a panacea. One area where gas-operated or pneumatic spring return valves are used almost exclusively is in emergency shutdown. If a break occurs in the pipeline or another upset occurs to the system, getting the pipeline shut down as quickly and reliably as possible is the first priority.

A disadvantage of electric actuators is that they are dependent on a supply of electric power, so if power is lost, the valve cannot operate—although they are provided with hand wheels for manual operation. This can be less of a problem for pneumatic actuators, which may include a spring (or in some cases, a nitrogen tank) to provide loss of power operation. Still, options exist for smaller electric actuators that can be equipped to run on DC power backed up with batteries.

IN SUMMARY

Electric actuators offer a number of important advantages in natural gas line operations. However, because valve types differ from large high-pressure ball valves to smaller butterfly, globe and plug valves, choosing just one type of actuator use across all valve types would be difficult. For this reason, partnering with an automation supplier who has experience serving the pipeline industry and has the expertise to make recommendations specific to each application is paramount to selecting the right valve actuator. VM

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VALVE {Ed}

Recycling Fracking Wastewater

BY BRENT MULLINIKS

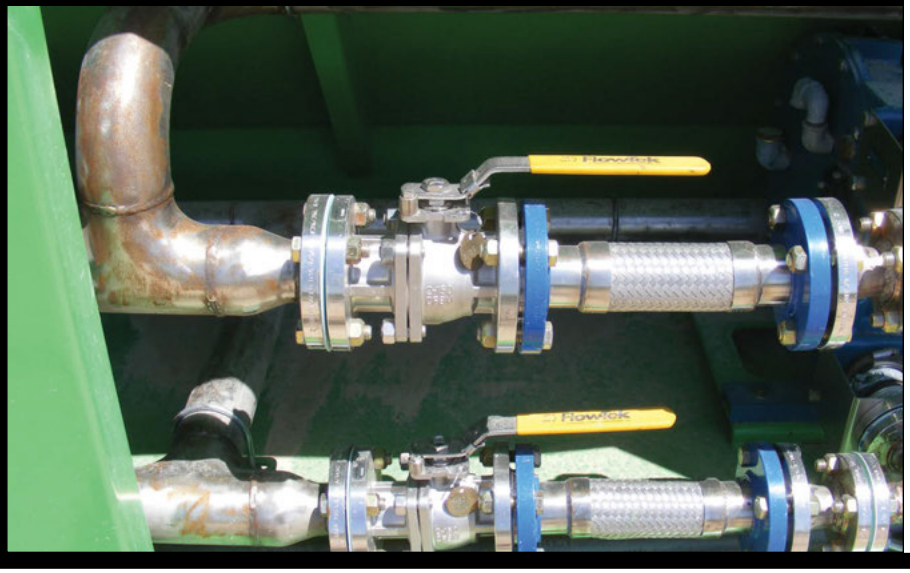
America is the largest consumer of energy in the world—energy production is pivotal to the economy, balance of trade, deficits and domestic stability. That's why new oil and gas well completion techniques, including horizontal drilling and hydraulic fracturing (fracking) are critical: Many Americans believe fracking is the road to becoming oil independent, creating jobs and improving the U.S. economy.

However, as with many great things in the business world, challenges exist. One of the major ones with fracking involves the copious amounts of water needed for the process. According to Chesapeake Energy, the company's current typical oil well fracking process consumes about 5 million gallons of fresh water per well. With the many new oil and gas wells being drilled across America, we can expect billions of gallons of fresh water to be used, contaminated, and then discarded.

As water conservation becomes a larger issue, and fracking takes on even more significance, the oil and gas industry has come face to face with this dilemma. Adding to the problem is the reality that, in many of the areas where fracking is taking place (e.g., Texas and Oklahoma, which constitute 57% of the nation's rig count), there is serious drought. Fresh water taken from community reservoirs and environmental ground waters in these drought-ridden regions has those regions concerned. What's more, about 30% of the water used in a typical fracturing process comes back to the surface soon after it is completed, a process known as flow back water. This water can create concerns with the local drinking and agricultural water supply.

A butterfly valve (red handle) and a ball valve (blue valve) on the sump pump take waste out of the frack water

Butterfly valves lead out of the mixing unit.



Ball valves connect to air floatation that goes to the DAF unit.

Faced with the growing issues, operators will increasingly turn to alternative ways of obtaining and reusing frack water.

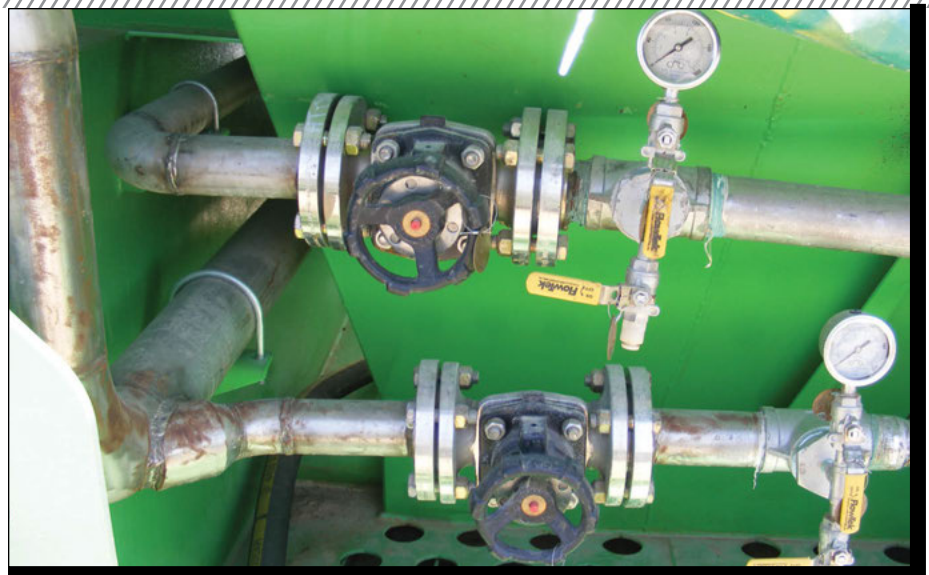
A SOLUTION

One solution to this ever-increasing water problem is the $9 billion industry of water recycling. Firms from traditional industrial wastewater companies, as well as energy service companies, have recently developed technologies to address the critical needs of sourcing water and disposal issues. Some of the firms have built physical plants requiring trucks to haul the water to a location for processing, while others have sought on-site mobile systems.

This oilfield water recycling industry segment is a young and rapidly growing market. Many of these companies have heavily invested time and money into developing and commercializing effective water recycling systems. The cost of sourcing fresh water, transferring it to a frack site, then disposing of the end result are driving new solutions

such as reverse osmosis, evaporation, electro-coagulation and chemical coagulation (CC). Most experts agree that the water to be recycled varies significantly in different parts of the United States; therefore, many believe technologies should not be selected solely by operating costs, but also by efficacy to certain types of water.

One proven system that benefits from the fact it's a mobile service with relatively low operating costs for the on-site processing is CC, along with dissolved air floatation (DAF). The CC/DAF system can take the contaminated flow back water created by the frack process, eliminate most of the suspended solids and kill about 99% of the bacteria, producing on-site reusable frack water. Since most flow back water can be recycled through the process, operators can then use this recycled water instead of relying on local water supplies. The process not only conserves water, it can create significant economic savings to oil and gas operators. This can range from $100,000 to $500,000 when taking into consideration the amount of water fracking needs, the cost of transport and the disposal of flow back water.



Gate valves lead into the DAF system.

THE PROCESS

The CC/DAF water recycling system uses a two-step process: It coagulates and flocks with chemistry the larger particles found in the water, which fall to the bottom of a large frack tank-size container, then it pushes the remaining water through an air flotation process (dissolved air flotation treatment) to clean and disinfect wastewater.

The first step in this water recycling system is to filter contaminated flow back water through 6-inch butterfly valves into the blending unit. At this stage, the chemicals are added to bind and coagulate the suspended solids. Based on the specific makeup of the environmental water of the fracking site, different chemicals are added to treat different types of contaminated water. That means the system is conveniently compliant to the site's specific location with no negative impact on existing ecosystems in the treated areas.

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The next step is the water leaving the blending unit through multiple 4-inch gate valves, then traveling through several 4-inch ball valves to the DAF unit. Here, millions of nano-sized bubbles are introduced into the water, floating the suspended solids to the surface of the water. This allows the system to scrape off suspended solids that once contaminated the water, leaving clean fracking water at the bottom.

Finally, the water leaves the DAF unit through a 6-inch butterfly valve, entering the disinfecting unit. Here, the total suspended solids-free water is disinfected against 99% of the remaining bacteria. This eliminates concerns of local water resource depletion as well as concerns about negative effects on the local environment from disposal.

Scrapers remove solids on top of the unit where bubbles are formed.

A gate valve introduces air to the DAF unit.

A good water recycling system can provide a realistic solution for water conservation in the oil and gas industry. With each system recycling upwards of 20,000 to 30,000 barrels of frack water per day, an operator can save roughly $1 to $2 per barrel. At a rate of using 5 million gallons of water per well, the savings adds up quickly.

On-site recycling systems also eliminate the cost of transporting and buying millions of gallons of fresh water. By lessening the use of community and environmental water and using recycled flow back water, impact on local sources of fresh water and their ecosystems are greatly lessened. VM

Brent Mulliniks is a petroleum engineer and president of AES Water Solutions, a U.S.-based frack water services company. Reach him at Brent@aeswatersolutions.com.

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

NWS Technologies
Spartanburg, SC
www.nwstechnologies.com

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

The Wm. Powell Company
Cincinnati
www.powellvalves.com

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

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

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

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

United Valve
South Houston, TX
www.unitedvalve.com

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

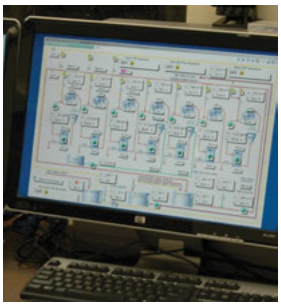
Valve Reconditioning Service Co.
Melvindale, MI
www.vrsinc.net

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

VRC ASSOCIATE MEMBER

Quality Valve
Mobile, AL
www.qualityvalves.com

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



METSO has strengthened its product portfolio and developed new control applications to improve usability in the Metso DNA automation system such as tools for alarm shelving and a function test. Also, an IEC 61850 interface is now available.

To improve usability in the system, Metso developed an application whereby an operator can temporarily prevent an alarm from being displayed. A shelved alarm will be removed from the alarm list and will not show until it is unshelved. The user can shelve an alarm, possibly comment on it and define the length of the shelving time. The shelved alarms are hidden in the user interface until they expire.

EMERSON PROCESS MANAGEMENT'S ValveLink Mobile software version 4.0 introduces mobile management of control valves on a Foundation fieldbus network. Available and preinstalled on new 475 Field Communicators, the new version offers an intuitive interface featuring large touchscreen icons that allow operators to configure, calibrate, validate, diagnose and troubleshoot valves in the field.

The field communicators extend advantages to hazardous areas where FIELDVUE digital valve controllers are located. Greater plantwide access to control valve status means operating reliability is improved, while overall plant uptime is increased using embedded troubleshooting guides.

ValveLink Mobile 4.0 seamlessly integrates field diagnostics of HART and fieldbus instruments into the ValveLink software. The new version can be added to existing 475 and 375 Field Communicators.

ASCO NUMATICS introduced the ASCO 291 Series of high-pressure solenoid valves for compressed natural gas dispensing applications in North America.

The rugged construction and unique internal design of the series are tailored to meet the industry's unique requirements for solenoid valves, safely withstanding pressures of over 5,000 psi, providing superior flow rates and consuming only 12 watts of power.

The 291 Series valves are offered in three pipe sizes—3/8 inch, 1/2 inch and 1 inch—plus three-station and six-station manifold versions.

SAMSON CONTROLS Type 3291 Valve was specifically developed for application in the oil and gas industry. Its con-

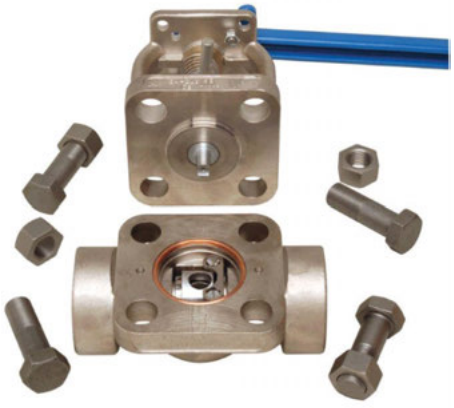
struction is based on the previous Samson valve design, but instead of being screwed in place, the valve's seat is clamped in. Unlike with the widespread cage valves, this valve generates very little friction during operation and is resistant to dirt deposits and leakage.

The valve is suitable for use in severe operating conditions, such as those found in the oil, gas and petrochemical industries. It's designed to be easy to service and can be disassembled and assembled using standard tools.

BALLUFF SteelFace sensors are designed and built to survive longer in abusive applications. For applications that require something more compact than a tubular sensor, the all new flatpack sensor features a one-piece stainless steel housing that offers a robust operating face for demanding applications. Balluff's all new patent-pending coating makes the sensor a good choice for extreme applications.

These sensors are suitable for welding and stamping applications. They can also be used in any heavy manufacturing areas where impact and abrasion pose a problem for sensors.

CONVAL'S zero leakage, metal-seated forged ball valve features a cartridge-style, top-entry design that saves significant time and money on installation, maintenance, replacement and downtime.



The Camseal body/bonnet joint is not subject to pipeline stresses. There is no in-line body bolting to loosen or suffer from fatigue so the body remains leak-free. All valves can meet zero bubbles for four minutes at 50 psi and 1,000 psi nitrogen. Modular internals isolate critical seal surfaces from thermal effects.

Conval's integral gland wrench concentrically loads the stem packing without tools, eliminating stem leaks and extending packing life. Superior bearing support of the blowout-proof stem ensures proper axial alignment. The custom-engineered flame spray chrome carbide coating has superior bond strength and coating density for high temperatures and high pressure drop applications.

HAROLD BECK & SONS

Group 29 linear valve actuator is designed to provide precise, reliable control of all types of modulating globe valves. It offers the excellent performance and maintenance-free design typical of all the company's drives, as well as the flexibility and advanced features provided by microprocessor-based electronics.

Well suited for process control applications in even the harshest environments, the Group 29 handles valve thrust requirements up to 6,100 pounds and is easily mounted on most valves. In addition to the ordinary agency location approvals, the actuator can be rated for hazardous locations as well.

FLOWSERVE launched the newly developed UEX electronic control package for L120 series actuators. The package replaces existing UEC-3 electronic controllers with a field-retrofitable, MX technology-based package. The UEX also can be installed into L120 electric actuators that are equipped with integral control packages.

This product is designed to deliver state-of-the-art actuation and network connectivity through five network protocols for reliable process control, and incorporates all of the UEC-3 functionality including its more than 20 features. Additional features include an LCD display for actuator setup, status indication in 11 languages, and position feedback via a battery-free, absolute encoder. VM

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Celebrating the Valve Manufacturers Association's 75th anniversary as the voice of flow control and Limitorque's 84th year of flow control excellence.

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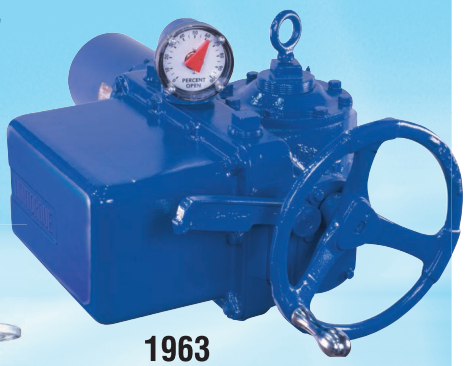

1963
SMB/SB

1988
L120

1997
MX

2009
QX

A History of Innovation

Having proven their performance since 1929 in the most demanding applications around the world, Limitorque actuators and gearboxes have pioneered many of the features now considered standard in the industry.

1929 – 1962

- Limitorque introduces the first electric actuator with torque sensing and control.
- Limitorque introduces local position indication, spring compensation and integral controls.

1963 – 1996

- Introduces the SMB/SB, which is still in production today serving the nuclear industry and critical/severe service applications.
- Pioneers modulating control for single-phase and three-phase AC power applications.
- Introduces digital, two-wire network control with open architecture.

1997 – present

- Introduces the first non-intrusive MX actuator with absolute optical encoder for position control and indication.
- Introduces the first redundant, self-testing, absolute encoder for MX and QX actuators.
- Introduces the QX with brushless DC motors for three-phase and single-phase AC and DC power supplies.

For more information, visit www.limitorque.com

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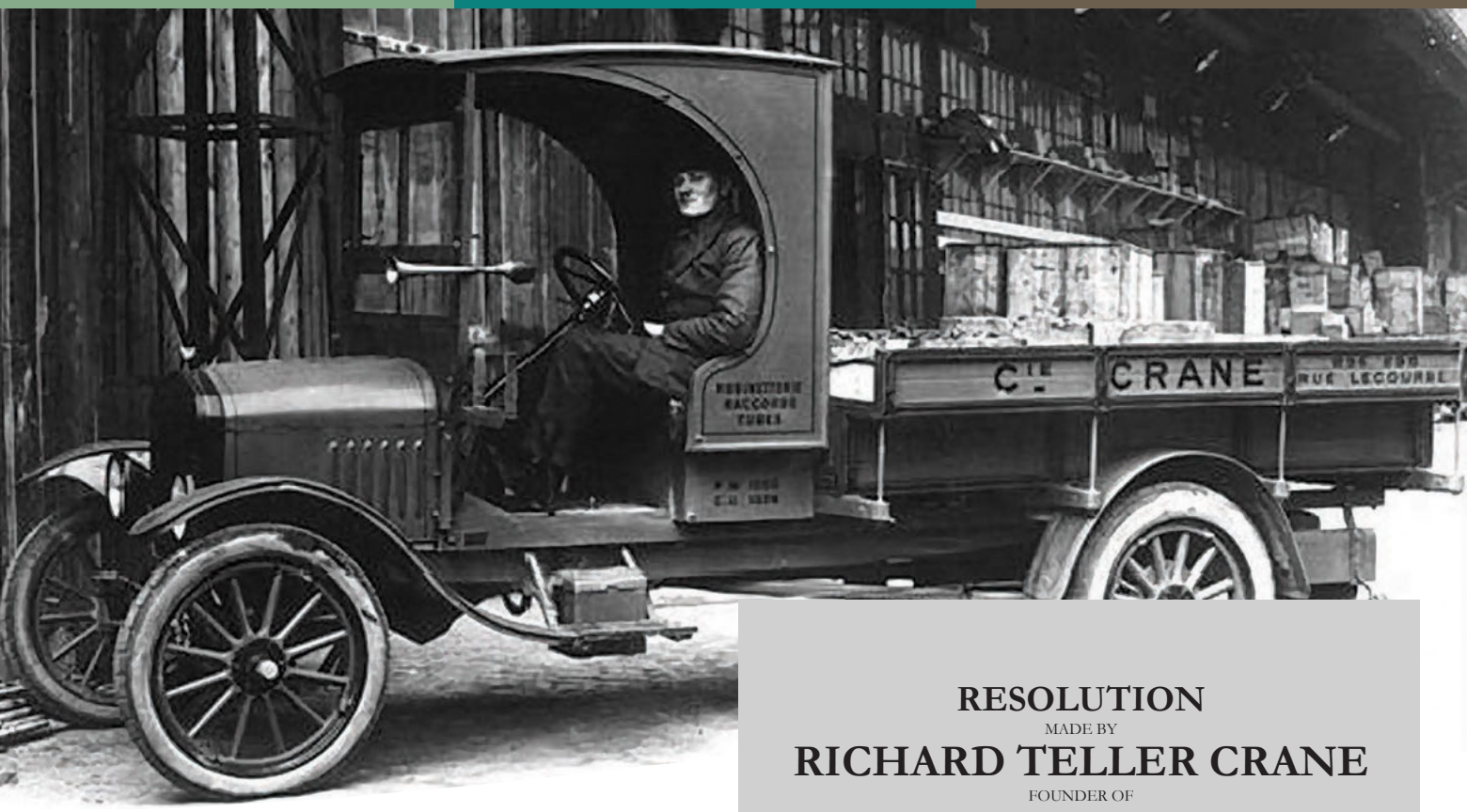

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