VMA'S VALVE BASICS PROGRAM CELEBRATES 10 YEARS

VALVE MAGAZINE

SUMMER 2019 | VOL. 31, NO. 3

The Repair vs. Replace Debate

- WHY COATINGS FAIL
- LEAN MANUFACTURING TOOLS
- ECCENTRIC PLUG VALVES
- THE BASICS OF PINCH VALVES

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VALVE MAGAZINE
SUMMER 2019 | VOL. 31, NO. 3

VALVE MAGAZINE

www.VALVEmagazine.com

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VMA VALVE MANUFACTURERS ASSOCIATION OF AMERICA
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A Final Visit with my European Colleagues

Bill Sandler at the 60th CEIR Anniversary Gala with CEIR incoming president Carlo Velazquez of Spain (center) and current president Ugo Pettinaroli of Italy (right).

I recently returned from a trip across the pond to the European Congress of the Valves and Taps Industry (CEIR) held June 17-18 in Barcelona, Spain. CEIR was celebrating its 60th anniversary, attended by 50 representatives from seven European nations.

In my 21 years as VMA president, I have attended 19 CEIR Congresses held all around Europe including Turkey, Denmark, Scotland, Italy, Switzerland, France, Spain, Belgium, Portugal, United Kingdom and Russia, and I can tell you, the only difference between this meeting and a VMA meeting is the languages spoken—the concerns today are remarkably similar.

I had the privilege of once again addressing the group on the outlook for the industrial valve industry in the U.S. and Canada, as well as the current activities of our association. This year, I emphasized the fact that CEIR should expand its programs to include more industrial valve presentations in order to have the ongoing support of VMA.

I also had the honor of sitting at CEIR's president's table during the 60th Anniversary Gala, right next to incoming CEIR President Carlo Velazquez of Roca Sanitario SA in Barcelona. Carlo will be an asset to CEIR with many good ideas for bringing the group forward. He also expressed the hope that my successor, as well as the VMA liaison to the CEIR, David Moser (DFT), will continue to attend these annual meetings so that we can learn from other nations, and they can learn from us.

I know that VMA will benefit in the future from this collaboration with our European colleagues, and I personally invited the CEIR membership to join us at our 81st Annual Meeting later this year at The Breakers in Palm Beach, Florida.

This CEIR, as those in the past, truly showed me that the industrial valve business is most definitely a worldwide industry. VM

Bill Sandler
President, Valve Manufacturers Association of America

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NEW CONTRACTS

BHGE Supplying Largest Combined Cycle Plant

BHGE is delivering severe service control valve packages to Saudi Aramco's Jazan Integrated Gas Combined Cycle Power Plant. At greater than 2,500 megawatts, the plant is the world's largest gasifier-based power plant, using vacuum residue and high-sulphur fuel oil from the Jazan Refinery to generate power to feed the local Jazan complex.

Velan Supplying ITER Nuclear Fusion Reactor

Velan will provide more than 2,000 valves for the ITER Tokamak and plant auxiliary systems in southern France. The project is a collaboration among 35 nations to build the world's largest magnetic fusion device, which is designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers our sun and stars. Velan will provide ball, butterfly check and globe valves to the system, which will produce an average of 500 megawatts of heat during a typical plasma pulse cycle.

Emerson to Modernize BASF Plant

As part of a five-year investment to boost capacity within its global plastics additives business, BASF has awarded Emerson a multi-million-dollar contract to modernize automation software and controllers at its specialty chemical production facility in Lampertheim, Germany. These enhancements will help the chemical manufacturer increase production flexibility and enhance operations.

Emerson will also replace an obsolete system controlling the tank farm and distillation columns at the facility.

BASF's chemical plant

Weir Valves & Controls USA Appoints Nuclear Agent

Weir Valves & Controls USA appointed AROD Valve Services LLC an authorized representative. AROD's owner, Dave Martin, was formerly a regional sales manager for Weir Valves & Controls USA. Territory coverage will include Arkansas Nuclear One, Grand Gulf, North Anna, Riverbend, Surry and Waterford nuclear plants.

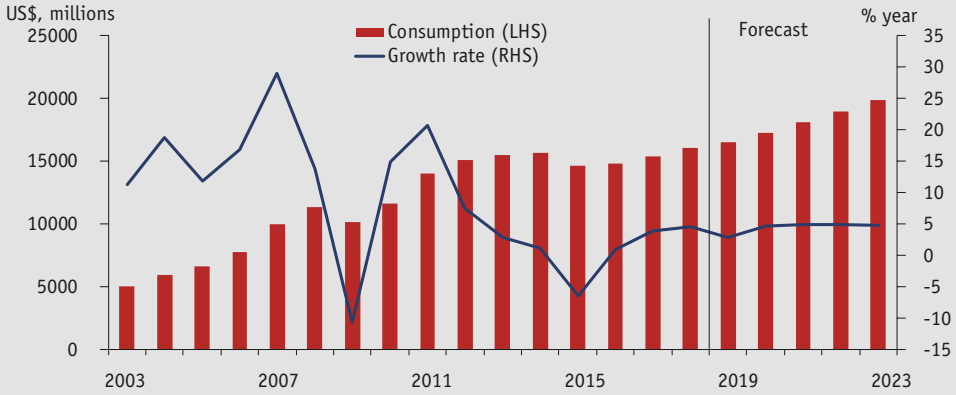
MARKET FOCUS: Water, Wastewater to See Stable Growth

Global industrial product growth in water treatment and supply is expected to increase by 2% in 2019, down from 3.3% last year, according to the "Global Valve and Actuator Market Outlook, Spring 2019," by Oxford Economics, prepared for VMA and BVAA (the British Valve and Actuators Association). Global water and wastewater management output should edge up by about 0.9% after growing 1.7% last year.

The report says that the softening of global activity results from a combination of the sharp slowdown in world trade, persistent geopolitical uncertainties (including ongoing fears of a no-deal Brexit and U.S. trade policy) and supply chain disruptions. In the U.S., external headwinds mean industrial momentum may cool down; however, benefits from tax cuts will provide a healthy impetus, the report says.

Near-term growth prospects in emerging nations seems to be moderating, but beyond 2019's decline, water and wastewater output should grow at a steady rate of 1% over the forecast horizon for both the developed and emerging world, the report says.

World: End-use consumption in water, sewerage and waste management



Source: Oxford Economics

NEW FACILITIES

AIV, Gulf Coast Open New Headquarters

AIV and Gulf Coast Modification have opened a 320,000-square-foot warehouse, manufacturing and office headquarters at 22806 Northwest Lake Drive, Houston.

The new facility consolidates three separate Houston properties previously operated by the two companies. The new facility houses two stories

New AIV/Gulf Coast Modification headquarters

of Class A office space, a dedicated warehouse space operated by AIV and a separate manufacturing space for Gulf Coast Modification.

Weir Oil & Gas Opens Texas Customer Service Center

Weir Oil & Gas is opening a new, 92,000-square-foot Midland, TX Customer Service Center. The new center consolidates three existing Permian-area service locations into one central location.

The center offers pressure pumping and pressure control assembly, repair and testing facilities, a central hub for field service operations, office space and a regional distribution center. The facility will help meet the growing customer demand in the Permian Basin region.

MERGERS & ACQUISITIONS

Weir Becomes Trillium

Weir Flow Control (WFC) recently became Trillium Flow Technologies with the completion of a sale to First Reserve, a global private equity investment firm. Trillium will consist of the same 15 established global pump and valve brands of WFC, which serve the power generation, oil and gas, water and wastewater, mining, and industrial sectors.

Trillium focuses on every stage of the process including design, installation, and operation using its global footprint and supply chain, aftermarket parts and service.

In his new role as president and chief executive officer, WFC's acting president David Paradis will continue to lead Trillium with his management team.

Crane Co. Attempting to Acquire CIRCOR

Crane Co. submitted a proposal to the Board of Directors of CIRCOR International, Inc. to acquire CIRCOR. Crane Co. proposed the all-cash transaction to CIRCOR's President and CEO Scott Buckhout on April 30, 2019. On May 13, the CIRCOR Board summarily rejected Crane Co.'s proposal with no offer of discussions or due diligence. On June 4, Crane Co. reaffirmed its commitment to provide a significant premium for CIRCOR shareholders.

Spirax-Sarco Completes Purchase of Thermocoax

Spirax-Sarco completed the acquisition of Thermocoax and its group companies following regulatory approval in France, Germany and the U.S.

Spirax Sarco said the acquisition will enhance and add significantly to Thermocoax electrical process heating business in delivering thermal energy solutions to customers.

Metso Closes Acquisition of HighService Service

Metso has successfully completed purchase of the service division of the Chilean mining engineering, construction and technology company HighService Corp.

HighService offers its customers a variety of services from maintenance to commissioning and remote monitoring. The company has 1,000 employees and operates in Chile, Argentina and Brazil.

Emerson Acquires Life Sciences Analytics Software Firm

Emerson has acquired Bioproduction Group (Bio-G), which makes simulation, modeling and scheduling software for biomanufacturing. Bio-G's software will become a part of Emerson's Plantweb digital ecosystem.

Hunt Valve Buys Montreal Bronze

Hunt Valve Company completed its purchase of Montreal Bronze Limited (MB Valve). Located in Terrebonne, Quebec, MB Valve supplies severe-duty bronze marine valves. The company also has a large variety of special bronze and alloy steel products that meet specific performance requirements for U.S., Canadian and NATO-friendly Navy ships as well as pharmaceutical and nuclear applications.

2019

AUGUST

8-9
VMA Market Outlook Workshop*
San Diego
www.vma.org/MarketOutlook

SEPTEMBER

21-25
WEFTEC 2019
Chicago
www.weftec.org

25-27
VMA/VRC Annual Meeting*
Palm Beach, FL
www.vma.org/AnnualMeeting

NOVEMBER

12-14
Valve Basics Seminar & Exhibits
Houston
www.vma.org/ValveBasics

19-21
Power-Gen International
New Orleans
www.power-gen.com

2020

MARCH

26-27
VMA Leadership Forum
New Orleans
www.vma.org

MAY

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

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

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

AWARDS & MILESTONES

Curtiss-Wright's Exlar Facility Wins Safety Award

The Curtiss-Wright facility in Chanhassen, MN, received the Award of Honor in Occupational Safety as part of the Minnesota Governor's Safety Awards. The Chanhassen site produces Exlar products and earned the award by reporting better than industry average recordable rates and scored at least 91 on a 100-point safety program evaluation scale.

Flowserve Engineer Honored by Hydraulic Institute

Michael Mueller, manag-

PEOPLE IN THE NEWS

CONVAL… appointed **Carl Hyltin** as southwestern regional sales manager covering the southwestern U.S. plus Mexico. Hyltin brings 27 years of valve sales experience in power generation, petrochemical and pulp & paper industries throughout the south. He has extensive product knowledge of control valves, turbine bypass, desuperheating and gas turbine valve technology.

CURTISS-WRIGHT… named **Günther Pergher** EST Group business development manager. While based in the North American headquarters in Pennsylvania, Pergher will support growing new build efforts in the Middle East, Asia and Latin America as well.

Prior to joining EST Group, Pergher held several high-profile positions, including director and regional vice president business development at COOEC Subsea.

OPTIMATION TECHNOLOGY… VP of engineering **Wendy Smith** was among Putnam Media's class of 2019 Influential Women in Manufacturing. Smith will be profiled with the other winners in a dedicated e-book to be released in September.

Among the honorees in this year's class of Influential Women in Manufacturing are CEOs, senior engineers and a member of Congress. These winners are leading initiatives that are challenging traditional approaches.

FORUM ENERGY TECHNOLOGIES… promoted **John C. Ivascu** to senior vice president, general counsel and secretary. **James L. McCulloch**, general counsel since 2010, has transitioned to serve as chief compliance officer and as an advisor to the CEO.

Ivascu joined Forum in 2011 as assistant general counsel. He also served as an attorney for the U.S. Securities & Exchange Commission, Division of Enforcement.

UNITED VALVE added **Donald Polasek** to its management team as repair operations manager. He will oversee all the company's repair activities. Polasek has 38 years of experience including 25 years in repair operation management with Crane Energy Flow Solutions where he received a lean six-sigma black belt.

TEAM, INC… appointed **Susan M. Ball** as executive vice president and CFO. Ball will succeed **Greg L. Boane**, who will now serve as a special advisor to **Amerino Gatti**, Team's CEO.

Prior to joining Team, Ball served for more than 12 years at CVR Energy, Inc. in various roles. In 2012, she was appointed as CFO and treasurer for CVR Energy and its subsidiaries, CVR Refining, LP and CVR Partners, LP.

EMERSON… appointed **Vidya Ramnath** as the new president for its Automation Solutions business in the Middle East and Africa. A 24-year veteran of Emerson, Vidya was most recently vice president for Emerson's measurement and analytical business in Asia Pacific.

Vidya served as global sales leader for Plantweb, Emerson's portfolio of Industrial Internet of Things technologies and services. She led the growth of wireless business in Asia Pacific and expanded industry solutions and the lifecycle services portfolio for the region.

AUMA ACTUATORS… Tony Pecora retired on May 1, 2019. Pecora has spent the last 36 years in various roles from applications to vice president of sales. He has travelled extensively throughout North and South America setting up sales channels, establishing customer relationships and promoting AUMA to the various industries it serves. Pecora helped elevate the organization from the 12 employees the company had when he joined to over 120 today. Pecora is also a recipient of VMA's top honor, the Man of the Year award in 2017.

He has agreed to continue working with AUMA as a consultant.

From left, Gary Kilponen, chief procurement officer (Sulzer Switzerland); Kim Morgan, VP of Business Development and Marketing (Highland); Blair Alton, president and general manager (Highland); Risto Lindroos, head of Direct Spend Category Management Group Procurement (Sulzer Switzerland) celebrate the Highland Foundry award.

er–Global Engineering Standards at Flowserve, recently received the 2018 Member of the Year award from the Hydraulic Institute (HI). The award was presented at the organization's annual meeting in St. Petersburg, FL.

Mueller, a principal engineer on Flowserve's Engineering Standardization team has been with the company since 1991 holding various roles in quality, order engineering and engineering standardization and has served as a subject matter expert.

Valve Reconditioning Service Celebrates 50

This last spring, Valve Reconditioning Service (VRS), a family-run company in Melvindale, MI, celebrated the 50th anniversary of its business. The company was founded in June 1969 by Italian immigrant Mario Carbonaro.

The company kicked off its 50th year with three days of food, fun and demonstrations such as orbital welding, safety valve and live steam testing.

American Foundry Society Recognizes Emerson

Emerson was recognized for its commitment to continuous improvement at its South Milwaukee Foundry by receiving the 2019 Plant Engineering Award by the American Foundry Society.

The honor recognized Emerson's innovation and leadership in driving improved workflow by updating the plant's processes and equipment to the latest industry standards, from melting operations to the core room.

Highland Foundry Wins Sulzer Excellence Award

Highland Foundry Ltd. was recognized with a Sulzer Excellence Award for "Best Technical Support in 2018" in the Casting Category, AME Region. The award ceremony was a part of the Sulzer Pump Global Supplier Days, an event to jointly improve supply chain performance, procurement strategy and outlook to better serve the market.

Weir USA Receives Safety Award

Weir Valves & Controls USA Inc. has received the 2018 Weir Safety Award for Innovation by implementing safety kaizens to improve its safety culture. The division holds regular safety kaizens to raise awareness on the importance of keeping its teams safe. It also has a cross-functional team to assess areas and challenge the current status quo that has a 94% success rate for correcting safety issues.

Frost & Sullivan Commends Emerson

Frost & Sullivan recognized Emerson with the 2019 Global Growth Innovation & Leadership Frost Radar Award. The best practices award is bestowed upon companies that are market leaders at the forefront of innovation.

NEW CERTIFICATIONS

Emerson Earns Industry-First Certification

Emerson has received the industry's first ISASecure System Security Assurance Level 1 certification for cybersecurity. It was issued by industry consortium ISA Security Compliance Institute and certifies that Emerson's DeltaV distributed control and safety systems are robust against network and system attacks.

The certification is designed to help the industry navigate the ever-changing digital landscape and recognize products with enhanced cybersecurity measures.

ValvTechnologies Achieves API 641 Certification

ValvTechnologies, Inc. achieved American Petroleum Institute (API) 641 certification. The API 641 accreditation is one of three prevalent valve standards tests that evaluate fugitive emissions' performance over an accelerated life cycle. Of three such certifications, the API 641 standard is the most stringent test for quarter-turn valves and covers different designs, temperature ratings and sealing components. To pass this test, valves must meet the demanding criteria of maximum leakage of 100 parts per million by volume, while undergoing 610 cycles of the valve under extreme temperatures.

Weir USA Completes ISO Audit

Weir Valves & Controls USA Inc. completed the audit process and was recommended for continued certification to ISO 9001:2015 standards. The Quality Policy Manual and all related procedures have been reviewed for compliance and employees have been trained on the updated manual.

The audit was performed by two auditors from Hartford Steam Boiler Registration Services. The audit plan included a review of sales order entries, purchasing, engineering and manufacturing processes.

Registration Opens for VMA Fall Basics

Early interest in 2019's fall Valve Basics Seminar & Exhibits has been higher than normal. The event is Nov. 12-14 at the Houston Area Safety Council. One reason for the uptick in interest may be a change in format that complements the continuing need for end users and manufacturers in the industry for educational programming presented in a non-proprietary format.

New this year is the option for attendees to participate in either a 101 or 201 course, or to take both at one time. The first day-and-a-half of programming covers Valves 101: Industrial Valves & Materials, which begins on Tuesday, Nov. 12 and concludes mid-day on Wednesday, Nov. 13. Next on the schedule is Valves 201: Control Valves, Automation & Special Applications, which begins mid-day on Wednesday, Nov. 13 and concludes at day's end on Thursday, Nov. 14.

Valves 101 covers the following topics:

- An Introduction to the Industry
- Linear Valves
- Check Valves
- Quarter-turn: Plug and Ball Valves
- Quarter-turn: Butterfly Valves
- Pressure-relief Valves
- Materials

Valves 201 addresses these subjects:

- Electric Actuators
- Fluid Power Actuators
- Solenoid Valves
- Solenoids
- Valve Automation Controls
- Control Valves
- Electric Actuator Asset Management, Feedback and Monitoring
- Critical Service Applications and Valves

During the petting zoo at last year's Valve Basics event, control valve presenter Bert Evans (Emerson) demonstrates how a control valve works.

THE ZOO, THE EXHIBITS AND 'JEOPARDY'

In addition to the seminar portion of the event, VMA continues its popular "valve petting zoo," which gives participants the opportunity to sit down with presenters to discuss different categories of the products they're learning about: each table contains an array of samples that attendees can pick up and examine.

Also on the agenda are tabletop exhibits; a variety of products related to the industry highlighted in displays shown by manufacturers of valves and accessories, actuators and controls, castings and forgings, seals, gaskets and packings, Belleville springs, coatings, fasteners and hardware, and valve service and repair firms.

The exhibit hall is open on both Tuesday and Wednesday afternoons, from 4:30 to 6:00 pm.

Attendees who complete both Valves 101 and 201 will receive 18 professional development hours (PDHs) or 9 PDHs for completing one course.

Also new on the schedule this year is Valve Jeopardy 101 and 201 in which presenters will give answers, and attendees are invited to pose the questions. The team with the most correct questions will win a special gift.

EARLY-BIRD THROUGH AUG. 31

To register for the courses, visit VMA.org/ValveBasics to find links to course registration and the complete program. From that same page, exhibitors can also access registration and an exhibitor prospectus. Those registering before Sept. 1 receive early-bird rates. For additional information, contact Abby Brown at abrown@vma.org.

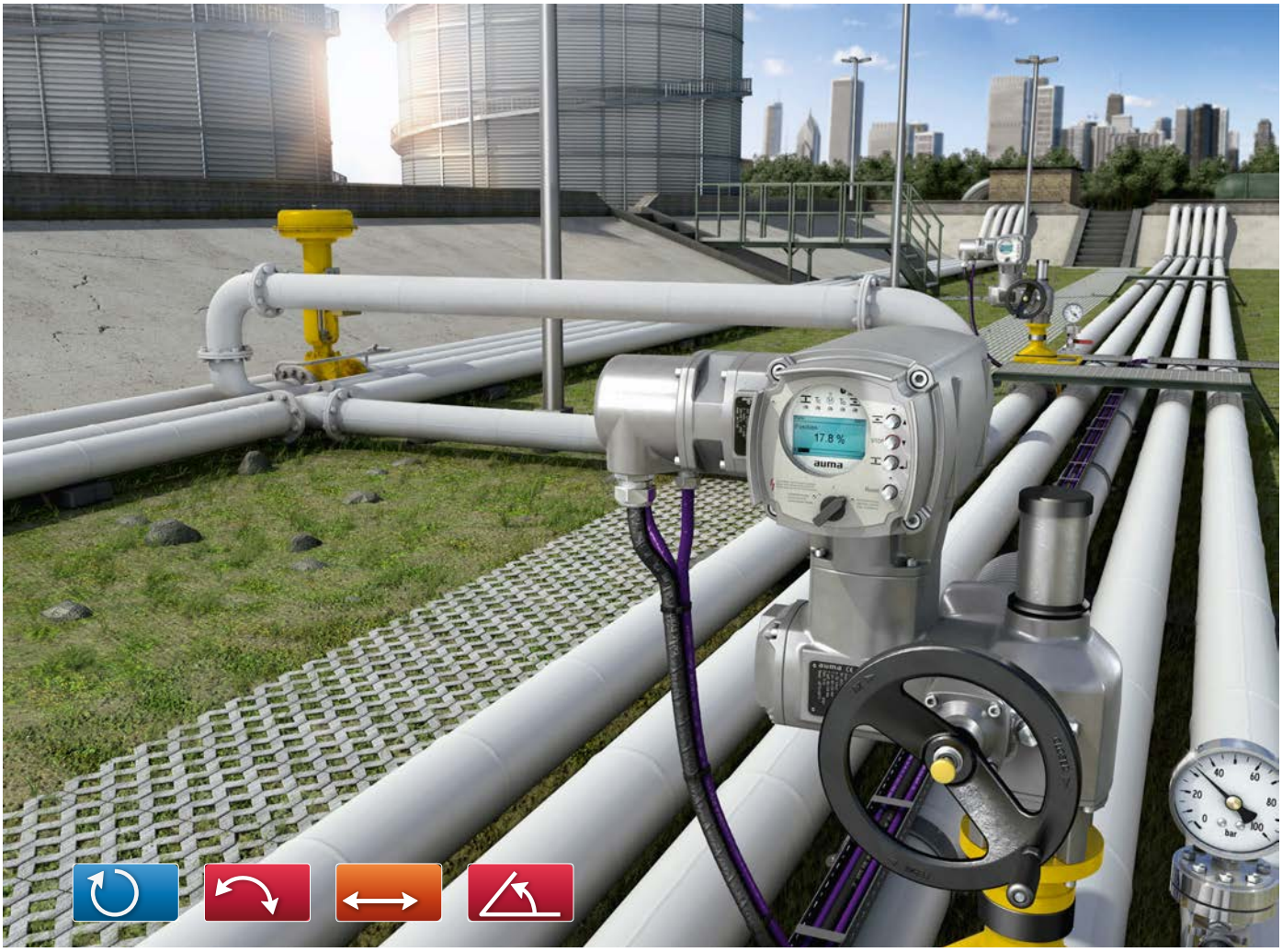
WELCOME NEW MEMBERS

Joining VMA as a full members are:

Lance Valves (www.lancevalves.com), Lancaster, NY. Established in 1972, Lance Valves, which specializes in industrial valves and automation products, produces many of its products in its Buffalo, NY area facility.

Drillmax Inc. (www.drillmax.com), Houston. is a manufacturer of drill pipe float valves, mud gate valves and shear relief valves for the oil & gas, water well and air drilling industries.

Joining the Valve Repair Council is: **AWC, Inc.** (www.awc-inc.com), Corpus Christi, TX. AWC is aligned with the industry's top manufacturers for industrial applications. The company works with its technology partners to meet customers' needs, which include applications engineering, testing, support, training, supplying and more.



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Largest Gathering of Water Quality Professionals in September

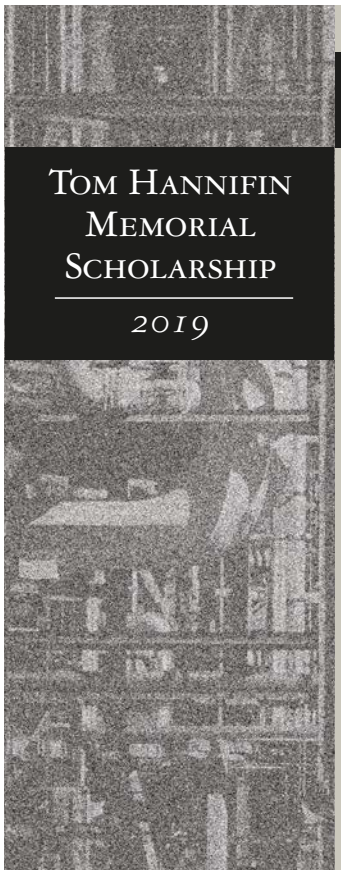
WEFTEC 2019, the 92nd Annual Water Environment Federal Technical Exhibition & Conference brings together professionals from around the world for the largest conference of its kind. This year's event is Sept. 21-25 at the McCormick Place, Chicago.

The conference theme is "Regeneration Workforce," chosen to celebrate harnessing the power of individuals coming together to reinvigorate the water workforce and to provide solutions for worker development, diversity and inclusion in the water sector.

More than 20,000 people coming from more than 80 countries are expected to attend. The event features 148 technical sessions, 27 workshops and 16 mobile sessions on topics such as advances in wastewater treatment, the latest technical tools for testing and treating water, new techniques for managing facilities and the latest research on the water industry.

In addition, the largest assembly of water and wastewater products and services in the world will be featured by the more than 1,000 companies that showcase their goods on the exhibit floor. Valves and valve controls is one of the categories of exhibition and several VMA members will be part of the exhibit.

For information, go to www.weftec.org.



MSS 2019 Scholarship Awardees

MSS congratulates the 2019 awardees of the MSS/Tom Hannafin Scholarship Awards! The following engineering students were awarded $2000 scholarships:

Ethan Kinnaird
Gardendale, Alabama
Auburn University

Jake Robinson
South Windsor, Connecticut
University of Connecticut

Ivan Rodriguez
La Porte, Texas
Texas Tech University

Nic Shelton
Scottsboro, Alabama
University of Alabama Huntsville

The MSS member companies that are affiliated with the 2019 awardees are:

American Flow Control
(American Cast Iron Pipe Company)

Dynamic Products

Empire Industries

Parker Hannifin Corporation
(Parker Instrumentation Products).

MSS is an American National Standards Institute (ANSI)-accredited standards developer.

Send inquiries to standards@msshq.org

To view the Press Release, visit the MSS homepage at msshq.org

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The Economics of Valve Repair

Executive Summary

SUBJECT: The debate on whether to repair or replace a valve is affected by many factors today.

KEY ISSUES:

- The present world of repair
- Factors that affect the decision
- Issues for different industries

TAKE-AWAY: Although the repair scenario has changed over the years, the goal is still balancing owner/end-user needs with the realities of the economics involved.

BY GREG JOHNSON

The old saying in the valve service industry is "price, quality and delivery—you can pick any two." That saying is still true 175 years after the first steam valves quit working and needed repair. Today, the most important criterion is quality, followed closely by delivery and then trailed by that nagging interloper, price.

THE PRESENT REPAIR WORLD

Although single valves or small batches of valves are repaired for major process and power plants all the time, the greatest influx in the business today comes from dedicated periods of plant maintenance. These intervals are called outages, shutdowns or turnarounds.

During a turnaround, the valve repair company only has so many days and hours to repair valves and bring them back to working condition in accordance with the original design specification or repair standard. This situation could be compared to TV cooking shows where the contestants only have so many minutes to effectively create a well-prepared, succulent dish.

To further that analogy, the TV chefs, at the beginning of the show, often don't know the ingredients they'll have. Similarly, a repair company often doesn't know what valves must be repaired or what condition they're in until repair personnel come through the door, and the equipment has been inspected. All these repair unknowns mean that accurate pricing is important, both for the service company to cover its costs and make a profit, and for the owner/end user to justify the cost of the repair.

To use a second analogy, a repair procedure is a lot like a visit to the doctor. The ailing person might be feeling a bit fatigued or have some recurring pain. Sometimes the problem will be obvious, and a prescription or treatment will be ordered right away. Sometimes, however, additional investigation is needed so tests are administered to determine what to fix and how. This is similar to the process involved in valve repair.

TOTAL COST OF OWNERSHIP

Wearing the hardhat of owners/end users means understanding that they want to maximize every valve dollar spent. They would like the valves, which are capital expenditures, to last as long as possible. If those valves are of the repairable type (more on that later), the cost of owning the valve has to include initial cost plus required maintenance and repairs. This is referred to as the total cost of ownership (TCO).

TCO is probably the most important consideration in the repair/no-repair decision-making process. However essential variables in the TCO equation have changed significantly in the last 20–25 years. Today, many of the valves that would have been fixed two decades ago are not repaired; instead, they are just replaced. This is because the cost of a new valve from a low-cost manufacturing location such as India or China is lower than the cost of basic refurbishing.

Furthermore, before Y2K, valve service companies were regularly repairing 2–6-inch, Class 150 and 300 gate valves. In fact, some facilities had assembly-line refurbishment operations for small cast steel valves that reduced the cost of repair for these valves because of economy of scale.

But labor rates for trained valve technicians have risen significantly over the last two decades as the workforce aged. This, plus the requirement to repair valves to tighter specifications such as American Petroleum Institute (API) RP621 valve repair standard, have raised the total cost of valve repair.

What this means is that the line between an economically repairable valve or a decision to replace with a new valve has seen a distinctive rise in size and pressure classes. Today, many refiners will not even consider repairing Class 150 cast-steel valves less than nominal pipe size (NPS) 12. Other refiners bump up the repair threshold to NPS 20. In Class 300, the economical-to-repair size limit drops to around NPS 10 for cast-steel-bodied valves. It drops even lower for valves in Class 600 and above.

So far, we're talking about commodity gate, globe and check valves,

☐ Many valve repairs require machining of components such as this 48-inch NPT, Class 300 valve being worked on a large vertical boring mill.

which make up the bulk of refinery and process plant valve populations. But what about more expensive and more exotic valves? When the body material becomes chrome/moly or stainless steel, the repair/no-repair threshold drops significantly. Here, an NPS 6-inch Class 150 in CF8M (cast 316ss) material becomes cost effective to repair. However, as the austenitic stainless steels (300 series) become more commoditized, that go/no-go repair threshold continues climbing up just as the plain carbon steel plot line did years ago.

☐ Sometimes it's more cost effective to replace a valve than to repair it, though if necessary, even this hulk could be refurbished and returned to service.

CRITICAL VALVES

Most owner/end users have some valves in their facilities that are more critical than others. These valves may see much higher pressures, be larger in size, be motor-operated or convey hazardous or lethal media. The TCO formula for these critical valves is a bit different. They must be maintained at a higher level than the commodity valves so proper repair is even more important. Oftentimes, additional nondestructive evaluation is called for, and special testing is required. These valves almost always take more expertise, technology and time to repair. This translates into higher repair cost.

Sometimes a new critical valve is available and the owner/end user has to decide whether or not to issue a purchase order for the repair or order new equipment. A rule of thumb for this decision is that if the cost of repair exceeds about 60–65% of the cost of the new valve, then a new valve is ordered.

Replacement with new equipment is not always an option, however, because these valves are often special-order, highly engineered valves with long lead times. In those cases, the decision becomes easy: The valve is repaired. In some cases, repair

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of specialized valves can cost more than a replacement valve would cost. Another factor in deciding whether or not to repair is the robustness of the original valve compared to the perceived robustness of a new replacement valve.

TEARDOWN AND INSPECTION

Unless a defect or problem is a painfully obvious one such as a casting leak through the side of the valve body, an investigation must be made first. This repair investigation is called tear down and inspection (TDI). TDI is where the problems are discovered, and the diagnosis is made. Most valve repair operations of critical valves begin with TDI, while in some cases, the owner may not ask for an initial TDI. TDI is almost always a separate billable item to cover the repair company's costs for the inspection in case the valve is scrapped and no additional repair work is performed. Usually, the initial purchase order to a valve service company is just for the initial TDI.

TDI involves complete disassembly of the valve and examination of all the component parts. In some cases, a pretest is performed before the disassembly process. Once the valve is disassembled, any corroded or discolored parts are blasted or chemically cleaned to get the parts down to bare metal so that a careful inspection can be made. The visual inspection is augmented by measurement of key components. Sometimes additional nondestructive evaluations such as dye penetrant (PT), magnetic particle (MT), positive material inspection (PMI) or radiography (RT) are performed.

With all the parts' inspections completed, the repair facility can prepare a scope of work and give an expected repair price, which includes the purchase of new parts, if they are available. The valve owner will then make the decision to repair or replace.

Although we've been talking about linear valves and check valves so far in this article, the process for quarter-turn valves has some similarities but also some differences.

QUARTER-TURN VALVES

For soft-seated ball valves, it's vital to procure exact OEM replacement soft goods if they are available. By going back with the original OEM seals, tolerances can be maintained, and proper operation is better assured. This also ensures that during the valve's next turnaround, OEM replacement parts will still fit. The cost of OEM parts is usually higher, but they should be the choice when available from the OEM. Parts are usually billed on a cost-plus-20% or so basis.

Metal-seated ball valves are slightly more difficult and potentially costly to repair because of the non-resilient nature of their seats and less-forgiving finishes and tolerances. For this reason, some of the severe-service ball valve manufacturers provide their own repair services. While OEM repair can be an excellent choice because of the direct access to OEM engineering and parts, possible drawbacks also exist, depending upon the situation and repair capabilities of the OEM.

These include: 1) The owner/end user usually prefers to minimize the number of purchase orders issued for valve repair on a turnaround, and sending every valve back to the OEM for repair involves cumbersome paperwork, and 2) OEM repair operations sometimes compete with production work, especially when machining or welding is involved, so valve repair work is sometimes pushed aside for project work.

OEM parts are not always available so new components must be designed and built. A new disc is pictured on the left and the badly damaged original disc it replaced is on the right.

High-performance butterfly valves see a greater percentage of OEM repair. The angles and tolerances of these valves are critical and usually, the OEM has the benefit of special jigs and fixtures that can make repair of the valves quicker and more economical.

Other valve types that favor OEM repair (or at least very strong OEM/repair facility relationships) are control valves. In general, they do not even fall under the same plant umbrella as block valves do. The control valves, with their critical regulating function to perform, are usually handled by the instrumentation group in the plant. The coordination of their repair falls under their responsibility as well. Since the control valves are more than final control elements, the repair facility needs to have an excellent understanding of the actuator,

A metal-seated ball valve gasket pocket is measured to ensure that the OEM replacement gasket will fit properly.

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positioner and control system with which the valve interfaces, which is why OEM repair facilities see a much greater percentage of these valves during outages.

PRESSURE RELIEF VALVES

Repairing pressure relief valves (PRVs) is a special case. Since these valves perform a critical safety-related function in the plant, repairing them is heavily scrutinized by governmental agencies, the valve manufacturer and the owner/end user. There are strict rules established by the American Society of Mechanical Engineers (ASME) National Board (NB), that describe in detail repair procedures to be followed. Included in these requirements is the insistence on OEM replacement parts if the valve is to be restamped.

Since PRVs are repaired on regular schedules and they generally are not operated frequently, their repair costs can usually be estimated fairly accurately ahead of time. The repair process normally involves a pretest, followed by the typical TDI, and measurement and inspection of key components. The machining of parts and especially welding of any component is tightly controlled by the repair section of the NB code. Following repair and/or parts replacement, the PRV must pass a tight test procedure that ensures the valve will function as required.

IN-LINE REPAIR

Process plants and refineries also have large and unusual special-purpose valves that have to be repaired periodically. Giant, high-temperature flue gas and catalyst slide valves, which can weigh 20 tons or more, are examples of these types of valves. The repair of valves this large must be accomplished by field service (in-line) repair. Any in-line valve repair is going to be more expensive because of the logistics involved.

Other valves that are almost always repaired in place include virtually all welded-in valves. In-line valve repair is usually performed on critical butt-weld-end power plant valves. Any machining, lapping or welding equipment must be portable to be brought to the jobsite and transported to the valve in need of repair. Just the handling of the equipment can require the creation of special temporary scaffolding as well as the availability of cranes and lifts. Normally, all equipment brought to the jobsite for field service repair is billed to the customer on a per-day basis.

Labor rates for field service work can be anywhere from 50–100% higher than shop rates. This is because of the job conditions and the stringent requirements of working in a plant.

The most dangerous and expensive field service valve repair occurs in nuclear power plants. Personnel performing this work are the cream of the valve repair crop because any mistake made during repair can be deadly. Needless to say, the rates for field service repair in nuclear facilities are very high.

A 48-inch NPT, Class 600, reground gate valve disc is inspected prior to assembly. Grinding of discs are expenditures that can add to the price and delivery of a valve repair quote.

SHOP WORKFLOW

One of the biggest issues valve repair companies face is the balance of manpower. A company may participate in six to eight major repair turnarounds a year, plus a number of smaller repair jobs. A large valve repair turnaround can require two or three shifts of straight, 24-hours-a-day work until all the valves are repaired. These types of jobs require many highly qualified technicians to man the multiple shifts. An issue comes up when there are no turnarounds in house and the number of random repair jobs is low, a situation that leaves many highly paid personnel sweeping the floor or doing other non-billable work.

Because of the up-and-down monthly business cycles in valve repair, assessing the financial viability of a repair company has to take into account a 12-month business cycle, as some months can be very profitable, while others can be stained with red ink.

SPECIAL PROCESSES

Some repair jobs require techniques or processes that are above and beyond the normal daily routine. These include the qualification of very specific welding procedures. A good repair facility working on linear and quarter-turn valves will probably have 100 to 150 welding procedures qualified in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. However, it is not unusual for an end user to request special welding procedures that exceed the requirements of Section IX of the boiler code. These procedures are usually processed on a hot-rush basis, with the cost for these special procedures added to the invoice.

A logistical and economic advantage for repair facilities is having vertical integration. Not having to send components out for special processes such as welding, nondestructive evaluation and heat treatment can save the customer both time and money.

STANDARDIZED REPAIR

It is rare for a customer in the oil and gas industry to ask a valve service firm to just repair a valve. Specific criteria and procedures are created that need to be followed. While some companies have their own repair standards, many reference the appropriate and available API repair documents.

API's RP621 refinery valve repair document is thorough. It requires numerous examinations and inspections of valve components. In addition to the inspection phase, all repair activities must be documented in detail on forms submitted to the owner/end user following the repair process. This equates to much paperwork or a thorough enterprise resource planning (ERP) system to digitally document all repair activities, including inspection and test reports. All of these inspections and documentation take time. This is why the thorough repairs in accordance with RP621 cost a lot more than a cursory "clean up and retest" repair.

While the API RP621 document is specified for gate, globe and check valves, currently no repair standard exists for quarter-turn refinery valves.

☐ A batch of pipeline gate valves from a petroleum terminal repair outage are readied for tear down and inspection, then repair.

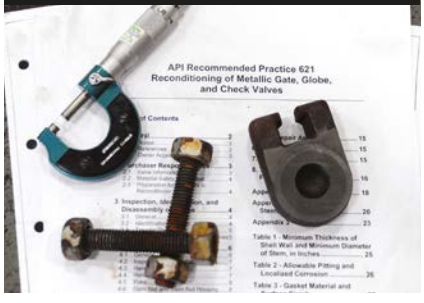
The API refinery valve group has considered creating such a document and could begin work on it in the next few years.

On the midstream side of the oil and gas industry, API has a repair document for valves built in accordance with the API 6D Pipeline Valves design standard. This document is API 6DR, Repair of Pipeline Valves. Repairing valves to this standard is also going to cost more because of the repair details and documentation requirements.

WATERWORKS VALVES

Most valve repair is focused primarily on the refining, petrochemical, chemical and power industries because of the harsh operating conditions that valves in these services see. However, valves in water service require repair from time to time, although not as often as process industry or power valves. Waterworks valves that see the most repair activity include large outer diameter gate, ball and butterfly valves as well as valves in dams and hydro-electric facilities. Since most of these valves are difficult to remove, they are repaired in place and dictate the higher in-line repair pricing.

☐ API Recommended Practice 621, Reconditioning of Metallic Gate, Globe and Check Valves is the repair standard for valves in refinery service.

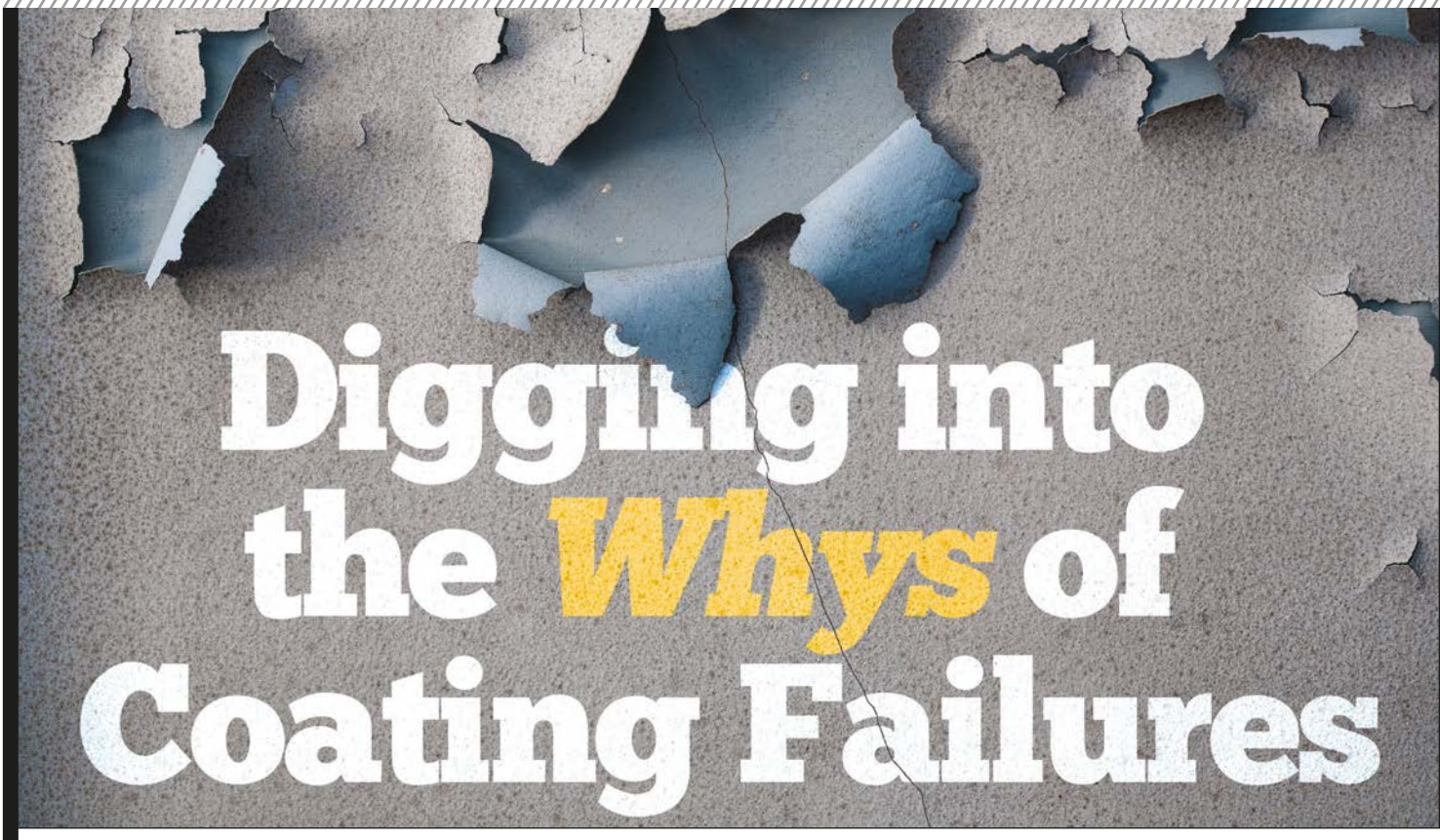


CONCLUSION

It would be great if all repairs could be quoted at a set price before the valves are inspected, but many factors go into the costs and pricing of fixing a valve. While set pricing is occasionally done, these ahead-of-time, no-inspection-basis price quotes are necessarily high to cover all possible contingencies.

Performing valve repair that is both profitable for the service facility and economical for the owner/end user is the goal for every repair job. At the end of the day or the end of the turnaround, the objective is to have customers that are confident they received value for their repair dollars and a repair company that was able to make a reasonable profit on its labors. VM

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



Digging into the *Whys* of Coating Failures

BY NEIL PITTMAN

The most common reason coatings don't do what they are tasked with doing is surface preparation. Studies of coating failures by NACE International have shown that up to 75% of all coating failures are related to this problem.[1] The remaining failures come from improper application, mixing or cure times, or improperly selected coatings, poorly written specifications, or a bad batch of coating.

Failure analysis benefits from using a method called the "5 whys," which is a process of digging deeper and deeper in looking at cause-and-effect relationships using the question "why." (Five is generally considered the optimum number to get a solution, but the layers can be more or less).

This method is taught in quality training courses such as Six Sigma and Lean Manufacturing classes. But the concept behind it is so simple, it is understood by children. In fact, our children use it often on us by continuing to ask why until they get an answer that satisfies them.

Applying this method to the topic of coating failures goes like this: The first time we ask why a coating failure occurred, the technical root cause is revealed, and it is time to ask *why* again. The second layer of *why* is often found to be: not following the instructions for the surface preparation and application of the coating. The topic of this article is the third *why*.

THE WHYS

During most coating applications, the content of three sets of documents must be followed to obtain a coating that will have the design life desired by the owner. First is the coating specification, which is written by the owner and details specific procedures and quality control activities that must take place for the coating to perform as desired. Second are the standards referenced in the coating specification. Standards are procedures or tests written by a consensus of industry experts, such as ASTM International, International Organization for Standardization (ISO), and NACE International. Third is the technical data sheet (TDS) for the coating in question. Written by the coating manufacturer, this document also contains instructions and limitations for the surface preparation and application of the coating.

The third *why* gets to the point of this article: Why were the instructions on how to apply the coating not followed? Some party involved in the application of the coating deviated from the instructions. In many instances, deviating from the specification, standards and TDS becomes commonplace.

Executive Summary

SUBJECT: Analyzing why a coating fails requires looking at what's happening in layers and going ever deeper in search of answers.

KEY ISSUES:

- Why coatings fail
- Case studies
- Looking deeper

TAKE-AWAY: Analyses show that the most significant cause of coating failure often begins with someone not following instructions.

In her book, The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA, Dianne Vaughan coined the term "Social Normalization of Deviance." She was discussing the space shuttle Challenger explosion.[2] Vaughan's definition is: "Social normalization of deviance means that people within the organization become so much accustomed to a deviation that they don't consider it as deviant, despite the fact that they far exceed their own rules for elementary safety."[3]

While Dianne Vaughan's book is about safety and the Challenger disaster, the same concept can be applied to quality. What follows are several case studies where social normalization of deviance played a part in coating failures.

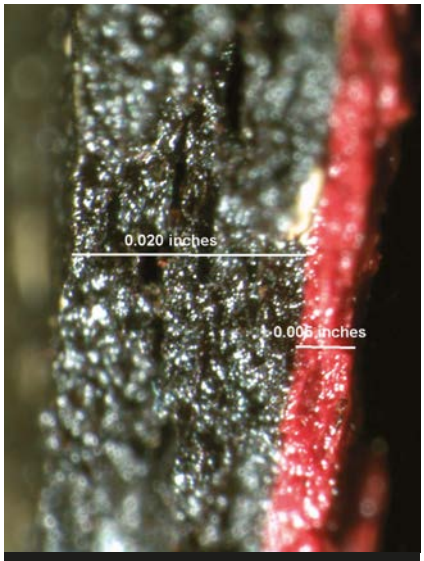
CASE ONE: Pressure Vessel Interior Coating

A pressure vessel used as a phase separator was found to have an interior coating failure when coating chips were found downstream in a strainer. The vessel was emptied, cleaned and entered by a subject matter expert (SME) tasked with performing a failure analysis. What was found was intercoat delamination between two layers of the coating system.

The system was one coat of epoxy primer specified to be 2–3 mils, one coat of coal tar epoxy at 6–8 mils and one coat of coal tar epoxy at 6–8 mils. The intercoat delamination appeared to be between two coats of the epoxy primer.

While the primer should have been put on in one coat, it was applied two coats thick. The coating chips that could be removed by hand had primer on the back of the chips, while primer was still on the surface of the vessel. Under microscopy, the coating chips had blisters filled with solvent and the thickness of the primer on the back of the chip was six mils thick, twice as thick as the primer was specified to be (Figure 1).

The cause of the failure was: The coating was too thick, trapping solvent in between layers of the system, which led to blisters and intercoat delamination. The owner had created a specification, and the manufacturer



☐ Figure 1. Coating chip from the interior of the vessel. The primer is the orange coating, six mils thick.

of the coating had a TDS that detailed the required thickness of each coat. The applicator was ISO 9001 certified and had processes in place for following the owner's specification. The applicator deviated from the specification and the written instructions from the coating manufacturer's TDS without understanding that it would cause a failure. This deviation resulted in a requirement that the entire interior of the vessel be reblasted and recoated.

CASE TWO: Pipeline Station Construction

The piping in a pipeline station had a specified exterior coating system that consisted of one primer coat of inorganic zinc at 3–4 mils and one topcoat of polysiloxane at 5–6 mils. The piping was coated at the fabrication shop before it was shipped to site, where the flanges were bolted together during construction. When the system was pressure tested, the topcoat cracked and delaminated from the primer.

The failure analysis showed that the dolly pull-off adhesion was 200 psi, when it should have been about 1,000 psi or more.

Review of quality control records from the coating application and interviews with the applicator and the inspector onsite during coating revealed that the topcoat often was applied during the same shift as the primer. But the inorganic zinc primer required a 24-hour cure before a topcoat could be applied. The failure occurred because the recoat window required by the manufacturer on their TDS was not followed. Deviation from the required recoat window had become commonplace because of pressures of scheduling for shipping the components to site for assembly. Additionally, the project had deviated from good manufacturing practices, using the same third-party inspector as both the quality control inspector and the project management/expediting representative in the fabrication/coating shop.

This coating failure resulted not only in requiring the entire station be reblasted and recoated, but also led to a scare about the metallurgy of the piping and concerns about each heat used in manufacturing the piping, fittings and valves. The coating cracking was initially thought to be caused by the piping swelling during the pressure test. Enormous effort was spent testing the metal and reviewing the documentation of pedigree for each heat of steel before the issue was found as only a coating issue.

CASE THREE: Improper Repair

During a routine audit of a pipeline construction project, a discovery was made that coatings used to repair the parent coating did not adhere well to the parent coating.

The pipe was originally coated with fusion-bonded epoxy (FBE), a powder coating applied in a mill. When small pinholes are found in the FBE, they are repaired with a patch stick at the mill. A patch stick is a thermoplastic polymer that can be melted and then solidifies as it cools, providing a coating over the hole. A discovery was made in the field that most of the repairs had poor adhesion—some of them could be removed with a fingernail.

An investigation found two problems with the coating, both directly related to application. The TDS from the manufacturer stated that the entire surface was to be coated with a patch stick that needed to be abraded, and that during the application, the pipe was to be heated with a propane torch, then the heat of the

CONTINUED ON P. 26

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"I really enjoyed the presentations and how the petting zoos brought the information together. Thank you!"

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Figure 2. The abrading with sandpaper only covers a small portion of the entire area patched.

Figure 3. Blisters and topcoat delamination on a valve

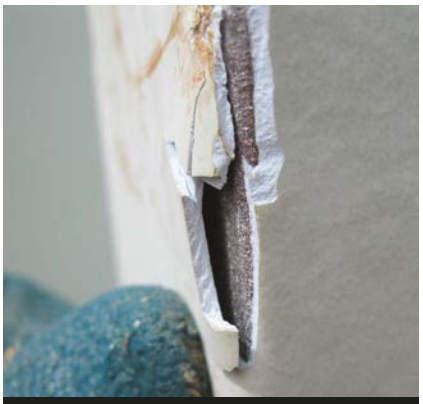

Figure 4. A small impact results in a much larger disbondment.

pipe used to melt the stick. In practice, the entire area to receive patch stick coating was not abraded and the patch stick itself was heated during application, not allowing enough heat for the patch stick to flow down into the abraded area, which would have ensured adhesion (Figure 2).

In the FBE mill, small deviations in surface preparation and application methods had occurred over time until the deviations reached a point where they caused a failure. The result of this failure was that thousands of patch stick repairs had to be removed in the field on the pipeline right of way and replaced.

CASE FOUR: Above-Grade Valve Coating

Several large valves arrived at staging yards. When they were uncrated, visual coating defects were noticeable. There were large areas on the valves with obvious blistering.

The valves were coated with an epoxy primer specified at 4–6 mils thick with a urethane topcoat specified at 2–3 mils thick. The blisters were filled with a mixture of water and solvent. Around the blisters, the topcoat could be easily delaminated from the primer by hand (Figure 3).

The failure analysis found that the recoat window recommended by the manufacturer's TDS was not followed. The topcoat was applied too soon, before the primer had properly cured, leaving solvent to be entrapped in the primer. This eventually drew in water through osmotic pressure and caused the blisters and intercoat delamination. The valve manufacturer had deviated from the requirements set forth by the coating manufacturer, not realizing that the result would be a coating failure. As a result of the coating failure, multiple valves had to be to be reblasted and recoated in the field.

CASE FIVE: Below-Grade Valve Coating Failure

In a staging yard, a valve coated by the valve manufacturer had mechanical damage to the coating. The coating disbondment around the relatively small impact site seemed larger than expected so a coating SME was brought in to determine if an issue existed. The SME performed field adhesion testing via impact and found that the adhesion of the coating was indeed lower than would be expected (Figure 4). Below-grade coatings are durable and built to withstand the impact of backfilling.

Subsequent investigation showed there were two main failure modes. One was that the fins on the valves did not have an adequate anchor profile. Abrasive blasting with the typical coal slag used by the valve manufacturer did not impart the depth of anchor profile required by the coating manufacturer; the coal slag was too soft to adequately abrade the work-hardened steel.

The second was that the valves were not adequately blown down between abrasive blasting and coating to remove the dust from surface preparation. This dust was visible on the back side of the disbonded coating chips. While not using a harder abrasive such as aluminum oxide to deal with the work-hardened steel was not a deviation from written requirements, the lack of adequate dust removal from the valve before coating application was a deviation, one not recognized by the valve manufacturer as a quality risk. The result of the coating failure was that nine large valves had to be recoated in the field.

SOCIAL DEVIANCE

In each of these cases, only three of five whys revealed that social normalization of deviance contributed to the coating failures. In each case, the coating applicators had deviated from a written requirement; either from the customer or the manufacturer of the coating they were using.

These deviations were committed by very successful companies, some of whom had rigorous quality management systems in place.

So how could all this happen? We still have the fourth and fifth why to determine the answer to that. But that is a subject for another article. VM

Endnotes

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BACK TO BASICS

Lean Manufacturing

BY JEFF COOK

Most people in industry today recognize that lean manufacturing helps manufacturers and plants improve efficiency by eliminating waste in the production process.

But what exactly is lean manufacturing, and how is it implemented?

The first reality to keep in mind with lean is that it isn't one particular process. It's an adaptable set of tools that can be applied to any system of manufacturing—whether that system produces valves, flowerpots or magazines. No matter which tools are used, however, manufacturers implementing lean into their processes will start by identifying waste in the process (known in lean parlance as muda). The focus then becomes elimination of muda bit by bit until production is as streamlined and efficient as possible.

Executive Summary

SUBJECT: The process of creating leaner operations has been around now for some time, and there are many tools for getting there.

KEY ISSUES:

- The history of lean
- Five of the most common tools today
- Getting started

TAKE-AWAY: No two companies will follow the same path, but understanding how the tools work can help guide decisionmakers on their own journey to lean.

BACKGROUND AND HISTORY

Lean manufacturing has roots in Henry Ford's assembly line, but Japanese entrepreneurial scientists—predominantly those working at Toyota Motors—are credited with developing many of the lean tools in use today (Figure 1). While the term, "lean manufacturing," wasn't coined until 1988, Toyota started developing

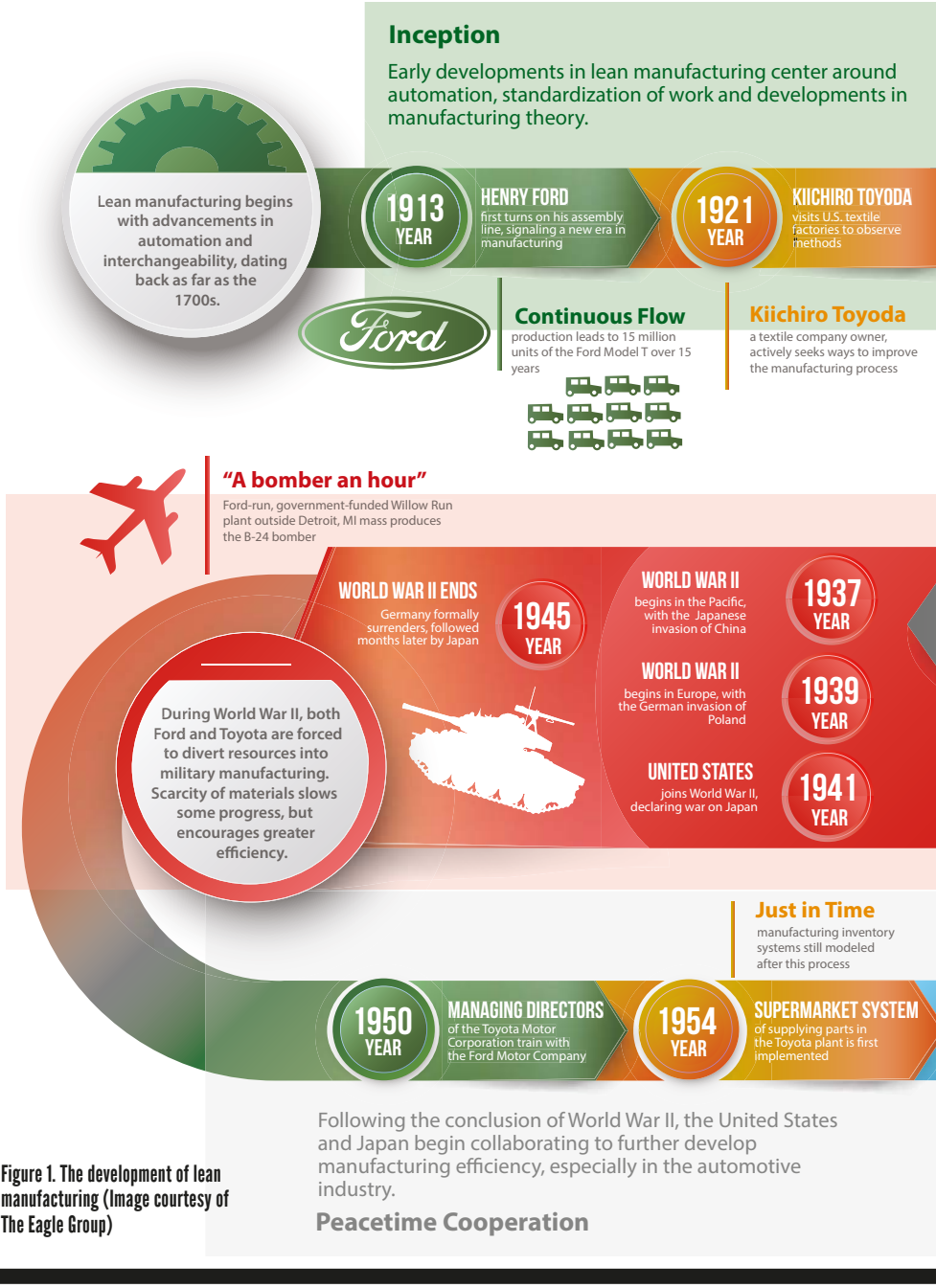


Figure 1. The development of lean manufacturing (Image courtesy of The Eagle Group)

methodologies for eliminating waste as early as the 1930s.

Ford's Assembly Line

Henry Ford's manufacturing process was revolutionary for its time. By implementing what he called "flow production," characterized most visually by the assembly line, Ford's automotive fabrication plant could churn out car after car with a high degree of quality and precision. But flow production had its flaws, namely the lack of adaptability.

If Model Ts were the only car Ford ever made, the company could have stopped right there. However, the problem of variety in product soon showed up. While flow production all but eliminated human error and manufacturing defects, it was nearly impossible to use the same processes to manufacture anything but that beautiful, black Model T.

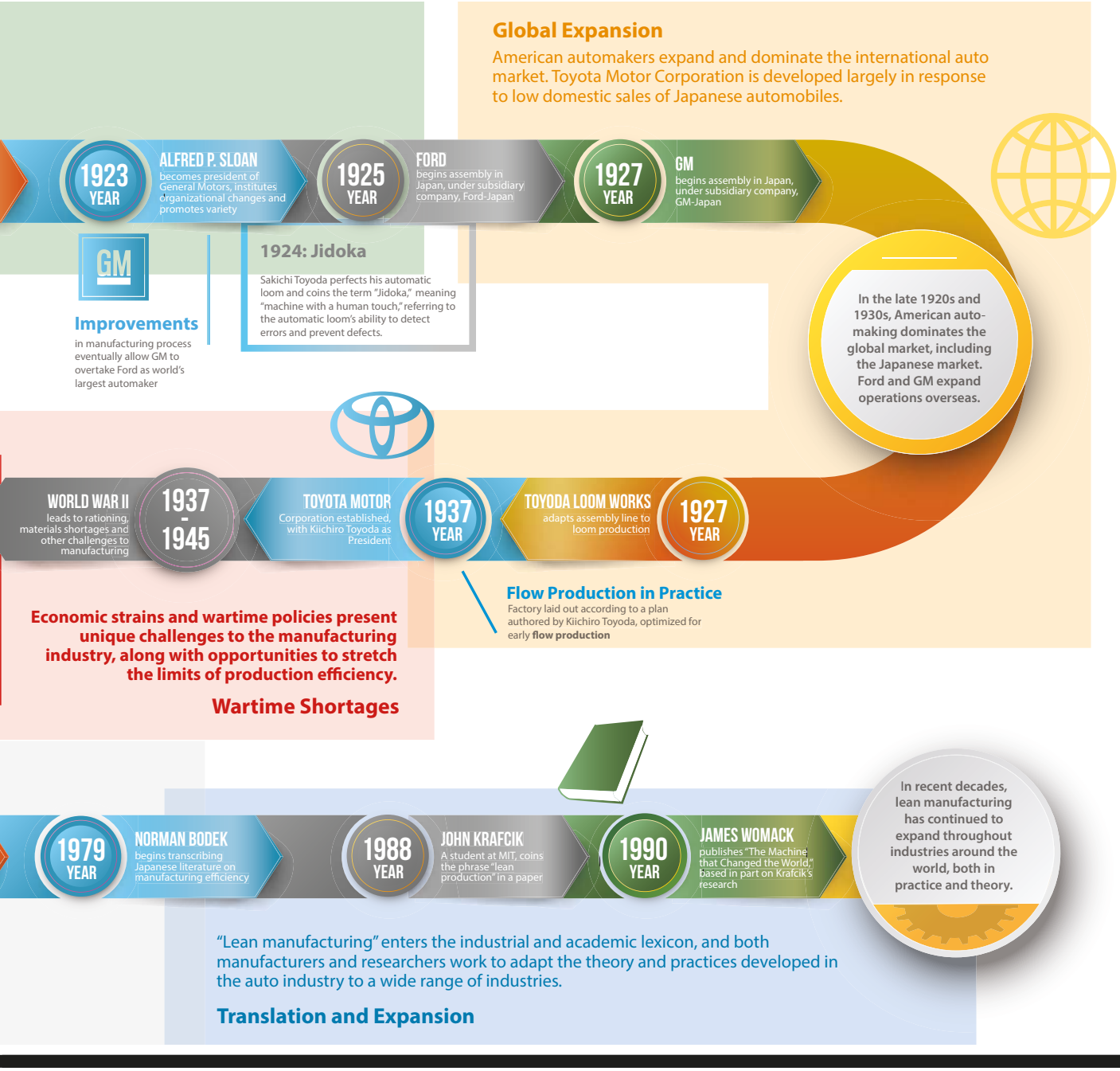
Toyota's System

With Ford's system as a starting point, engineers at Toyota Motors (then a division of Toyoda Automatic Loom Works) began perfecting the flow production concept. The system that the company developed, called the Toyota Production System (TPS), formed the basis for modern lean manufacturing.

Since TPS emerged, lean has become as academic as it is practical with hundreds of papers and books written about it. In fact, the term, "lean manufacturing," was coined in an MIT master's thesis.

A wide variety of approaches to lean now revolve around different sets of tools, and these tools are constantly in flux. You could say, then, that lean manufacturing is the intersection of theoretical and applied science in manufacturing.

While quite a lot has changed over



the decades—both in manufacturing technology and the products themselves—the basic goals of lean manufacturing remain the same:

- Eliminate waste
- Increase throughput speed
- Improve quality of products

FIVE LEAN TOOLS TO KNOW

For any company interested in going lean, the most important thing is to learn what tools and ways of thinking are available to help. While dozens of lean tools and methods have been identified, the following five concepts provide a solid basis for understanding the lean manufacturing mindset. None of these tools is all-inclusive as the way to go lean, but rather they provide a different way of thinking that can be put into an individual company's processes and methods.

5S

5S is often the launching point for businesses just starting out to implement lean manufacturing. Much of 5S seems to be common sense, but implementing these steps can result in significant improvements in efficiency and quality. Just having the structure of working on these areas can give a plant the right direction. The five steps (Figure 2) are:

- **Sort:** Every workspace is organized by separating the necessary (materials, tools) from the unnecessary (waste, scrap, redundancies) and removing anything unnecessary from the production area.
- **Set in order:** The necessary inputs of production (equipment and materials) are laid out in an easy, intuitive manner.
- **Shine:** The workspace is cleaned, and clutter is removed.
- **Standardize:** A list of instructions for repeating the first three steps is made, so that any employee who arrives in the workspace knows exactly how to proceed.
- **Sustain:** This is what's called the "rinse and repeat" phase. In other words, it is ensuring that sort, set in order and shine occur on a regular and ongoing basis, so that the workspace stays clean and clutter-free at all times.

Gemba

Gemba translates roughly to "the real place," referring to the physical space where the company creates value. For manufacturers, Gemba encourages executives and upper-level managers to spend as much time as possible on the shop floor, interacting with employees and witnessing the production process firsthand.

By adopting a culture of Gemba, companies can improve in several ways, including:

- Building communication chains between the shop floor and the executive offices, often by performing "Gemba Walks," or managerial and executive visits to production facilities
- Promoting a more thorough understanding of issues that affect production, such as worker skills, equipment performance and materials handling.

Kaizen

One of the cornerstones of lean manufacturing is Kaizen, which focuses on continuous improvement in the manufacturing process. While Gemba promotes a more thorough understanding of the production process, Kaizen continues by helping the company orient itself toward ongoing, incremental improvement. To implement Kaizen, a company must:

- Promote communication between shop-floor employees and management, often by adopting Gemba practices
- Regularly request feedback from employees on day-to-day processes, equipment status and workplace atmosphere
- Separate, record and quantify all aspects of production to more easily identify patterns and improve accountability
- Continually stay abreast of technological advancements that may improve or facilitate production

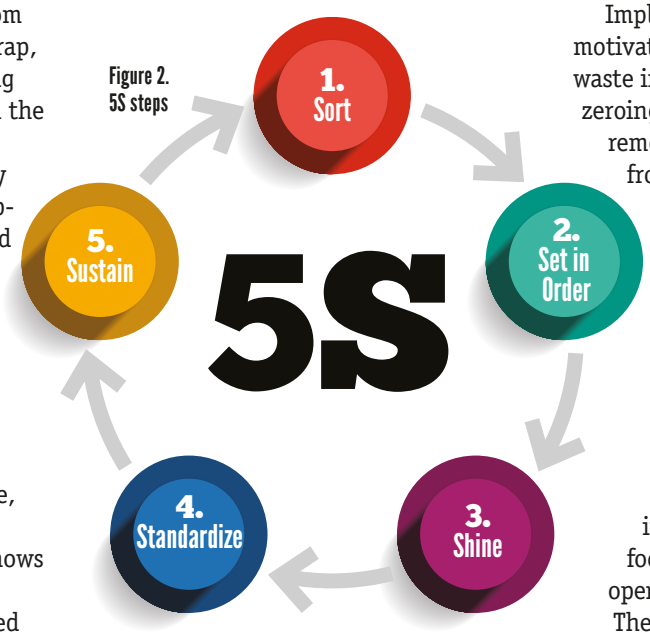


Figure 2. 5S steps

Takt Time

Takt time is the average time allowed for manufacturing a product to match customer demand. Takt time can be calculated with a simple formula:

takt time = time available (per period)/customer demand (per period)

The resulting value gives manufacturers an idea of how often they should schedule the start of production for each part.

Implementation of takt time motivates manufacturers to eliminate waste in the production system by zeroing in on bottlenecks and to remove non-value-adding work from the process.

Total Productive Maintenance

Total productive maintenance (TPM) is an equipment-focused tool that aims to eliminate four factors: breakdowns, slow operation, defects and accidents. Training and scheduling are two important aspects of TPM, which focuses equally on equipment operators and on management. The following are the "pillars" of TPM:

- *Autonomous maintenance:* Operators are made responsible for cleaning and maintaining equipment.
- *Planned maintenance:* Maintenance tasks are scheduled based on likely periods between failures.
- *Quality maintenance:* Error detection is added to the production workflow, and root-cause analysis is used to solve any problems.
- *Focused improvement:* Collaboration to regularly achieve small process improvements is encouraged.
- *Early equipment management:* Knowledge of failures and issues to improve installation or production of new equipment is applied.
- *Training and education:* This is ensuring everyone, from headquarters to the shop floor, is equipped with the knowledge to implement TPM principles.
- *Safe and healthy environment:* Hazards and risks to all employees are minimized wherever possible.
- *TPM in administration:* The seven guidelines listed above should be applied not just to plant employees but to company administration.

ACHIEVING LEAN SUCCESS

Just as no two companies are alike, no two lean journeys follow the same path. Every lean tool must be adapted to the particular type of production that is occurring, to the size of the company and to the facility's space and challenges. There are, however, a few common practices that can increase a company's chances of achieving lean success.

Start with 5S

5S is often the first lean tool implemented because it's easy to adapt to just about any environment. Companies may then go on to incorporate other aspects of lean, such as putting Gemba in place and moving onto Kaizen practices.

To start using 5S, companies don't need to make drastic changes to workflows, scheduling systems or overall company culture. Instead, they can simply fashion their operations using the 5S acronym of sort, set in order, shine, standardize, sustain. Implementing 5S can lead to cleaner, less-cluttered workspaces. Less clutter and more order means employees will always know where to find tools, and waste materials will stop occupying useful space on the plant floor. Furthermore, 5S can create a more welcoming environment for clients touring the manufacturing facility, which can lead to higher sales conversion rates.

HIRE OUTSIDE HELP

Some companies implement 5S, then claim they are now practicing lean manufacturing. This isn't entirely inaccurate, but there's a night-and-day difference between dabbling in 5S and reinventing production systems from a lean standpoint or redoing the company thinking by producing takt time processes.

That's why many companies start their journey with an external consultant. Professionals trained in lean manufacturing tools and techniques know the best way to thoroughly evaluate a company to identify what and where waste is. This is often over a period of weeks or months. These lean specialists then can offer concrete, strategic recommendations to move forward geared precisely to those places where waste exists.

Having a third party onsite during implementation of lean helps in two ways. First, it allows manufacturers to draw on decades of lean experience and theory without taking time off for specialized training in the ways of lean. Second, third-party consultants often provide ideas that would be overlooked by core, long-term staff who may have been doing things a certain way many years. When a company has used the same methods for a long time it's sometimes hard to see change as a viable option.

The cost of hiring lean consultants might seem high, but an effective lean strategy allows companies to recoup those costs in a short amount of time.

PREPARE TO MAKE CHANGES

Despite producing very real gains in both the short and long term, lean manufacturing is not without its challenges. In addition to consulting fees, companies that go lean often invest huge amounts in new equipment and building updates such as newer electrical connections, improved ventilation and transportation rerouting.

Lean manufacturing also is sometimes criticized as responsible for stifling individuality on the shop floor. Operators sometimes have their own preferred methods of getting things done.

To successfully implement lean requires a different way of thinking. Everyone has to agree on an optimal way of doing a job, and everyone has to do the job exactly that way or the system will fail. While the changeover can be difficult for some, any negative effects on morale can be offset by opening clear channels of communicating the whys and hows of what's being done as well as by promoting accountability at all levels.

One of the ways lean manufacturing differs from other efficiency strategies is that implementation is not top-down. Lean manufacturing is a company-wide commitment that needs to be shared by employees at all levels, from the shop floor to the executive offices. If everyone is dedicated to improvement, informed of changes and involved in lean discussions, the company has a good chance of success.

Even without calling what's done "lean manufacturing," successful companies around the world already embrace waste elimination, product quality and efficiency. The tools of lean simply offer a way to quantify, measure and implement these improvements. Despite some challenges, lean manufacturing can be a rewarding process and a solid investment, leading not just to increased profits but also to improved workforce morale and overall company perception.

What's more, both customers and suppliers tend to see lean companies as more reliable, more stable and generally better business partners. VM

Jeff Cook is chief sales and marketing officer at Eagle Alloy. You can reach him at jcook@eaglealloy.com.

Ten Years and Counting:

VMA's Valve Basics Celebrates the Power of Change

BY KATE KUNKEL AND JUDY TIBBS

One of the founding members of VMA's Education & Training (E&T) Committee, **Ed Holtgraver** (QTRCO), remembers the excitement created by the first Valve Basics Seminar held in Houston a decade ago.

"We were all getting our feet wet, learning how to present all this great information to people hungry to learn. We had seating for about 150 people but still had an overflow crowd. It was rewarding to see so many people eager for information."

Those types of comments have continued over the 10 years that Valve Basics has been offered. As the industry changed, the program adapted so that the data presented is relevant, timely and not readily available anywhere else.

This is important in today's rapidly evolving world, both to keep up with things and to attract new talent by showing them how interesting the industry is.

"Careers in the industrial valve segment are challenging, well-renumerated today and ever-changing as automation technologies advance," says **Bert Evans** (Emerson), E&T committee member and control valve educator. "But we need to get the word out. VMA's role is to support those in the industry and the industry itself. Today, much of the need is for foundational training for people who are new or are in new roles in their career," he said.

The Valve Basics Seminar was developed to serve as a primer both for those new people and a refresher to those who want to brush up on valve technologies.

Greg Johnson (United Valve), who was largely responsible for creating the program and was the E&T committee chairman for nine years, points out another need filled by the Basics program. He explains that while manufacturers and distributors generally train employees on their own products, Valve Basics was designed to get away from

brand-specific teaching; instead, it focuses on the general types of valves, actuators and controls.

"This kind of all-around, basic information is essential for a thorough understanding of where the different products and equipment fit into the picture, where they go in the running of things, what some of the issues are, as well as what different technologies and methods of operation there are," he says.

Most attendees are people already working in the industry in some capacity, whether it is in maintenance at an end-user plant, on the order desk at a distribution facility or on the shop floor at a valve manufacturing company. While it's likely these people already received some training at their jobs, most companies don't really have any broad official educational resources, notes new committee member **Stephane Meunier** (Emerson Automation Solutions). This is why he feels Valve Basics is essential.

"I think VMA is providing a resource that is not comparable to anything else out there," he says. "No university has any major valve training—only theory and very little practice."

Those coming into the industry or changing jobs within the industry often must understand pretty quickly where things belong and how they work.

"Basics provides that knowledge in one concise package," Meunier points out.

Another of the founding members of the Basics programs, **Arie Bregman** (DFT), remembers the early vision of bringing in groups of people and giving them the benefit of all the wisdom and experience that the instructors have. This vision has been fulfilled with the current lineup of teachers.

"Each of these instructors volunteers their time. They all have years of experience they share with the students, and every time they do a class, they work to ensure the content remains fresh and relevant," Bregman says.

While the material itself is important, Valve Basics has provided much more than just the technical information.

"Each of these instructors volunteers their time. They all have years of experience they share with the students, and every time they do a class, they work to ensure the content remains fresh and relevant."

– Arie Bregman, DFT

Meunier notes that once students have taken the course, they can go back to their own companies with newly gained knowledge about other kinds of valves besides those offered by their employers.

"By learning about others' products, they can understand how to compete better, what the differences are, what challenges there are to using the different valves, and so much more," he explains.

NEWBIES AND BEYOND

Another strength of the program is that people who attend realize there is always going to be something more to learn, according to **Tom Waldmann** (KITZ Corp. of America).

"Even I have learned a lot, and I've been in the business for 39 years!"

It's not uncommon for long-term veterans to the industry who attended the course to express similar thoughts.

Program participants also say that Valve Basics helps to build enthusiasm for working in the industry.

"People new to the industry, right out of college or newly in a position, meet many people from many different companies, with a wide range of products," Holtgraver says. "They see all of the various opportunities, whether it's in sales or engineering and realize they can grow and change positions. They actually are more inclined to stay within the industry," he says.

The program is also important for bringing new blood into the industry. Every time a class is held, VMA offers scholarships to students from local colleges. To date, the association has given well over 100 scholarships to students in the cities where the event has been held.

Committee member **John Molloy**

While Basics events used to be held in different locations around the country, the growth of the "valve petting zoo" created the need for a facility that could handle larger pieces of equipment. As a result, the Houston Area Safety Council (HASC) is the new home for the Valve Basics programs. Shown here is a view from above of HASC's large workshop.

(ASCO–Emerson Automation Solutions) points out that some of these young people may never have considered the valve industry as a viable career option before exposure to others from the industry and to the equipment and how it works.

Attending the basics program gives them an appreciation of the fact, "they are getting exposure to many types of products, and I think this opens their eyes to the possibilities of a career in this field," he says. He remembers one student who told him he had always assumed he was going into electronic engineering but realized after learning about how fascinating the valve world was that there were other options.

The other most-common demographic served by Valve Basics are those that have come up through ranks from operations or maintenance or moved into a completely different field within their companies. Evans explains that, "They have to re-educate, and Valve Basics is a great place to do that."

CONSTANTLY EVOLVING

Those who plan and volunteer to teach stress that a strength of Valve Basics is that it's never a finished program, but rather "an evolving agenda," points out committee member and check valve instructor **Jeff Kane** (DFT). "It's just a little bit better and a little bit different every time it's held."

☐ The hands-on experience at VMA's Valve Basics event helps attendees better understand the material presented during the lecture portion of the course.

That factor is necessary because, "We must be in constant motion to keep up with our students' demands. We listen to what they would like to see and hear," he says.

That's why the feedback from the nearly 2,000 students who have taken the course over the past decade is so vital. What attendees have to say is responsible for enhancements such as one of the most popular segments of the program today, the "Valve Petting Zoo," which was introduced at the third event in 2010.

The zoo was needed because, "There is a lot of theory and plenty of information in the presentations, but there is nothing like hands-on experience to help students understand and retain that information," Kane observes.

Among other changes made in response to student feedback from surveys and one-on-one discussions were adding example reference specs and standards in many of the modules and adding safety topics, as well as more specific application photos.

Waldmann, who presents a session on quarter-turn valves, explains changes planned for the near future. "Right now, we are restructuring the program," he says. "We're splitting up the content between industrial valve basics and more advanced information on automation including actuation and controls and emphasizing areas of learning we haven't focused on as much before."

For example, in his area of quarter-turn valves, "I originally had an hour for the whole topic," says Waldmann. "Now it will be two hours in two separate presentations: one for plug and ball valves, a second for butterfly."

This is being done because, "Those are two of the largest growth areas in the industry. They've become more popular and there are more advances in ball and butterfly valves as far as the technology and capabilities compared to other types," he explains.

Paul Souza (AUMA), current chairman of the committee, explains further about plans to break the course down into segments, which are being called Valves 101 and Valves 201.

"There are many busy people doing this training, so they don't need to sit through a day of things that don't pertain to them. They want to learn this or that portion. With this new plan, they can do that—or stay for the whole thing," he says.

CONTINUED ON P. 36

☐ In recent years, VMA's education program has expanded to include customized Valve Basics programs for end users and other companies that need training at their facility. This petting zoo was part of a program held at the Los Angeles Sanitation Districts. About 50 engineers attended.

THE INDUSTRY'S BIGGEST CHALLENGE: RECRUITMENT

A common theme among members interviewed for this article was the same topic that comes up at virtually every industry gathering: the challenge of getting new people into the industry.

Paul Souza (AUMA) explains that it's an uphill battle today to attract youth and build relationships with trade schools. His company has excellent apprenticeship programs with local trade schools, but Souza says it is difficult to break out of the relatively small geographical area of 25 miles around Canonsburg, PA where his company's facilities are located.

When the suggestion was made to try to reach kids before they leave high school, he agreed. "We've gone into guidance offices in local high schools, even met with a group of students at one point. They were looking at an alternative to college, so we went in and showed them what we do," he explains. "We brought an engineering manager, production manager and a sales expert to talk with them and let them know they don't have to get a four-year degree to get a good, stable job."

"Young people who graduate with a certification in a trade get jobs right away. Their friends who went on to pursue a degree are often not able to get anything in their own field for a long time."

Many kids today have been convinced that the only way to get a job is to go into debt and get a university degree, he adds. "Unfortunately, many of those degrees are in subjects that are not useful in the real world, where the jobs are," he explains.

Greg Johnson (United Valve) notes that the higher the socio-economic background of a student, the more difficult it is to attract them to the trades. "They get pressure from their parents and their parents' friends to get a business degree. Manufacturing has a bad rap. It's not just the valve industry, it's all of manufacturing."

Still, Johnson says he thinks the tide might be turning. What many are seeing today is that, "Young people who graduate with a certification in a trade get jobs right away. Their friends who went on to pursue a degree are often not able to get anything in their own field for a long time, so it's making an impression."

Industry, "is a tough sell," notes **Bert Evans** (Emerson). "Even though the valve manufacturing sector can be very technical and has lots of exotic and exciting engineering stuff with computer controls and so forth, it doesn't have the sex appeal of many other kinds of industries." Evans says his company has taken the approach of pointing out the importance of the valve industry to young people. "We are ultimately making products that make the lights go on," he explains. "We all use these products, but don't think about how that happens." Because of this, "We're working on raising awareness, and how there are good jobs in the valve industry that make people's lives better," he adds.

Another complication in the matter has to do with succession. The last several years have been economically challenging for many manufacturers, so management is focusing on building business, and the more experienced staff are doing more work as their contemporaries retire, **Stephane Meunier** (Emerson) explains. "This is not a good succession plan," he says. "I am a bit worried about the future. If there aren't enough veterans of the industry in place, how will the knowledge be passed on? We need to be more focused on succession plans now," he adds.

VALVE CAREERS INITIATIVE

While the monumental task of recruiting young people to choose careers in manufacturing and industry is being tackled by many large organizations such as The Manufacturing Institute, government agencies and other groups with greater resources than VMA, the association is doing its part via the Valve Careers (www.valvecareers.com) initiative.

At the centerpiece of the initiative is a robust social media campaign that posts two job openings from member companies every weekday. The campaign has been a great success with more than 7,500 followers on LinkedIn, between 40,000 and 60,000 impressions per month and more than 1,000 link clicks to member-company recruiting pages every month.

The initiative also includes a website that provides information about the industry, various career paths that can be pursued, and a list of current VMA and VRC (Valve Repair Council) members with links to those companies' recruiting pages. Additionally, several videos feature interviews with young people discussing their positive experiences pursuing careers in the valve industry.

VMA's social media team can coordinate with member-company recruitment efforts; members should contact **Kelly Songer** (kelly@project1421.com) to make sure their open positions are promoted. The #ValveCareers initiative can be found on social media by following the hashtag or the pages on LinkedIn (Valve Careers), Facebook (@ValveCareers) and Twitter (@ValveCareers). Member companies and their employees are encouraged to like, comment and share these posts on social media to spread the word of the many opportunities available in the valve industry.

This program is a complimentary service available to all current VMA/VRC members. To find out how to become a VMA or VRC member, go to www.VMA.org.

INTO THE FUTURE

Many admirers of the Basics program wonder if Valve Basics 301 or 401 is in the works. Evans points out that, while that's an interesting idea, more advanced training usually means learning more geared to specific products and applications.

Such learning is "probably something that would be handled by manufacturers, and for specific applications, by the end users," he points out.

However, the VMA Education & Training Committee is exploring the addition of add-on courses on subjects such as valve repair or special applications.

In addition, VMA offers customized basic training in end-user facilities, with modifications made to the program to make the course suitable for specific industries, such as refineries or water/wastewater facilities or power generation.

But most people who participate are there for a basic learning experience. As vice president and general manager of DFT Inc., Bregman says he sends his newer employees to the Basics course to get a good base of knowledge. "One of the great values of this course has been training our distribution channel. It helps them get a solid basic education in all the different styles of ball vs. butterfly vs. gate valves. They can help guide end users since those buyers may not necessarily know what they want or need in a particular application."

Bruce Broxterman, president of

Chairman Paul Souza (left) presents a plaque honoring Greg Johnson for his role in the successful development of the Valve Basics program.

Richards Industries, has sent several employees to the Basics programs. "It's a great way to expose people to the industry," he says. "While our in-house training is valuable with our own products, Valve Basics gives them a solid foundation on the other valves that are available in the industry."

Broxterman notes that everybody he's sent to the class comes back enthusiastic about what they've seen. Also, "the manual created from the presentations is fantastic. Everyone who's done the class keeps it close by and uses it frequently as a reference tool, something that they can refer to and revisit as time passes."

"I think VMA is providing a resource that is not comparable to anything else out there. No university has any major valve training–only theory and very little practice."

– Stephane Meunier, Emerson Automation Solutions

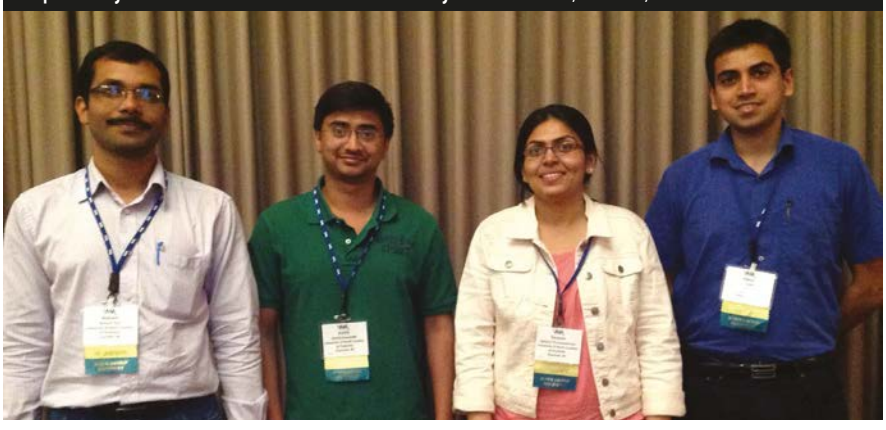
WHAT PAST ATTENDEES SAY

Perhaps the greatest marketing tool the VMA Basics Seminar has is what comes from the mouths of those who have attended.

For example, **James O'Brien**, who attended the most recent event, says he found the petting zoo a key aspect of the learning. "The cutaways and getting to put your hands on products like packing were beneficial. Some engineers such as me are looking at computer monitors most of the day so real world, 3D examples are extremely helpful."

Brittani Collins, a product manager at CNC Flow Control, has been in the valve industry 10 years and attended one of the earliest events. She went back for a return visit last year, "with a few of our employees who are new to the industry because it was such a great help to me during my first few years in oil & gas," she explains. "Overall, both times I attended were extremely fulfilling to me. A wealth of information is covered and all of the speakers have deep insight from their many years of experience. You leave with an extensive collection of PowerPoints to reference in the future," she said.

This passing of knowledge is a vital reason the program exists. As the "grey shift change" occurs and more boomers retire, passing on information to new employees becomes increasingly more challenging. VMA's Valve Basics program is one way that manufacturers and end users can pass on the knowledge that might otherwise be lost as these veterans leave the industry. VM



Many senior-level engineering students have been able to attend the Valve Basics course thanks to scholarships provided by VMA. These students came from The University of North Carolina, Charlotte, NC.

Kate Kunkel is a freelance writer and former senior editor for VALVE Magazine. **Judy Tibbs** is VMA director of education and editor-in-chief for VALVE Magazine. Reach her at jtibbs@vma.org.

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The Basics of Eccentric Plug Valves

BY JOHN V. BALLUN, P. E.

Wastewater systems present many challenges to pumps and valves because the flow can contain grit, solids and debris, depending where in the process the equipment is located. That's why the eccentric plug valve is often the valve of choice.

Figure 1. Installation of 24-inch plug valve in a vault in Collingwood, Ontario

THE VALVE MAKE-UP

First used in the 1930s in the paper industry, the eccentric plug valve can handle fluids with solid content in a manner similar to a gate valve. But the plug valves also provide important advantages of a quarter-turn valve such as modulating service.

These plug valves consist of a cast iron body and bolted removable cover. The plug has a resilient coating for sealing against a nickel-welded seat in the body. The valve shaft is typically integrally cast as part of the plug and rotates in stainless-steel bearings in the bottom of the body and the cover. In Figure 2, the plug valve is actuated with a worm gear actuator, which is necessary on valves larger than 8 inches. A worm gear actuator may also be beneficial in holding the valve in position against flow, and pneumatic, electric and hydraulic actuation are also options.

ECCENTRIC ACTION

The unique feature of this valve is that its seat is offset from the valve shaft, thereby providing eccentric action. Figure 3 illustrates the second offset between the centerlines of the seat and shaft. A mid-size valve may have a half-inch second offset. As the valve opens counterclockwise about the shaft, the double offset causes the plug to lift off the seat as it rotates open. The lifting action helps to prevent wear in gritty wastewater service.

Figure 3 also illustrates two pressure directions. "Direct" pressure is applied on the end of the valve opposite the seat and "reverse" pressure is applied on the seat end. The sealing function of the valve is assisted by the direct pressure because it pushes the plug tightly into the seat. The valve will also seal with pressure in the reverse pressure direction, but the plug needs to be turned clockwise past the center of the seat. Because of the eccentric action, the greater the closing rotation, the tighter the seal. If the valve becomes worn during service, it can be closed further to restore a leak-tight seal.

PLUG VALVE STANDARDS

The eccentric plug valve was first standardized in MSS [Manufacturers Standardization Society] Standard SP-108 in 1991. As the American Water Works Association (AWWA) expanded into wastewater applications, it published AWWA Standard C517 (in 2005). Both standards are congruent with similar materials of construction and scope.

Eccentric plug valves are provided in sizes ranging from 3–72 inches with a cold working pressure rating of 150 or 175 psig depending on size

Figure 2. Construction of an eccentric plug valve

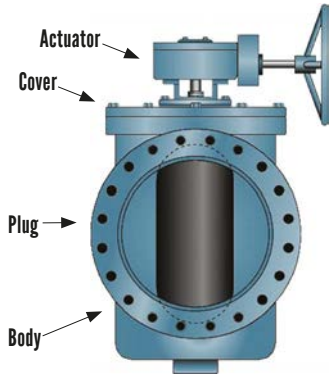
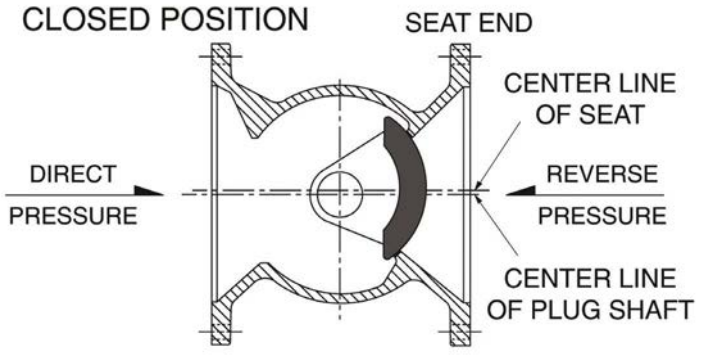


Figure 3. Eccentric plug valve geometry



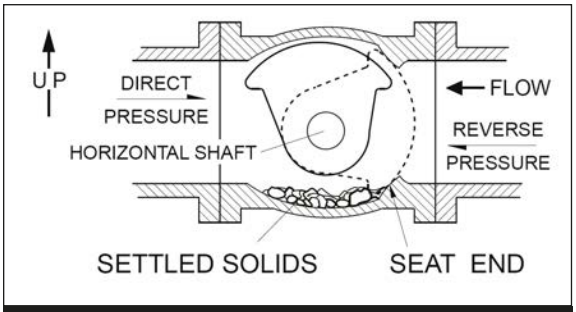


Figure 4. Horizontal installation guidelines

and have a flow rating of 8 feet per second. The valves are available in short-body and long-body configurations and are seat-tested in the direct pressure direction unless otherwise specified.

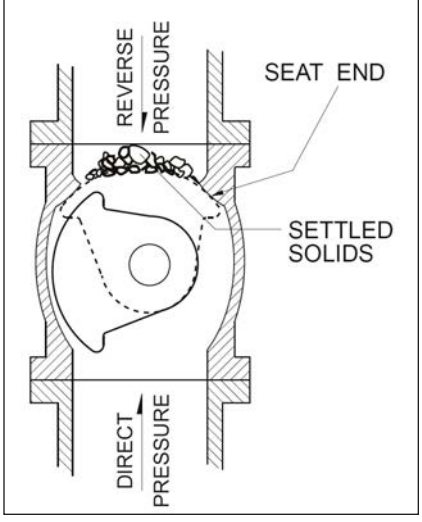
Despite published standards, alternate plug valve designs are available that comply. One design has a cylindrical plug face and cylindrical seat (Figure 2). In another design, the port and plug face are round, similar to a half ball valve. Both designs, rectangular and round, can be provided with standard 80% port openings or full 100% port openings and are piggable using flexible urethane pigs. Plug valves also can be provided with metal-to-metal seats for severe applications such as activated sludge service.

PLUG VALVE INSTALLATION

Because of the geometry of the eccentric plug valve and its use in wastewater service, special installation recommendations should be followed. As shown in Figure 4, when settling solids are expected, the valve should be installed with the shaft horizontal so that when the valve is open, the plug is at the top of the pipe. Also, the seat end should be towards the pump so that when the pump is off, the system pressure pushes the plug into the seat.

As shown in Figure 5, the valve should be installed for vertical pipes regardless of flow direction with the seat end up so that settled solids will not collect in the valve when closed.

Figure 5. Vertical installation guidelines



CONCLUSION

The resilient-seated eccentric plug valve is a unique valve in that it is designed to handle wastewater fluids; when equipped with rubber or glass lining, this valve can also handle abrasive fluids. Because it is a quarter-turn valve, it is easily automated for controlling process flow or pressure.

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The Future of After-sales Service

BY DAVID BAYREUTHER

After-sales service has many definitions starting with the broad view that it's all the help and information a company provides to its customers after they have bought a product. A narrower definition would be offering periodic maintenance or repair of equipment during and after a warranty period. This article focuses on that narrower definition to provide an outlook for the future of maintenance and repair in the valve industry.

PHOTOS COURTESY: UNITED VALVE

Product knowledge and skills transfer are the key to a better bottom line in valve repair.

THE BEGINNINGS

To predict the future, it's usually best to look backward to understand how we got to where we are today. Valve maintenance in the past was simple. Factories typically had a dedicated team of pipefitters and a storeroom full of pipe, flanges, gaskets, seals, insulation, packing and valve repair parts. Repair work was a skilled trade that did not require a higher education. Pipefitters usually started as apprentices and learned diverse skills such as welding, machining and valve repair on the job. It was hard work, but a career usually lasted through retirement, which included a pension. By the 1940s, these positions were lucrative since one in three jobs in the U.S. was in manufacturing.

However, all good things come to an end. Factory owners became squeezed by tighter regulations and higher costs from labor rates, benefits, pension plans and environmental regulations. Global competition drove pricing and profitability down. The easiest and fastest way to stay competitive became cost cutting.

The U.S. industry reacted by outsourcing. Companies focused on defined core businesses and outsourced the rest. Storerooms were cleared out, and staff was reduced. Outside service companies appeared to fill the void in maintenance needs. Also, in the continuous search to remain competitive, valve production moved across the border and overseas. Valve manufacturers looked for growth opportunities by expanding their focus beyond product sales and into repair services.

This evolution led to where we are today: a mix of OEM manufacturers competing against service companies in the world of valve repair. Some reports estimate that one in 11 U.S. jobs today are in manufacturing. Statistics also show that many industry jobs are moving to service industries.

But these statistics can be misleading when it comes to maintenance and repair. Valve repair work itself has not gone away. However, some of the repair work formerly done by factory employees is now done by outside service providers.

Meanwhile, market pressures continue to drive change. Factory owners are squeezed even tighter by higher costs, health care, tighter regulations, global competition, higher borrowing rates and longer payment terms. The solution is more cost cutting, which impacts all of today's businesses including service companies. Previously unthinkable practices are now accepted and justified in places; maintenance budgets are slashed and run to failure is a common practice.

To grow, or simply just to survive, OEM manufacturers and service companies are looking at diversifying. Field inspections and surveys, predictive maintenance tools, engineering and purchasing support are all horizontal service opportunities for everyone.

The ways to grow, then, are there, but industry is burdened with lack of awareness of where those opportunities lie. Also, the next generation generally has a negative image of factory and technical work. At the same time, the U.S. Bureau of Labor Statistics reveals that the entire workforce is aging in this country. For example, there are just as many people past retirement age working in the fabricated metals product industry as there are employees ages 20 to 24. More than half of the employees in this industry are 50 years or older. This is another reason that experience and needed technical know-how are declining throughout the valve industry.

LACK OF SKILLS

As far as what this aging workforce means today, Mark Twain explained it best when he said, "Good judgement comes from experience, and experience comes from bad judgement." We risk being able to transfer knowledge and the experience learned over time. We learn from our mistakes. But transferring our valuable know-how, or tribal knowledge, is critical to avoid repeating the mistakes of the past. This tribal knowledge is unwritten information not commonly known including what's needed to produce a quality product or service. Studies by consulting companies reveal that as much as 70% of the knowledge we need to produce a product or service is undocumented. An additional 20% is documented, but not in a digital, easily retrievable format.

With an aging workforce and limited possibility to transfer the tribal knowledge, the outlook seems bleak. But it can get worse. The market is saturated with low-cost valves that are less expensive than repairing existing valves. Cost cutting has its limits so the breakeven size for replace versus repair is increasing. Independent repair shops are struggling to compete against OEM manufacturers that can influence customer choice through parts pricing and minimizing parts availability. Also, whether it's a truth or misperception, some believe the next generation has a lower work ethic and limited desire for "dirty" jobs.

LOOKING AHEAD

Is it possible to survive in the future then? The answer is yes; we just need to focus on the right areas. The valve service industry will not go away, but it needs to adapt. Areas of opportunity include niche markets such as specialty products and applications and servicing higher value products such as control valves, pressure relief valves, cryogenic, fire and fugitive emission testing and products. New areas of opportunity include product dismantling and disposal services.

A critical element for future growth will be key performance indicators (KPIs). All of us live with KPIs, including our customers. To survive requires understanding our customers' performance metrics—knowing how they measure success. We must talk their language and find ways to help them achieve those metrics. Common service indicators are numbers such as mean time between repairs, process interruptions, production rates, safety and environmental goals, outage cycle time, etc.

To guarantee service business in the future will require innovation; we must find creative options that can provide savings for customers such as valve leasing programs. We must quickly respond in the run-to-failure world. Our businesses must spread horizontally as customers continue to cut costs and look outside for services. Opportunity may lie in procurement and supply-chain management services, turn-around management, accounting, information technology and training programs.

Technology brings opportunities; embracing and employing technology will help us flourish. The nation is at the cusp of the fourth industrial revolution—smart factories with autonomous systems and machine learning using big data and the Internet of Things (IoT) is here. A recent study by a global consulting firm revealed that 60% of companies claim to have active IoT programs, but only 5% say they have commercialized results. Yet big data brings several opportunities. For example, installed base information of product, performance and maintenance history can help customers plan future maintenance expenses. Web conferencing allows greater distance between product expertise and point of use. In the next five years, the number of IoT-connected devices is projected to grow 250%. We see this growth commonly today in coffee makers, televisions, automobiles, refrigerators and washing machines. But the future also includes valves that can communicate their health and status. As with other devices, use of IoT technology in valves will increase along with the need for the required level of knowledge and skills for service.

The biggest opportunity for the future, however, is the simplest: product knowledge. This is the key to survival. Companies must learn to train, train and then train again to ensure they have the skilled workforce they need—a workforce that knows the products and what they can do. This training will maintain the expertise we need so badly in the valve industry. In the end, this product knowledge means a better bottom line.

☐ Repair of actuators can be costly. Proper actuator repair requires the purchase of OEM repair parts, if parts are required.

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Pinch Valves: An Uncomplicated Valve with an Important Purpose

BY COREY P. CHURILLA

Pinch valves are a simple valve design that uses an elastomeric tube forced together or pinched to stop the flow of media. This force can be applied in a variety of ways: Compressed air or fluid can be supplied directly into the valve housing to force the elastomeric tubing closed or a clamp mechanism can be used that is forced closed, from a manual handle or an actuator.

Pinch valves are used in on/off applications as well as throttling services. The applications where this is useful range from clean or sanitary services such as the chemical, food and pharmaceutical industries to more industrial services such as wastewater, the cement industry and where there is flow of bulk solids. Pinch valves are used in sanitary services because of their cleanliness and drainage, while they are used in more industrial services because of their low friction and resistance to clogging. They do well in these services compared to other more common valve types such as butterfly, ball and globe valves because, along with their aforementioned merits, their simplicity makes them simple and cost effective.

PINCH VALVE STYLES

The different types of pinch valves can be described broadly as two types: those where the sleeve is integral to the body and those where a separate clamp is used to pinch a tube or a hose closed.

Integral Sleeve

The style of pinch valve that has an integral sleeve through the valve body can be actuated by compressed air or hydraulic pressure applied into the valve body between the body and sleeve. As the air or hydraulic pressure fills the body cavity, the pressure closes off the sleeve to restrict or stop the flow of media. These valves also may have a mechanism that is closed via a manual operator or actuator integral to the valve. This style of pinch valve can be used as a control valve when a mechanism is used to close the valve.

Pinch valves are generally very low maintenance. However, since they rely on an elastomeric tube or hose that is forced or clamped to restrict or stop flow, the tube or hose is where the majority of the maintenance is required. When the sleeve, tube or hose becomes worn or damaged from use, it must be replaced. Meanwhile, the valve body components, since they are isolated from valve media, require little maintenance.

Pinch valve components can be made from a variety of different materials depending on the severity of the service and the media that flows through the valve. The sleeve, tube and hose can be made from neoprene, natural rubbers, silicone, EPDM (ethylene propylene diene monomer rubber, extremely durable synthetic rubber membrane that has a higher heat resistance than natural rubbers), FKM (fluoroelastomer, which has more heat and chemical resistance than nitrile or neoprene), and many other elastomers, while the body of the valve can be made from plastics, stainless steel, aluminum and other metals depending on the service of the valve.

Integral sleeve-style pinch valves are chosen when the media can be corrosive or it contains solids or abrasives. This is because there is minimal

☐ Automated pinch valve

☐ Manual pinch valve

friction within the sleeve of the pinch valve so it is resistant to clogging. These valves also may be chosen when minimal turbulence is required or in cases where excellent drainage is necessary. Pinch valves are also an excellent choice when media exposure to non-elastomeric materials can be an issue such as when the media is corrosive to metals.

Clamp Style

The clamp style of pinch valve essentially clamps a separate tube or hose closed with the use of a manual actuator, pneumatic actuator or solenoid actuator that exerts the clamping force to provide shutoff. This style of pinch valve is completely separate from the tube or hose. It can be installed and removed from the system without disassembling the hose system or breaking the line. This type is designed for systems where breaks in the process tubing or hose are not feasible. These valves are used as a clamp for single-use tubing in most cases.

Since the clamp style of pinch valve is separate from the tubing or hose that it closes off, the valve itself has very minimal maintenance. This style of pinch valve is generally made from metallic materials such as stainless steel or aluminum, with handles made from plastics to help reduce weight. In some cases, this style of pinch valve can be made entirely from plastic to reduce cost and weight. However, doing so creates a more limited ability and life span.

Clamp-style pinch valves are chosen for services that require a valve that can be installed with no process break. They are generally installed on single-use disposable systems, in pharmaceutical manufacturing, and in food and beverage applications that use flexible or braided tubing.

CONCLUSION

Although pinch valves have a simple design and purpose, they are used for a wide variety of applications. Knowing their purpose and how they work allows those who choose them to pick the right type.

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www.egcflexiblegraphitesolutions.com

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

Garlock Sealing Technologies
Palmyra, NY
www.garlock.com

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

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

Matrix Metals, LLC
Richmond, TX
www.matrixmetalsllc.com

Optimation Technology, Inc.
Rush, NY
www.optimation.us

Scientific Linings & Coatings
San Antonio
www.weathercap.com

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

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

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

Technetics Group
Columbia, SC
www.technetics.com

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

Watson Grinding & Mfg.
Houston
www.watsongrinding.com

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

MEMBERS OF THE VALVE REPAIR COUNCIL *An affiliate of the Valve Manufacturers Association of America*

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www.allagashinternational.com

Allied Valve
Chicago
www.alliedvalveinc.com

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

AWC, Inc.
Corpus Christi, TX
www.awc-inc.com

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

Chalmers & Kubeck
Watkinsville, VA
www.candksouth.com

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

Curtiss-Wright Industrial Division,
Brecksville, OH
www.cw-industrial.com

Dowco Valve Company
Hastings, MN
www.dowcovalve.com

Eastern Controls, Inc.
Philadelphia
www.easterncontrols.com

Emerson
Corporate Headquarters
St.Louis, MO
www.emerson.com/FinalControl
Emerson Lifecycle Services
Actuators
Control valves
Isolation valves
Pressure relief
Regulators
Marshalltown, IA

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

Flowserve Corporation
Baton Rouge, LA
www.flowserve.com

Formosa Plastics USA
Point Comfort, TX
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Gulf Coast Modification, LP
Houston
www.gulfcoastmod.com

Gulf Coast Valve, Inc.
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www.gulfcoastvalve.net

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

Kirksey Machine
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www.kirkseymachine.com

Metso Automation
Shrewsbury, MA
www.metso.com

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

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

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

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

Precision Valve Group
Monroe, NC
www.precisionvalvegroup.com

Puffer-Sweiven
Houston
www.puffer.com

Renew Valve & Cleveland Valve — FCX Performance Companies
Carleton, MI/Cleveland
www.renewvalve.com
www.clevelandvalve.com

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

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

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

TEAM Industrial Services
Houston
www.www.teaminc.com

United Valve
South Houston, TX
www.unitedvalve.com

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

Valve Reconditioning Service Co.
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www.vrsinc.net

ValvTechnologies
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www.valv.com

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www.wal-tech.com

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www.qualityvalves.com

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

Emerson introduced the TopWorx GO Switch 7LY proximity sensor, the first such device to feature ultra-bright, easy-to-see light-emitting diodes for highly visible position indication in bright sunlight. The new barrel-style sensor makes diagnostics and troubleshooting easier in challenging environments and hazardous locations.

The product's hazardous area certifications and ability to withstand temporary submersion make it suitable for applications in process industries such as oil and gas, petrochemicals, refineries, mining, water and wastewater.

Valtorc introduced its new explosion-proof, series EL-XP9000 electric actuator, a sophisticated solution for hazardous environments. The actuator's robust construction offers reliable performance and ability to fully integrate into sophisticated control systems.

The actuators suit various applications, including gas turbine inlet guide vanes, bleed valves and gas fuel flow.

Conval announced that its Camseal metal-seated, forged ball valves feature a new stem position indicator disc for easy, precise onsite identification and inspection of the open-close status of the valve. This is important when adding an actuator to a valve or resetting valve actuation in the field. The high-quality severe service valves are available in half-inch through 4-inch sizes with socket weld, butt weld and flanged ends, in pressure classes from ASME 900 through 4500.

The new design is intended to improve the accuracy of the stem and ball alignment into the valve seat.

Weir introduced its SPM SafeEdge Automated Relief Valve Control (ARC) System. The intelligent valve system enables operators to remotely set and control SPM's line of back pressure relief valves while monitoring treating-line pressure and helping to prevent over-pressuring of treating iron. The SPM SafeEdge ARC reduces nonproductive time through its autonomous reporting and monitoring capabilities while enhancing personnel safety.

Chesterton released its latest pump packing innovation. DualPac 2212 is a new non-staining, high-pressure packing that resists burning, extrusion and requires significantly fewer gland adjustments than conventional packing.

DualPac 2212 combines a burn-resistant material (white) on the sealing side, with a highly resilient outer fiber (yellow). It is designed for demanding abrasive sealing applications in rotating equipment such as agitators, mixers, stock pumps, sludge pumps, slurry pumps and process pumps.

BHGE announced the expansion of the Mooney product line to include ANSI Class 300 and 600 rated FlowMax regulators, available with fail-to-close action for positive safe failure mode, supporting customers' needs to expand to higher ranges of regulation.

The product is a high-pressure-reducing regulator that offers bubble tight shut-off at all pressure differentials and full capacity at very low-pressure differentials.

Check-All Valve Mfg. Co. introduces the brand-new Vacuum Flange Insert (VI) for rough to high vacuum systems, systems requiring frequent cleaning or modification, roughing and foreline plumbing, and research and teaching lab applications and more.

The VI is designed to fit between ISO/NW/KF/QF vacuum flanges designed in accordance with DIN 28403, DIN 28404, ISO 1609, and ISO 2861. It is both a centering ring and a check valve so it requires no additional space in the line. The VI can also be used as a low-pressure relief valve under either positive or vacuum conditions by using the desired spring setting.

"I've been active in many different associations over the years. **VMA is by far one of the best run and most beneficial** in terms of content, quality and people!"

–Robert Kemple, Jr.,
Former Executive VP, ASCO-Emerson

Become a member of the Valve Manufacturers Association or its affiliate the Valve Repair Council

and you'll learn why so many others have joined... and stayed members for many years—even decades!

You could be eligible if you are a U.S. or Canadian company that fits one or more of these categories:

✔ **MANUFACTURERS**
OF VALVES, ACTUATORS & CONTROLS

✔ **SUPPLIERS**
TO VALVE, ACTUATOR & CONTROL MANUFACTURERS

✔ **DISTRIBUTORS/CHANNEL PARTNERS**
TO VALVE, ACTUATOR & CONTROL MANUFACTURERS

✔ **OEM MAINTENANCE, REPAIR & SERVICE**
VMA MEMBERS AND FIRMS SERVING THOSE MEMBERS

Once you've applied and your membership approved, you'll be eligible for a wide array of benefits:

- Numerous Networking Opportunities
- Special Member-only Events
- Quarterly Economic Forecasts
- Annual Global Valve Forecast
- Reduced Fees on Advertising, Exhibits, Meetings and Educational Materials
- Free Job Listings on VMA and Valve Careers Social Media
- Access to VMA's Legal Counsel

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

To determine if your company meets the criteria for membership, visit VMA.org > Members for information on Qualifications, Benefits and Dues, and then apply Online.

Questions about VMA? Contact VMA President Bill Sandler (wsandler@vma.org).
Questions about VRC? Contact Marc Pasternak (mpasternak@vma.org).

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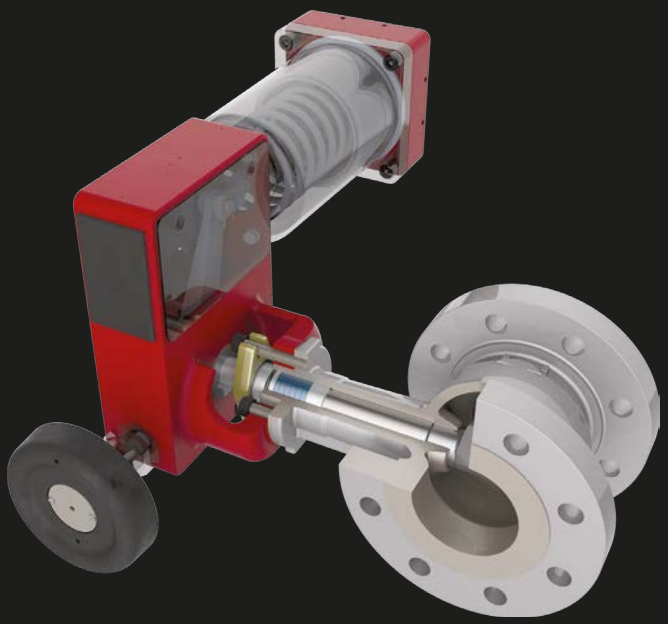
MASONEILAN* INTELLIGENT CONTROL VALVES

PROCESS CONTROLLED.

ENVIRONMENTALLY FRIENDLY

MASONEILAN CAMFLEX ECCENTRIC PLUG CONTROL VALVES

FEATURING 'Low-E' PACKING SERIES



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a GE company

Masoneilan 'Low-E' packing series exceeds EPA's requirements by:

- Certified Low Leak Technology (CLLT) resulting in actual results of < 3 ppm leakage
- 3rd party validation testing with Helium and Methane gases
- 4 thermal cycle ranges during the 100,000 cycle testing

Upgrade to Masoneilan ISO-15848 compliant 'Low-E' packing today to reduce CO_2 and other harmful gas emissions while improving plant efficiency and reliability

For more information, contact your local BHGE representative or visit valves.bhge.com

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WESTLOCK
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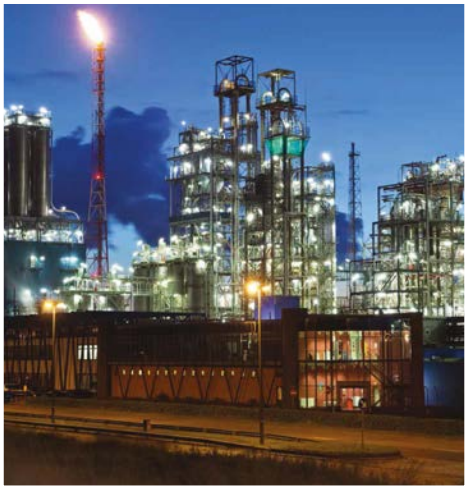
DIGITAL EPIC-D200 VALVE POSITION TRANSMITTER FOR SAFETY VALVES



The Digital EPIC D200 combines the advantages of 4-10 mA transmitter technology with proven switchbox reliability.

RELIABILITY AND EASE OF COMMISSIONING: Non-contact position feedback transmitter with simple push button calibration. The D200 provides accurate reliable feedback and control.

GREATER VERSATILITY AND WIDE RANGE OF APPLICATIONS: Globally certified for hazardous areas with the option to include end of travel switches

HART ®7 PROTOCOL WITH DD/FDT® DTM: Compatible with the latest communication technology for each of integration to host systems

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Westlock is a global leader in innovative and emerging technologies in the Valve Position Monitor, Digital Control Monitor, Network Control Monitor, Position Transmitter and Smart Positioner segments of the Flow Control Industry

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