Considering Valve Specification & Installation

Best Practices & Technology to Ensure Long-Term Performance

by Matt Migliore

When specifying valves for a given application, it is important to first determine the intended function. This may seem a rather obvious observation, but, unfortunately, a lack of functional understanding is often where valve performance issues begin. The user, rather than fully considering the application in which the valve will operate, moves forward on a purchase, only to find later on that the valve isn't all that well suited to meet the needs of the job it is being asked to do.

To avoid such problems, Ron Fletcher, a technical support representative for ASCO Valve (*www.ascovalve.com*), recommends users answer a few simple questions when considering a valve purchase:

- What is the valve controlling (air, water, gas, etc.)?
- What size valve is needed?
- Will the valve connect to tubing or hard piping?
- What is the desired volume?
- What is the max./min. pressure of the process?
- Where is the application (inside or outside)?
- What is the voltage (AC or DC)?
- Are there any special features required?

In addition, Fletcher says there are also some common pitfalls users should be aware of when specifying valves. For example, he says users often select valves with internal or body materials of construction that are not compatible with the fluid being handled and/or the application environment. He says this scenario results in a situation where the valve surfaces degrade at a rapid rate and ultimately compromise the performance of the device.

Fletcher says users must also be cognizant of the effect flow restrictions have on the performance of valves. If the application or related equipment hinders the ability of the process to meet the valve's minimum pressure differential, performance will suffer.

Finally, Fletcher says users must be careful to properly filter the material going through the valve, as unfiltered media will often result in buildup in the internal passages of the valve and hamper operation. For example, in air service, Fletcher says failure to place an upstream filter makes the process susceptible to debris or particulate contamination, which could affect the lifespan of the valve.

Online specification tools, such as ASCO's Redundant Control System (RCS) configurator (pictured here), allow users to build virtual valve assemblies with a variety of options, including diagnostics capability, materials, manual resets, and SIL ratings. Such tools are designed to enable specifying engineers to more quickly and accurately select the valve solution that is most appropriate for a given application.

In an effort to help end-users with specification and care, ASCO provides an information sheet for each valve it manufactures, detailing best practices for installation, maintenance, and rebuild. For all of its valves, ASCO recommends users filter process media to avoid contamination and buildup, as well as maintain process pressure within the valve's specified pressure rating.

Regarding installation, Fletcher says the most common mistakes users make typically revolve around improper piping arrangements, which often lead to insufficient pressure differential for consistent performance. For example, a poor piping arrangement might create a situation where the lack of pressure differential between the pressure and the exhaust ports will not allow the valve to shift properly.

ASCO also stresses the importance of valve sizing when consulting end-users. The company offers sizing software on its Web site, which looks at three specific application characteristics — volume (i.e., flowrate), pressure drop, and Cv rating — to determine the valve size needed for a given use. If the user knows two of these parameters, the software can calculate the third to provide an accurate size estimate for the application under consideration.

Fletcher says oversized and undersized valves lead to their own unique set of problems. For example, he says an undersized valve will be incapable of providing the needed volume no matter how much pressure is provided. Meanwhile, he says, an oversized valve will exhibit erratic behavior — sometimes failing to open, sometimes failing to close — because there just isn't enough volume passing through the valve to ensure proper operation, which can also cause premature valve failures.

Though users must be diligent when it comes to specification and maintenance best practices, valve manufacturers continue to develop new valve technologies to support more application flexibility and higher levels of performance. ASCO, for example, is now embedding microchips into the coils of its solenoid valves to enable improved pressure ratings, lower power consumption, noise reduction, and increased operating voltage range. "In recent years we've made tremendous progress improving solenoid valve performance by incorporating advanced electronics into our designs," says Nick Buccheri, vice president of engineering for ASCO Valve. For example, he says ASCO's RedHat Next Generation Electronic Valve features DC pressure ratings 100 percent to 500 percent higher than today's standards; consumes up to 80 percent less power than traditional solenoid valves; eliminates the hum associated with typical AC solenoid valves; operates across broad voltage ranges; and includes built-in surge suppression.

Buccheri also cites the evolution of online configurators as a major advance for the valve industry, as such systems now provide feature-rich capabilities that allow specifying engineers to easily use Web-based software to "build" a valving system that meets their specific needs. For example, ASCO's Redundant Control System (RCS) configurator allows users to create a dual-pilot valve assembly for process control applications with a variety of options, including diagnostics capability, materials, manual resets, and SIL ratings.

Going forward, Buccheri anticipates valve performance will continue to improve as engineers employ design tools, such as finite element analysis, computational fluid dynamics, electromagnetic field simulation, mold flow analysis, and others. He expects improvements will come in the form of increased flow, higher pressure ratings, smaller envelope size, and expanded temperature ratings. He sees valve selection becoming faster and easier as well, as the use of online product configurators continues to rise.

Regarding entirely new forms of valve technology, Nicolo Accordino, an analyst with The Freedonia Group (*www.freedoniagroup.com*), says it is unlikely there will be any revolutionary designs to come to market in the valve space in the immediate future. "Typically, advances in industrial valve technology occur at a slower, more evolutionary pace than in more technology-intensive industries," says Accordino. "Because of this, valve producers usually alter minor parameters, such as changing the materials of construction — for example, using plastics instead of metals — or tweaking the design — developing, for instance, high-performance butterfly valves with better features than standard butterfly valves."

Accordino does, however, see a lot of activity brewing in the area of "smart" valve technology, such as wireless actuators. "While still in its infancy, the main advantage for [wireless] is that it effectively eliminates wires and the costs associated with installing and maintaining a vast network of wiring in a modern factory setting," he says.

Specifically, Accordino sees the recent release of the HART 7 protocol, which includes a framework for enabling wireless diagnostics, as an area of potential for new valve technology. He says, "The HART 7 protocol and the advantages that it presents are in line with those of other smart valve devices, with WirelessHART allowing the system to be controlled from an even more remote location."

ASCO Valve's online sizing software is available at www.ascovalve.com/applications/valvesizing/valvesizing.aspx.

Matt Migliore is the editor of Flow Control magazine. He can be reached by phone at 610 828-1711 or via e-mail at matt@grandviewmedia.com.

World Valve Mkt. to Reach $77.6 Bil. in 2011

WORLD INDUSTRIAL VALVE DEMAND
(million dollars)

Item	2001	2006	2011	% Annual Growth 2001-2006	% Annual Growth 2006-2011
Valve Demand	46930	62600	77550	5.9	4.4
North America	12410	16750	19650	6.2	3.2
Western Europe	15610	18800	20850	3.8	2.1
Asia/Pacific	12070	18250	26350	8.6	7.6
Other Regions	6840	8800	10700	5.2	4.0

World industrial valve demand will exceed $77.6 billion in 2011 based on a 4.4 percent annual growth rate, according to a study by The Freedonia Group (*www.freedoniagroup.com*). The study, titled World Industrial Valves, predicts gains will be driven by a healthy outlook for the global economy, leading to increased fixed investment activity in key valve markets such as the United States, China, and Germany. Valve demand in the energy production sector is expected to benefit from a pickup in primary energy consumption in mature markets like North America, as well as in developing valve markets such as Latin America.

Growth in valve demand in the United States, Japan, and Western Europe is expected to trail the world average through 2011, with stronger growth in rapidly developing nations, such as China, Indonesia, Thailand, Malaysia, and India. Advances in valve demand in these areas will be driven by healthy economic and fixed investment growth, while an expanding market for more expensive automated valves and actuators will support overall valve gains in the United States, Japan, and Western Europe.

Freedonia predicts the global market for automatic valves will outpace that for conventional valves, due to the ongoing efforts of process manufacturers to improve operational efficiencies. The strongest gains will be registered in sales of separately sold automatic actuators, which are used together with standard valves to allow for automated valve functions and are less expensive than automatic control and regulator valves with actuators preinstalled. Still, conventional valves are expected to continue to account for 54 percent of total valve demand in 2011, due to their low cost relative to other highly engineered automatic valves.

The largest and most advanced industrial valve industries are located in developed nations, particularly those which have large, well-developed home markets, technical expertise in manufacturing higher-value products, and access to factors of production such as capital and labor supplies, according to Freedonia. China, however, is rapidly becoming a key player in the valve industry. France, the United Kingdom, Russia, and Taiwan are also sizable valve producers. According to Freedonia, the largest net exporters of valves are Germany, Italy, and Japan.

Researchers Make Breakthrough on 'Green Gas'

George Huber poses with a vial of green gasoline compounds. Photo courtesy of Ben Barnhart

Researchers have made an advance in the development of "green gasoline," a liquid identical to standard gasoline that is created from biomass sources like switchgrass and poplar trees, according to the National Science Foundation (NSF, *www.nsf.gov*).

Reporting in the cover article of the April 7, 2008 issue of Chemistry & Sustainability, Energy & Materials (ChemSusChem), chemical engineer and National Science Foundation (NSF, *www.nsf.gov*) CAREER awardee George Huber of the University of Massachusetts-Amherst (UMass, *www.umass.edu*) and his graduate students Torren Carlson and Tushar Vispute announced the first direct conversion of plant cellulose into gasoline components.

In the same issue, James Dumesic and colleagues from the University of Wisconsin-Madison (*www.wisc.edu*) announce an integrated process for creating chemical components of jet fuel using a green gasoline approach. While Dumesic's group had previously demonstrated the production of jet-fuel components using separate steps, their current work shows that the steps can be integrated and run sequentially, without complex separation and purification processes between reactors.

While it may be five to 10 years before green gasoline arrives at the pump or finds its way into a fighter jet, these breakthroughs have bypassed significant hurdles to bringing green gasoline biofuels to market, according to NSF.

For their new approach, the UMass researchers rapidly heated cellulose in the presence of solid catalysts, materials that speed up reactions without sacrificing themselves in the process. They then rapidly cooled the products to create a liquid that contains many of the compounds found in gasoline.

The entire process was completed in under two minutes using relatively moderate amounts of heat. The compounds that formed in that single step, like naphthalene and toluene, make up one fourth of the suite of chemicals found in gasoline. The liquid can be further treated to form the remaining fuel components or can be used "as is" for a high-octane gasoline blend.

To read a report sponsored by NSF, the Department of Energy, and the American Chemical Society entitled "Breaking the Chemical and Engineering Barriers to Lignocellulosic Biofuels: Next Generation Hydrocarbon Biorefineries," visit www.ecs.umass.edu/biofuels/.