Seven Breakthrough Advantages of New Steam Valve Technology

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Introduction

Solenoid-based valves that control the flow of steam and hot water are critical components for original equipment manufacturers (OEMs) and end users of commercial and industrial laundry, sterilizer, boiler, dishwasher, and food preparation equipment.

Until recently, specifiers and users of even the best traditional valve technology had to accept certain limitations. For instance, flow rates were relatively constrained, so throughput was restricted. Valve life was also comparatively short, and maintenance or replacement somewhat time-consuming.

Recently, these barriers have been breached. New approaches and technologies, incorporated into a new generation of products, are changing what buyers can expect.

Even differences in basic specifications can be considerable. In recent head-to-head testing of a popular traditional valve versus a new model, the new valve's ambient temperature range was wider. Compared to some older designs, maximum temperature can be improved by 60° F and pressure can be more than doubled.

The newest designs combine several features proven to offer significant benefits in traditional valves, such as threaded bonnets, a floating PTFE diaphragm, and a zero-minimum operating differential design. They also add innovative new approaches — such as optimized geometry, DC construction, and a lower power coil.

For major performance factors, the improvements may be dramatic. This report demonstrates how choosing the right next-generation steam valve can deliver benefits such as 60% higher flow rates, four times longer life, and more.

❶ Higher flow

These days, there's good news about flow for OEMs and end users. They can now specify newer-generation steam and hot water valves with flow rates that test out at 20% to 60% higher than conventional models. For example, certain ASCO models can provide the highest flow rates of any steam/hot water valves available today.

Valve makers achieve this truly substantial improvement via sophisticated use of computational fluid dynamics (CFD). Computerized modeling of valve internals predicts the expected efficiencies of myriad possible configurations. So the best of the next-generation models are designed with optimum internal geometry down the length of the pressure vessel.

These dramatic flow rates offer an attractive choice:

OEMs can use these valves to offer significantly higher throughputs and shorter cycle times from batch to batch, particularly in new lines of equipment for laundry, sterilization, and dishwashing applications.

However, for existing product lines, OEMs may well choose to downsize instead. The new valves' increased flow means that, for example, the flow of a ¾-inch model can provide as much flow as an older 1-inch model. So the specifier can reduce the dimensions of the new valve and its connections — while retaining the same flow. Thus tubing, pipes, fittings, manual valves, automatic shutoff valves, and other components can be sized at ¾ inch. Results: a smaller equipment footprint for tight spaces, as well as reduced costs for smaller components.

In a final flow feature that's useful in certain installations, look for newer model steam valves that offer zero-minimum operation. Where traditional valves require a minimum of 5 psi to open, these models can open even at 0 psi. It's a critical capability in applications with low steam supply pressures.

❷ Longer life

High temperatures and pressures make steam valve service inherently challenging. In some geographic locations, even the quality of the local water supply may pose problems: high mineral content in steam or hot water can attack valve diaphragms, eventually producing weepage or leaks. In the past, these factors have combined to make steam valves relatively short-lived, often requiring frequent rebuilding or replacement.

Newer-generation solenoid valves have demonstrated tremendous improvements in these areas. Continuing design development efforts help in the selection of the highest-quality materials specially treated to resist high temperatures. Innovations such as

floating PTFE diaphragms strongly resist corrosion and mineral buildup for better sealing, minimized leakage, and fewer closing problems.

Designers also study the complex shapes of various possible valve internals, subjecting simple parts of each shape to software-based finite element analysis (FEA). This helps identify the most robust and efficient geometries for the pressures and temperatures involved.

Finally, advanced designs are further optimized via extensive endurance testing programs.

The result of all these efforts: depending on the application, these new valves can exhibit service life up to four times longer than their predecessors.

For example, extensive testing shows that new ASCO steam/hot water valves offer up to 1 million cycles on hot water and low-pressure steam applications. Even in demanding high-pressure steam use, these valves can deliver up to 500,000 cycles of reliable performance. Until recently, this level of longevity for valves in steam or hot water service was virtually unthinkable.

3 Easier maintenance

Traditional steam valve designs emphasize stability at the expense of accessibility. Many models are held together by multiple heavy bolts, guaranteeing that valve components won’t come apart when stressed by high temperatures and pressures. Unfortunately, these bolts also translate into less convenient maintenance or replacement.

Look for newer valve designs that typically feature a threaded bonnet. While the bonnet’s heavy-duty threads ensure stability under stress, they also screw and unscrew without difficulty when required. So installation, maintenance access, and rebuilds can be accomplished onsite and inline, quickly and easily.

4 Quieter operation

Some equipment designers pay special attention to specifying steam valve models that feature DC construction. These eliminate the “AC hum” that can prove undesirable in certain applications.

For example, valves on equipment intended for use in medical lab sterilizers can offer DC designs to ensure quieter operation.

5 Lower energy consumption

Conventional solenoid steam valves require electrical currents of around 16 watts (W) for normal operation.

Newer-generation valves improve on this with new coil designs that require only 6 W to 10 W. Result: welcome savings in ongoing energy costs. When one sterilizer unit, for example, may require up to a half-dozen valves, and a typical laundry machine uses five, these savings can swiftly add up.

Together with the potential component downsizing benefits mentioned earlier, this can produce significant — and continuing — cost benefits.

6 Reduced inventories

Specifiers often assume they must obtain valves optimized for either steam or hot water use. However, in locations where both may be required, this can effectively double the supply of units that must be ordered and stocked.

Unlike some conventional models, most newer-generation valves from major manufacturers have been optimized for tight sealing and reliable use on almost any steam or hot water application. So OEMs and end users can simplify ordering and reduce inventories.

7 Lower cost

In terms of initial purchase price, next-generation steam valves are no more expensive than their predecessors.

However, as already emphasized, they can allow substantial component downsizing. They can provide significantly longer service lives. They can deliver faster, easier maintenance. And they can reduce energy consumption, overall component costs, and inventories.

All these add up to a virtual certainty of substantial cost savings over the life of the valve.

Dollars in detail: a case history

Various major OEMs report that new steam valve technologies are already making a bottom-line difference.

Example: based in Ripon, Wisconsin, USA, Alliance Laundry Systems LLC is a leading global provider of commercial laundry products and services to self-service, multi-housing, and on-premises laundries. Recently, the company changed out the valve models traditionally used on their equipment designs. Instead, it specified new-technology steam/hot water valves from ASCO.

The upgrade reduced part numbers Alliance had to stock from nine to seven, and cut coil inventories from four to two. It decreased fill time on a two-valve washer extractor from 30 seconds to 18.2 seconds — a 64% time efficiency gain. It achieved greener energy use with a 44% cut in power consumption (from 11 W to 6.1 W per valve). And Alliance expects users to incur much less downtime, since its former valves were rated for only 200,000 cycles, while the new models deliver 500,000 cycles on steam service, and 1 million cycles on hot water.

Further, higher valve flow rates and other design improvements allowed Alliance to buy smaller fill system components. The company downsized 450 1-inch valves to ¾-inch models and 2700 ¾-inch valves down to ½-inch valves — without reducing the performance of the equipment.

The annual savings resulting from lower-total-cost, longer-lasting steam valves, plus downsized fill system valves was $109,600 in purchase price alone. Additional savings were also realized from the use of the smaller related components and lower warranty costs.

Conclusion

Changes in established flow control components can often be incremental at best. New technologies may offer only small improvements in one or two aspects of functionality or performance.

In welcome contrast, the newest solenoid-based steam/hot water flow control valves offer a number of clear advantages over earlier models. These advantages can significantly impact core attributes such as flow rates and product life. OEM specifiers and end users who choose the right valve can enjoy dramatically more efficient and reliable service than ever before.

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