MW Components

Are the Springs in Your Valves a Ticking Time Bomb?

There are times when failure of the smallest components can create the biggest problems. In fact, problems that are so significant that they can cause injury or even death. An example of this are zinc-plated steel compression springs used in release valves for liquid propane (LP) applications.

These valves have been engineered to release gas when the pressure of the LP tank gets beyond a certain point. But when the spring is not operating correctly, gas can be continuously released. This creates a highly flammable environment, which can turn rapidly into a fire or explosion.

Why do Springs Used in LP Valves Fail?

To correct the situation, it's important to understand what factors cause the spring to fail and what approach should be taken during the engineering phase of the valve to ensure that this does not happen.

Springs can be impacted by a phenomenon called hydrogen embrittlement. It is a process by which the metal (usually steel) becomes brittle and will fracture. This is due to diffused hydrogen in the metal created by faulty execution of the zinc electroplating process. (The springs are supposed to be heated after they are plated. If that is not done correctly, hydrogen that is trapped between the metal and the plated surfaces makes the spring brittle. This will eventually cause the spring, and in turn, the valve, to fail.)

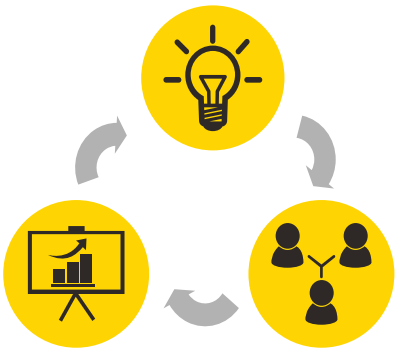
Case Study: Situation Analysis

This is exactly the predicament a valve company found itself in. Used in LP applications, its valves were failing, resulting in multimillion dollar lawsuits. The company needed to quickly determine why this was happening and come up with a plan to prevent future occurrences.

MW Components performed a Failure Mode Effects Analysis (FMEA) which is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service. The goal was to determine where the design had the largest failure potential. The FMEA analysis confirmed that springs subjected to hydrogen embrittlement had a risk of failure of 9 out of 10 points.

Further, the company had been using zinc-plated carbon steel springs in its valves for years, thereby escalating its marketplace exposure. With an increasing number of valves aging, the number of failures were also increasing. This subjected the company up to even more litigation.

The goal was to make changes to the design that would reduce the failure risk from 9 to less than 1 point, on a 10 point scale.



The Solution: Stainless Steel Springs

After completing a thorough analysis, MW Components recommended a switch from steel to stainless steel springs. Stainless steel has high corrosion resistance and therefore, does not require a surface coating such as electroplating. That completely removes the hydrogen embrittlement phenomenon from the equation.

Although switching to stainless steel compression springs with a closed-end ground for a relief valve application is more expensive than the plated steel solution, the cost increase was minor in relation to lawsuit payout exposure which continued to be on the increase due to aging valves. Additionally, the springs are a relatively small cost component within the overall valve assembly.

The company made the decision to change the springs across all product lines, resulting in approximately 30 new SKUs. Each valve required a custom solution incorporating one, two or even three springs.

Each change required a redesign of existing springs as well as related load data and inspection reports. Quick turnaround was also necessary to meet demanding deadlines and Underwriter Laboratory approval requirements.

It took six weeks to design and deliver the first spring samples. The project continued for 18 months until the company's entire line of valves had been redesigned, incorporating the new stainless steel compression springs.

The end result was a fully updated valve offering that minimized the failure rate over the life of the product. The company was pleased knowing that they were now able to sell a safer product that would protect consumers and remove a significant amount of liability exposure.

The MW Components Difference

For many decades, MW Components has been the supplier of choice for a variety of valve applications. This means we have the experience to provide solutions for even the most challenging situation. Our experienced engineering, technical and test staff enables us to deliver products meeting the highest quality standards.

If you have not put your current release valve assembly through failure analysis testing, now would be a good time to consider doing so. This is particularly critical in gas, electrical, automotive and other applications where spring failure can lead to arcing, which, in turn can result in injury or death.

Please contact us if you are interested in an analysis of how you can improve the functionality of your current valve assembly and reduce your liability, by converting to a stainless steel spring option.

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To learn more visit MWComponents.com or contact us at 704.280.8875 I sales@mwcomponents.com