Maximizing Component Life to Minimize Costs

The cost of replacing a single component in a plant goes far beyond the price of the part. It also encompasses the internal costs for procurement, installation, and maintenance, as well as costs associated with lost productivity during downtime.

While you don't want to compromise on safety, you do want to keep costs down and obtain the longest life possible from your components. Here are some tips from Swagelok field engineers to help maximize the life span of your fluid system components and reduce maintenance costs, while keeping safety in mind.

Focus on System Design First

System design affects many variables that act on the component including pressure and temperature fluctuations, water hammer, vibration, and contamination, among others. Such variables can affect not only component life, but the life of the system as well. It's important to follow sound design practices that limit these stressors to realize long-term performance.

If you're changing a design, be sure to check the new operating parameters, for example temperature, pressure, etc., against the manufacturer's ratings for all components to ensure they fall within the acceptable range. Even a seemingly small process change, such as increasing the frequency of steam cleaning a hose, deserves attention. The additional heat exposure may decrease the life of that hose from five years to one.

Consider *All* the Operating Conditions When Selecting a Component

When selecting components, take into account the entire application. By covering all aspects, a surprise leak or failure may be less likely due to a component being unsuited for some element of the application.

Here are some important details to consider:

- Normal operating temperatures and pressures
- Maximum operating temperatures and pressures
- Ambient temperatures and conditions, including external exposure
- Process fluid and external media exposure
- Vibration potential
- Tubing and other supports
- Cleaning protocols

Among operating conditions, process fluid compatibility is often overlooked. You will want to ensure all the materials contacting the fluid (the wetted area), including O-rings and packing, are compatible with the process fluid. Otherwise, the component could fail prematurely. Also, be sure to consider external conditions like high-chloride (saltwater) environments, which will accelerate the corrosion of some alloys such as 316 stainless steel, and may warrant special material choices, such as jacketed tubing or special clamping or tubing support options (Figure 1).

Figure 1. Corrosion of 316 stainless steel tubing in a typical offshore installation (left). Jacketed tubing and insulated jacketed tubing (right) may be wise choices in such environments.

Train Your Installers for Proper Installation

Even the best system designs and components can be compromised by missteps during installation, in effect undoing all the careful work and resources you have invested up to this point.

Installation mistakes can lead to many issues resulting in premature product failure. Tubing that isn't bent correctly can experience side-load stresses that may lead to cracks and leaks. Improperly supported tubing exposed to vibration may be prone to the tube cracking and the assembly leaking. Internal seals in valves and regulators may wear unevenly if the component is installed on its side.

Certain component features lend themselves to easier installation. For instance, fittings with a low torque requirement are more likely to be tightened properly, especially when combined with a helpful visual tool like a gap gauge.

Your best bet to ensure proper installation is training. While the installation procedures for many components may seem like common sense, minute details can make a big difference in the long-term performance and safety of a component. Training courses with hands-on instruction can help reinforce proper installation techniques to mitigate leaks and enhance safety.

Perform Preventive Maintenance

Some components require maintenance to realize their potential for long life. Not only regulators, but also valves and hoses require regular attention and inspection. In many cases, maintenance or repairs on these components can be performed at low cost, and the payoff is huge in terms of extended life. Consider the replacement of the packing in a utility valve to prevent internal leaks across the seat. If the valve swings open in line, as some models do (Figure 2), this is an easy and simple repair.

Figure 2. A valve that swings open to allow an easy seat replacement will have a lower cost of ownership than one that requires a full valve replacement.

Keeping records of your preventive maintenance program should help you determine whether particular components are being replaced often. In such cases, an analysis of the component can help you understand the frequency of replacement. Perhaps another component would be better suited to that application, last longer, and cost less over time.

Store Parts Properly

It makes sense to keep a replacement inventory of certain mission-critical components. However, be careful how you store them. In the case of hoses, storing them incorrectly can lead to damage. Never stack hoses. Hang them instead, making sure they are not bending more than the manufacturer's published bend radius (Figure 3). In addition, protect hoses from ultraviolet (UV) light, as some hose materials degrade from UV exposure. Finally, cap both ends of stored hose to prevent contamination of the interior.

In the case of other components, avoid mixing spare parts from different manufacturers in the same bucket or box. Spare parts like ferrules, O-rings, and valve packings need to be separated and stored by manufacturer and be clearly marked for their corresponding component. These parts should not be considered interchangeable even if they appear the same to the naked eye. Intermixing or interchanging parts from different manufacturers may lead to leaks, corrosion, or product failure.

Figure 3. Proper hose storage requires hanging hoses and ensuring they are not bent more than their published bend radius.

Learn as You Replace

Replacing components is a necessary part of running a plant, but you may be able to prolong component life by reviewing your practices related to system design, component selection, installation, maintenance, and storage.

When you have to replace a worn out or damaged component before its replacement interval, it's important to determine why. There's a reason the component failed, and you might not want to automatically order that same part again without investigating further. If the part experienced a failure due to pressure, temperature, or material incompatibilities, you can select an alternative that meets the process requirements. If the failure was due to a system-related issue such as vibration, contamination, or water hammer, you can correct the issue to increase component life – and your bottom line.

Contact your local **Swagelok sales and service center** or sign up for a **Swagelok Essentials training course** to learn more about maximizing the life of your components.