

DID YOU KNOW?

NO: 292

JANUARY 28, 2015

STEAM FILTERS - PREVENTING PREMATURE STEAM VALVE FAILURES

Part 1 – Acute Valve Failures (Shortly After Start-up)

Overview

Periodically, PRIMUS experiences repetitive field failures of steam-to-jacket valves and steam-to-chamber valves immediately following the start-up of a new steam sterilizer using in-house steam.

Acute Failure Mode in New Installations with House Steam

The valves have almost universally failed in the following manner:

- The original valve fails within a day or two of the sterilizer start-up
- The replacement valve fails a few days or a few weeks following installation
- The third valve does not fail, but instead operates as designed

Supplier Corrective Action Report Findings

When these failed valves are returned to the OEM for analysis under the PRIMUS Supplier Corrective Action Report (SCAR) system, the failures are largely determined to be the result of corrosion build-up on the internal valve spring and other critical valve parts.

Corrosion Particles from Carbon Steel Piping

The corrosion particles found in the valve internals are composed of carbon steel which originate in the new carbon steel piping ASTM A106 that is used to construct the new portion of the house steam system.

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PRIMUS Steam Valves Forced to Act as a Filter

The valves have acted as a filter during the period where the new carbon steel pipe is being conditioned by boiler corrosion control chemicals (developing a protective inner piping surface film that helps mitigate further corrosion). During this period, iron oxides are formed that slough off in the steam flow as it makes its way throughout the steam piping.

Failure to Flush New Steam Piping Exacerbates the Problem

The situation is also exacerbated when a facility does not take the time and manpower to thoroughly flush newly installed steam, water, and condensate piping. Metal filings, welding slag, and other carbon steel waste materials are readily flushed downstream into the steam sterilizer and other pieces of equipment. Most valve failures that occur immediately upon start-up or shortly thereafter are due to residual waste and corrosion particles left in the piping after construction.

Use of a Steam Filter and Steam Trap

Based on the information contained above, PRIMUS strongly recommends the installation of a steam filter and associated steam trap in those facilities with new carbon steel steam piping systems supplying one or more steam sterilizers.

While modestly expensive, a steam filter can eliminate unnecessary costs and downtime associated with premature steam valve replacements.

As Option P35 when initially purchased, or as an aftermarket kit assembly/spare parts, PRIMUS offers stainless steel filter housings and porous metal filter elements.

3/4" Stainless Steel Steam Filter Housing	P/N 401165
1" Stainless Steel Steam Filter Housing	P/N 401160
10" Length, 1.3 Micron Porous Metal Filter Element	P/N 401162

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3/4" Steam Filter Kit Assembly P/N 224110

1" Steam Filter Kit Assembly P/N 224100

The Steam Filter Kit Assembly contains the following parts: Steam Filter Housing, 1.3 Micron Porous Metal Filter Element, Steam Trap and a Trap Fitting to connect the trap to the filter housing.

The parts and assemblies are listed and can be ordered on the PRIMUS website at www.primus-sterilizer.com.

Part 2 – Chronic Valve Failures (Over a Long Period)

Erosion and Corrosion – Chronic System Effects – General Information

Water, both entrained in steam flow and also as non-discharged condensate traveling at high speeds in piping, is the source of most piping erosion. By repeatedly impacting piping at bends, the water can cause the gradual thinning of the pipe wall due to its mass and high velocity of impact, similar to what occurs in industrial water jet cutting. This type of erosion - caused by water droplets - is typically known as Liquid Droplet Impingement (LDI) Erosion.

Corrosion occurs due to dissolved carbon dioxide and oxygen being present in the condensate. When CO₂ dissolves in water, it forms carbonic acid which attacks the surface of carbon steel.

In many cases, but particularly with carbon steel piping, erosion can remove the protective inner piping surface treatment thereby speeding corrosion. In fact, both erosion and corrosion typically work together to cause the thinning of the steam pipe inner wall.

Corrosion and erosion particles can build up in sterilizer steam valves over time. Normally, complete valves or internal kit parts are replaced as part of a proper PM program before an unexpected valve failure occurs.

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Preventing Piping System Erosion and Corrosion

Depending upon individual circumstances, facilities can apply several options to prevent/rectify erosion and corrosion. These include:

Implementing water chemistry measures

Proper piping design/layout to improve flow geometries

Installing more corrosion resistant materials (e.g. stainless steel)

Water chemistry control measures are highly attractive to most facilities in that they offer a readily available and comparatively inexpensive means of prolonging the life of existing piping.

Summary

PRIMUS strongly encourages end users operating new carbon steel steam piping systems to consider investing in a steam filter assembly to eliminate costly downtime and material costs due to premature sterilizer steam valve failures.

Please contact Dave Schall, PRIMUS Director of Sales/Service/Aftermarket, at (402) 344-4200 Ext. 1212 or by e-mail at dschall@primus-sterilizer.com to answer any questions and/or to start the ordering process.

