

# Creating and Maintaining Liquid Seals for Rotating Shafts

Learn how liquid pressurized seals are used on rotating shafts to keep sterile process in, and contaminants out



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ASME BPE 2016 Section SG-2.3.2 provides an excellent, detailed study of Mechanical seals for rotating shafts. This author strongly recommends buying the ASME BPE and reviewing the applicable section. The subject matter below deals with some pressurized liquid seals only.

Liquid pressurized seals (usually cool, clean steam condensate or WFI) are used on some rotating shafts to keep sterile process in, and contaminants out. They must be continually flushed at a pressure that exceeds the process that is being sealed. For example, in the case of a vessel agitator, the seal pressure must exceed the pressure inside the vessel to ensure that leaks don't occur, and if they do, it will be a sterile liquid leaking into the vessel.

The mechanical pump seal concept is relatively the same, except the liquid seal pressures may be higher. WFI is most often used for the sealing media for pump seals.

These seals need to be constantly replenished with fresh sterile condensate or WFI regardless of the condition of the seal, or the pressure inside the vessel. Vessel pressure increases usually happen during filling or SIP. Pressure decreases can happen when the vessel is emptied or after SIP when the vessel cools, if vessel sterile air pressure is not maintained.

Many seal systems are designed with needle valves or rotameters to control the flow into the seal, and needle valves or orifice plates on seal barrier drain lines to maintain a fixed back pressure. Those drain line components often cause problems and are replaced because they can't hold a consistent back pressure as the seal media pressure, or flow changes.



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# Creating & Maintaining Liquid Seals For Rotating Shafts: How Steriflow Can Help

Seal water is usually produced by circulating clean steam or hot WFI through a dedicated heat exchanger. These custom designed dedicated heat exchangers are usually expensive pieces of equipment, and do not perform very well, particularly when you consider their cost. A more practical, lower cost product for use in these applications are Sample Coolers.

## Sample Coolers

Steriflow's compact line of SC Sample Coolers will reliably produce .16 liter/minute of 30°C clean steam condensate (or cool .5 liter/minute of hot WFI/min to 30°C). That flow rate is more than sufficient to continuously replenish typical seal chamber volumes, with enough left over for any pressure or volume upsets, should they occur.

## SV Sample Valves

Clean steam, or hot WFI flow into a sample cooler needs to be controlled. Steriflow's SV Sample Valves are designed specifically for that purpose.

## JSHM Manual Metering Valve

Clean steam condensate or WFI flow into the rotating seal chamber are also usually manually controlled. Steriflow's JSHM manual metering valve is the ideal choice for that application. It is the only aseptic, true manual metering valve on the market. End users typically use non-sanitary needle valves, or diaphragm valves for this application, which are not designed for aseptic, precision low flows. With it's Jorlon™ diaphragm seal, and precision rising stem with conical plug, the JSHM is perfect for this application.

## Mark 95 Series, JSB or JSBLF Back Pressure Regulators

A back pressure regulator is needed to accurately control the pressure in the seal chamber. Using a BPRV on the seal outlet line is the only way you can accurately ensure that seal pressure is accurately maintained. Steriflow's JSB, JSBLF, and MK95, are the only drainable, aseptically designed back pressure regulators that can regulate at the lower flows needed for these applications.



Sample Coolers



Metering Valve



Sample Valve



Back Pressure Regulators

Note: ASME BPE does not endorse any products.

## ABOUT THE AUTHOR



Karl J. Lutkewitte has spent his career working for two companies. For the last 10 years, Karl has been with Richards Industries' Steriflow Division as the Product Manager, and more recently as Product and Sales Manager. He has been with Richards Industries for almost 20 years. For 12 prior years he was with two Emerson Electric Companies: Emerson Process Management – Rosemount, and the Alco Controls Division.

## ABOUT STERIFLOW VALVE

Steriflow has introduced a broad range of industry firsts for the bio-pharmaceutical Industry:

- The industry's first and only Lifetime Diaphragm Warranty
- The first true spring-less and crevice-free check valve for horizontal and vertical line WFI and Bioprocess applications
  - The world's only down-flow check valve for Bioprocess drain applications
- The world's first precision aseptic metering valve
- The industry's highest capacity pure steam trap and accessory product range including:
  - Products that shorten SIP heat-up time and eliminate validation temperature alarm
  - Reduce dripleg length
- The industry's lowest Cv (Kv) regulators for use on Bioprocess additives and clean utilities.
- The first clean gas regulator product line developed specifically for Bio-pharmaceutical applications.
  - The first clean gas regulators designed specifically for reliable control of low flows and low pressures

How may we help you today? Call us at 513.533.5600, Email us at [steriflow@richardsind.com](mailto:steriflow@richardsind.com), Follow Us on LinkedIn, Facebook and Twitter.



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