

Spring Energized Seals



The Ask The Expert column will give readers the opportunity to have their valve concerns addressed, find out the answers to their pressing valve challenges and ask for feedback on application issues. If you have a questions that you need answered, please feel free to contact s.bradley@kci-world.com with the email subject: Ask The Expert.

If you are an individual with extensive valve expertise that you believe the Valve World readership could benefit from, please contact our Editor-in-Chief to become a future featured Expert.

This month our Experts are Rodney Roth, Strategic Account Manager / Stationary Equipment – A.W. Chesterton & Larry Douglas, Key Account Manager – A.W. Chesterton.

Q What is the purpose of the spring in a spring energized seal?

A Because seal jacket materials used in the manufacture of SES (Spring Energized Seals) are most often made from filled PTFE, the jacket material has a propensity to cold flow. Left unsupported the seal would collapse and no longer work effectively to form the necessary seal at low pressure or in startup conditions. Thus, the spring keeps the seal jacket in place in the absence of pressure to ensure positive contact at all times. The spring is also used to tailor the seal to the specific application.

Additionally, it is commonly believed that the higher the pressure in a system the heavier the spring needs to be within the SES. Although an understandable thought, in reality the opposite is actually true. For low pressure, low temperature applications a Helical spring might be best but for high speed rotary applications, Elliptical Coil spring would be a better choice. Think of the spring as the skeleton of the seal.

Q Can a spring energized seal replace an o-ring and be used in the same gland?

A This is a complicated question for a number of reasons. First, the gland shapes are different when using o-rings versus SES. O-ring glands are basically square where SES glands are more rectangular. However, because SES are machined components they can be machined to fit if necessary. Secondly, O-ring glands are usually solid glands having three metal sides. O-rings, being elastomers can easily be stretched or maneuvered into these glands without being damaged and then return to their original shape. This is called memory. PTFE does not have elastomeric memory so if it is stretched it will not return to its original shape and it will likely not function properly. Because of this issue, the better way to go for SES is a 2-piece or stepped gland. These types of glands allow the seal to be installed with little to no stretch and provide a much better chance of success. That being said if the ratio of diameter to cross section is sufficiently larger, it is possible to put a SES directly in to an o-ring gland. Consult with Chesterton Engineering for your specific application.

Q How are spring energized seals used?

A Unlike o-rings, u-cups and other molded products which are mass produced in standard sizes. SES are custom engineered components, with each seal designed to solve a specific set of application parameters using variables like spring type and material along with jacket geometry and design interference. The

design is then sent to the machining center where the jacket is machined starting from either a tube or rod of raw material. Once the final jacket machining is completed it then moves to assembly where the pre-specified spring is cut, welded and installed. Due to the nature of the design and manufacturing of this product, (engineered) very tight inspection controls are used to ensure the final product meets the design intent.

Q Besides temperature and pressure extremes, what other advantages are there to using spring energized seals?

A With temperature ratings from -450° F up to +575° F and pressure capabilities from light vacuum to 50,000+ psi it is easy to think of SES as only an extreme use seal. Though they perform very well in these harsh environments they can also be used to

solve various other sealing issues. For example: Since each one is a custom designed, the seal can be fine-tuned to handle friction sensitive applications such as spring return shut-off valves or torque limited actuators. Also, SES do not have to follow any catalog data in terms of gland size and shape. If a cross section is out of tolerance for an o-ring or u-cup, a SES can be manufactured to fit the available space. However, it is very important to note that SES will not stretch like elastomers so special care must be taken during installation.



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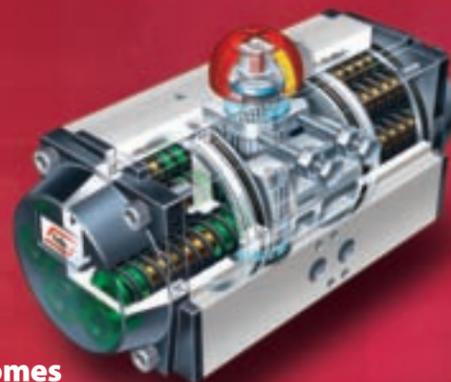


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