

TechBriefs

Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

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At a glance

- > Temperature activated
- > Provides circumferential sealing
- > Maintains continuous force
- > Conforms to irregular shapes and surface conditions
- > Expands to fill large gaps
- > U. S. Patent 7,503,594

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Passive High-temperature Sealing Device

Scientists at the Savannah River National Laboratory (SRNL) have designed a sealing device to act as a high-temperature shutoff valve for pipes and ducts. This passive device can be used to stop the flow of gas or liquid in conditions of sudden overheating.

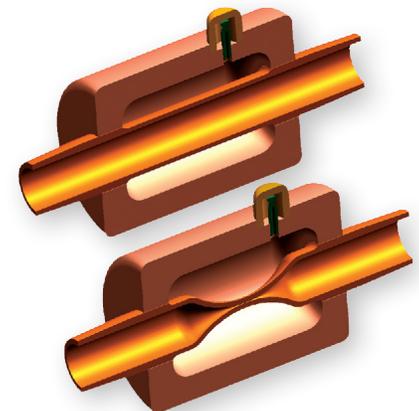
Quickly stops flow process

The device is an annular ring that can be slipped over the outside of the pipe (or built into a flanged spool piece). The cavity inside the device is filled with a gas, liquid or even a solid. When exposed to an elevated temperature, the material in the cavity expands, providing sufficient inward force to collapse the thinner process pipe wall which stops flow within the pipe.

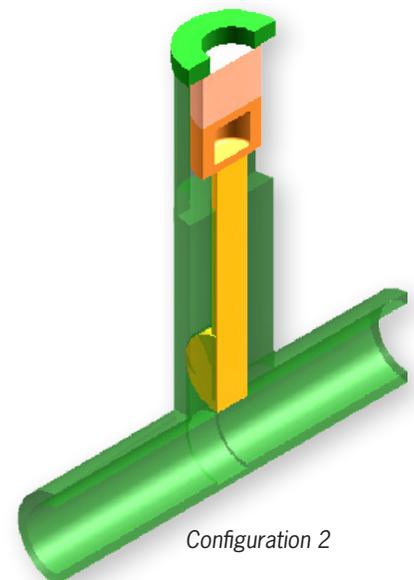
In configuration 2, the ring can be installed above the stem of a gate valve. In this case, the ring has a thinner lower wall and a thicker upper wall. When heated, the expanding lower wall of the ring will force the stem downward to push the gate into the pipe.

Seals process lines

To use as a seal, the ring can be inserted inside a pipe with the thinner wall in contact with the inner wall of the pipe. High temperature will cause the thinner wall to expand outward, providing a tight seal against the pipe. The expanding ring wall will accommodate irregularities in the pipe wall.



Before (top) and after



Configuration 2

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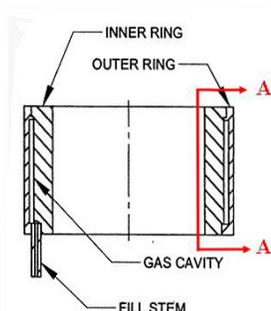
Savannah River National Laboratory

Technology transfer

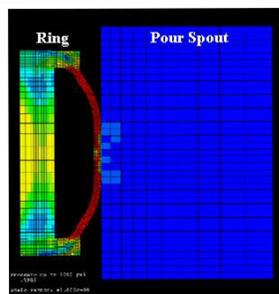
The Savannah River National Laboratory (SRNL) is the U.S. Department of Energy's (DOE) applied research and development laboratory at the Savannah River Site (SRS).

With its wide spectrum and expertise in areas such as homeland security, hydrogen technology, materials, sensors, and environmental science, SRNL's cutting edge technology delivers high dividends to its customers.

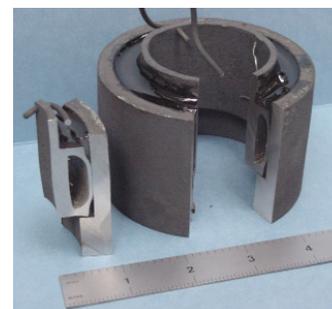
The management and operating contractor for SRS and SRNL is Savannah River Nuclear Solutions, LLC. SRNS is responsible for transferring its technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.



Material: Inconel 690
Fill gas: Helium



Finite element analysis
at 1050° C for section AA



Passive high-temperature
sealing device

Adaptable to varying process parameters

Choice of material for constructing the ring would depend on specific process parameters, such as corrosivity, activation temperature, and elevated temperature mechanical properties of the valve or process system. The cavity may be filled with a gas, such as nitrogen, with a volatile non-corrosive liquid, or with a volatile solid.

Partnering opportunities

SRNS invites interested companies with proven capabilities in this area of expertise to develop commercial applications for this process or product under a cooperative research and development agreement or licensing agreement. Interested companies will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention. Qualifications should include past experience at bringing similar products to market, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch.

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