

STRENGTHENING THE WEAKEST LINK

New materials and designs help seals and gaskets evolve into components that can overcome today's CPI challenges

Chemical processors rely on seals and gaskets to stand up to aggressive media, high temperatures and high pressures. However, due to leaks and failures, seals and gaskets are often considered the weakest link in chemical processing systems. But seal manufacturers are strengthening this link via new materials and designs in an effort to make seals and gaskets as robust as the rest of the system.

"Processors are looking for seals and gaskets that can operate in more difficult environments with little or no failure," notes John Kerwin, materials technologist with Precision Polymer Engineering (PPE), Ltd. (Blackburn, England). "They need these components to work at a variety of temperatures and pressures and in more chemically aggressive environments. As a result, we, as manufacturers, must develop materials with broader operating ranges and better chemical resistance to extend the life of the seal and increase system uptime."

New materials and designs

In the past, a processor may have had a vessel or reactor that was used only for one process, but now many in the chemical process industries (CPI) need to use that same equipment over a broader range of applications in order to get more production from existing systems. "One reaction vessel might have only operated at one temperature with one chemical, but now it's expected to be used for a completely different range of temperatures with completely different sets of chemicals," explains Kerwin.

Typically, running a variety of chem-

icals at higher or lower temperatures would require engineers to use different seals on the equipment each time. "However, they can't take the time to change out the seals and gaskets between every run, so that means that those components have to be much more capable over a broader range of temperatures and chemicals," says Kerwin.

This situation is especially common in the extreme conditions of the oil and gas industry, he adds. For this reason, PPE has developed new, explosive decompression resistant elastomers. The EnDura family of elastomer seals handles temperature extremes, higher pressures and greater levels of hydrogen sulfide and other chemicals encountered during oil and gas processing. The FKM, HNBR and TFE/P materials offer a wide operating temperature range, from 45 to 225°C, as well as excellent chemical resistance and mechanical properties.

These characteristics should help increase uptime. Trials of the EnDura seals on a leading gas compressor model have shown that the elastomer lasts at least three times as long as existing seals, significantly reducing the incidence of seal failure, says Kerwin.

Outside the oil and gas industry, the need for seals that are compatible with a variety of chemicals, temperatures and pressures is often coupled with the requirement of maintaining a sanitary environment, says Colin Macqueen, director of technology with Trelleborg Sealing Solutions (Fort Wayne, Ind.).

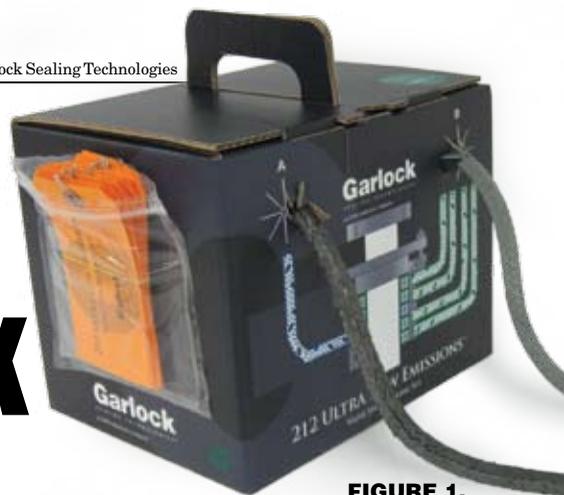


FIGURE 1. Style 212-ULE valve stem packing is said to outperform engineered sets, meeting global emission standards

Precision Polymer Engineering



FIGURE 2. The EnDura family of seals was developed to cope with temperature extremes, increasing pressures and higher levels of hydrogen sulfide in the oil and gas industry

While elastomer O-rings are a common choice for sealing in a multitude of applications, there is a risk of leaching, which leads to contamination, an unacceptable situation in many chemical processing applications. Elastomers can also deteriorate quickly when subjected to the aggressive media and gases in some systems, says Macqueen.

Turcon, the proprietary PTFE-based material from Trelleborg Sealing Solutions, provides an alternative sealing option where a sanitary environment is necessary. It has the benefit of being compatible with most chemical media, combined with wear resistance, high-friction characteristics and the ability to withstand extreme operating temperatures.

However, since PTFE has no elasticity, the Turcon Variseal product is energized with a spring fitted into the seal profile. In most applications the open spring of the standard Turcon

Variseal is acceptable. However, in some applications, where cleanliness is paramount, there is a risk of metal extractables entering the system, which can lead to contamination. For such cases, the company also offers an enclosed design in the form of the Turcon Variseal Ultra-Clean. In this design, the spring required to activate

the seal is fully enclosed within a Turcon case, allowing no metal extractables to enter the processing system.

In other sanitary applications, seals and gaskets must not only avoid contributing to contamination, but also must stand up to the stringent cleaning processes and chemicals present, notes Macqueen. "Cleaning regimes in

Saunders[®]
the science inside 

Since P K Saunders invented the original diaphragm valve in 1928, and founded Saunders Valve Co. five years later, Saunders has led the way in providing the highest standards of reliability, engineering and safety. The range has been continually expanded over **75 years** through innovation in both design and new materials technology. As a result the Saunders diaphragm valve has gained a widespread reputation for its versatility and established a presence in diverse process industry sectors.

See our
new products at
www.cranechempharma.com

75 years of science inside!

75

CRANE[®]

www.cranechempharma.com
© 2009 CRANE ChemPharma Flow Solutions

SEAL AND GASKET PROVIDERS

- A.W. Chesterton www.chesterton.com
- CoorsTek www.coorstek.com
- Diba Industries www.dibaind.com
- DuPont www.dupont.com
- Eagle Burgmann www.burgmann.com
- European Sealing Assn. www.eurosealing.com
- Flexitallic www.flexitallic.com
- Flowsolve www.flowsolve.com
- Fluid Sealing Assn. www.fluidsealing.com
- Garlock Sealing Technologies www.garlock.com
- Parker Page www.pageintl.com
- Precision Polymer Engineering www.prepol.com
- Proco Products www.procoproducts.com
- Reinz-Dichtungs www.reinz.de
- SKF USA, Inc. www.skfusa.com
- Trelleborg Sealing Solutions www.trelleborg.com
- W.L. Gore & Associates www.gore.com/sealants

the pharmaceutical and food-and-beverage industries are extremely stringent and often include a sterilize-in-place (SIP) practice," he says. In these instances, the long-term performance of standard FKM seals is limited. They tend to fail in steam at operating temperatures of 100°C, which is much lower than steam cleaning temperatures of 130°C. In addition, due to their vinylidene-based polymer composition, FKM's are acidic and show weakness in alkaline-based media.

With these issues in mind, Trelleborg began investigating the possibility of engineering an FKM material with a higher resistance to clean-in-place (CIP) and SIP regimes. To do this, two compounds were formulated based on a completely different polymer architecture, which combined with an elevated fluorine level, meant they had an almost non-polar structure. The resulting materials were Resifluor 500 and V8T41. Both materials have excellent steam resistance: Resifluor 500 withstands temperatures up to 150°C, while V8T41 is capable up to 170°C. In addition, Resifluor 500 demonstrates chemical stability with high-performance characteristics in both polar and non-polar CIP media, including the most aggressive solvents. Both products also have full compliance with FDA requirements, 3-A Sanitary Standards, USP Class VI and culminate in Cytotoxicity test-

Circle 15 on p. 56 or go to adlinks.che.com/23015-15

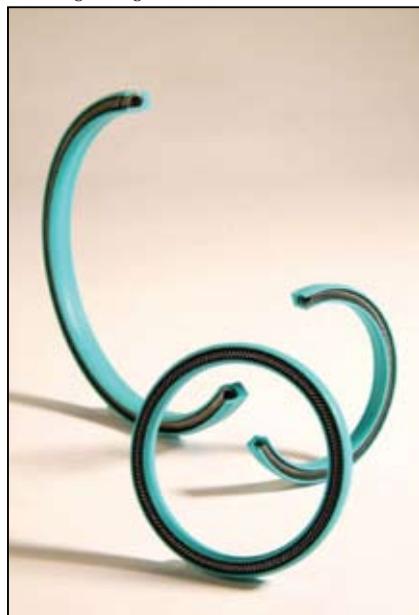


FIGURE 3. Designed to prevent contamination, the Turcon Variseal operates in extreme temperatures from -253 to 260°C and withstands high temperatures to enable use in a variety of applications where an ultra-clean environment is necessary

ing where suppliers must prove that products are completely non-toxic.

Recession-related challenges

Today's economy is putting additional pressure on seals and gaskets. Many chemical producers are postponing or shutting down processes in an effort to balance the supply of product with the lower demand, says Rob Haywood, product specialist with W.L. Gore & Associates (Elkton, MD). "Whenever you are shutting down and restarting a process, that creates a challenge for the seals to maintain those kinds of dynamic conditions and it requires a seal with high integrity to withstand repeated shutdowns and start ups," says Haywood.

To deal with this issue, Gore has been working to create expanded PTFE gaskets with improved creep resistance. "If the gasket technology can resist creep, it has a better chance of maintaining the seal during restarts," he explains.

The company now offers The Universal Pipe Gasket, as well as GR sheet gasketing, to help in this area. Used to seal all types of flanges in chemical process piping, the pipe gaskets are

unaffected by aggressive chemicals and deliver superior bolt load retention, which provides exceptional creep resistance for reliable sealing of steel piping flanges. The universal design allows them to be used in steel, glass-lined steel and fiberglass-reinforced plastic (FRP) systems.

Gore GR sheet gasketing provides

the benefits of conventional PTFE sheet without the creep and cold flow that is commonly associated with that material. The 100% expanded PTFE material is dimensionally stable, yet conformable, allowing it to compress into a gasket that creates a tight, long-lasting seal suitable for use with aggressive chemicals.

XOMOX[®]

See our
new products at
www.cranechempharma.com

NEW!

the science inside

Lined Ball Valve

- 1
New XOMOX[®] XLB offers an innovative stem sealing system, providing safety and long term fugitive emission control under extreme conditions
- 2
Dynamic body joint design
Retains pressure boundary during thermal cycles
- 3
Lower torque
Smaller actuators, reduced costs, space saving

CRANE

www.cranechempharma.com
© 2009 CRANE ChemPharma Flow Solutions

Know Your Flow

FCI Flow Switches and Flow Alarms



Ensuring fluid flows in industrial processes means increased productivity, reduced shutdowns, and product quality assurance. FCI has more than ten different models with thousands of configurations to provide a flow switch or flow alarm optimized for your application.

- Liquids, Gases, Slurries
- No Moving Parts
- Single and Dual Alarm Models
- Applications to 850°F (454°C)
- Widest Selection of Wetted Materials
- Built-in Temperature Compensation
- Full Instrument Agency Approvals
- 3-Year Warranty
- DC, AC and 4-20 mA Loop Powered Versions
- Unique Non-Intrusive Insertion Model

Learn How FCI Flow Switches Can Solve Your Applications Today. Visit:

www.fluidcomponents.com/ProdFlowSwitch

FCI FLUID COMPONENTS INTERNATIONAL LLC

1755 La Costa Meadows Drive
San Marcos, California 92078 USA
Phone: 760-744-6950, 800-854-1993

Persephonestraat 3-01
5047 TT Tilburg,
The Netherlands
Phone: 31-13-5159989

Newsfront

Regulations/designs

Tightening environmental regulations are also affecting seals. "It used to be that the processor would fix the seal when it leaked, but that is no longer acceptable as environmental regulations grow more stringent," notes Trelleborg's Macqueen. "Because of this, chemical processors need seals and gaskets with proven long life."

Jim Drago, manager of business development with Garlock Sealing Technologies (Palmyra, N.Y.), agrees that this is a growing issue for CPI. "The EPA [U.S. Environmental Protection Agency (Washington, D.C.)] is really starting to level their gaze on the chemical processing industry, much in the same way they did with hydrocarbon processors and [petroleum] refineries in the recent past," he says. "At the same time there is a real push from the regulators regarding leak detection and repair programs. Leaks can no longer just be monitored, they must be sought out and eliminated."

Now, he says, it is up to seal manufacturers to provide the latest technologies in seals so that leaks are no longer an issue. "The products must come with guarantees and warranties so processors have some sort of assurance that the seals they are using will meet regulations."

One such product includes Garlock's Style 212-ULE, a new ultra-low emission, high-temperature, valve-stem spool packing designed to simplify leak detection and repair in both the hydrocarbon and chemical process industries. Tested by a hydrocarbon processor, the packing delivered emissions performance of less than 20 ppm average leakage, according to Garlock.

Able to withstand operating temperatures of -200 to 1,200°C in steam and non-oxidizing environments and up to 455°C in media containing free oxygen, the valve stem packing has

W.L. Gore & Associates



FIGURE 4. Gore GR sheet gasketing is made from 100 percent ePTFE, providing a level of high-temperature and blowout resistance while preventing creep and cold flow



FIGURE 5. Unaffected by aggressive chemicals, Gore Universal Pipe Gaskets combine all the properties of ePTFE with exceptional sealability, bolt load retention and creep resistance

a maximum pressure rating of 4,500 psig and a pH rating of 0-14, except for strong oxidizers.

"This is such an environmentally valuable product for processors because research has shown that 60% of the leakage of VOCs in chemical processing plants comes through valve stems," says Mike Faulkner, product manager with Garlock. "This product will help them chase down and eliminate the biggest contributor to the problem."

This improvement and the others mentioned above are helping chemical processors to run their equipment for the longest possible time between repairs in a continually changing and challenging processing environment without the additional burden of seal contamination, leakage or failure.

"These are all things that come down to dollars at the end of the day, and seals and gaskets are evolving in such a way that they actually will help processors extend the time between refitting these components in their equipment," says Macqueen. ■

Joy LePree