Manufacturing Innovation Insider Newsletter

Hi-Tech Gaskets Slash the High Costs of Failures and Repetitive Replacement

The cost of the gasket is not the question. When it comes to making intelligent choices about replacement gaskets, the key question is: Do you want this problem to go away?

As the manufacturing and process industries struggle to trim costs, there is an ever-shrinking margin for inefficient or stopgap maintenance techniques. Successful managers are raising their maintenance standards in order to extend uptime and avoid maintenance crises that choke production.

Gaskets are a good example of a relatively low-cost item where improved standards can prevent repetitive maintenance problems. Chronic leaks and blowouts of heat exchanger gaskets, for example, can bring an entire process down. A definite need for improved gasket protection becomes apparent when downtime per failure is considered. This can be particularly true of applications where gaskets are viewed as industry-standard, no-brainers – yet where leaks, unsatisfactory service life and time-consuming labor are endured as acceptable evils that are inherent to "difficult" sealing applications.

With a profusion of process-critical applications throughout industry – heat exchangers, pumps, boilers and innumerable pipe flanges – gaskets are often viewed as commodity items that are unfortunately problematic, requiring frequent servicing and replacement. Today it is becoming intolerable that conventional gaskets are often the cause of process interruptions, maintenance labor, expensive gaskets inventory requirements, and safety and environmental issues.

"Gaskets have been failing prematurely forever," says Gary McCoy, Business Development Manager, A.W. Chesterton Global Marketing Department. "In many applications they are subjected to high pressures, thermal cycling, vibration and other stressful conditions. With often hundreds of gasket installations throughout a plant, many premature failures cause expensive process disruptions or other problems. Yet, in too many cases, the failed gaskets are simply replaced with the same model."

Leak-proof, blowout-proof gaskets provide major savings for manufacturing and process operations.

McCoy is a proponent of a new generation of gasket technology, a high-tech, flexible graphite-encapsulated stainless steel design that solves many problems that are inherent to gasket applications on stationary equipment.

"One of the major advantages of a graphite-stainless steel gasket is its ability to go through temperature cycles," McCoy explains. "This is a very thin (approx. 1/32 in.), convoluted stainless steel gasket with a graphite sealing medium on both sides that you compress to the thickness of the gasket metal. We now use this technology in many applications where spiral wound gas-

kets were traditionally used."

Chesterton, a renowned worldwide supplier of mechanical seals and packing products to the petrochemical, pulp & paper, shipping and other industries, frequently recommends the graphite-encapsulated stainless steel gasket marketed under the SteelTrap™ brand. These gaskets are manufactured by Sealing Corporation ("Selco"), North Hollywood, CA.

"For years and years we used the standard gaskets on our main steam drums and our lower water wall headers," says Stuart Bussman at Trans Alta Power, Centralia, WA. "After six cycles, we had to replace them. There are 20 gaskets on each unit, so it was an expensive and time-consuming proposition. Plus, they want them done fast." After successfully testing a graphite-stainless manway gasket in a boiler, Bussman says he decided to try SteelTrap gaskets for the main drums. "We're very pleased with the performance of these gaskets. We've had no cycling problems and the overall cost savings has been very substantial."

Cost is often the issue when gaskets are specified. When compared with spiral wound gaskets, the graphite-stainless technology is similar in cost, but offers substantial savings in other ways. For example, if you live load a SteelTrap gasket, Chesterton and Sealing Corporation will guarantee it for three years of leak-free service. "Whether it's a static application or a temperature cycling application, if it's live loaded, it will be covered by the warranty. No one else in the industry will do that," says McCoy.

At a Texas refinery Chesterton installed graphite-stainless gaskets on over 300 valves. Over a three-year period approximately 20 of those valves required servicing. So, the user not only got at least years of worry-free service life, but any incidental problems were serviced by the supplier.

"The cost of the gasket is not the question," says Vance St. Jean, Sales Manager for Chesterton in Houston, TX. "Your costs aren't really dependent on the sealing device. Your costs are associated with changing it out - the labor, the downtime, the process disruptions and the other problems. Once I explain that to one of our refinery customers, they agree with me. Doing it right might be worth thousands of dollars, or it might be worth millions of dollars. It depends on the situation."

"The graphite-stainless gasket is also much more forgiving in terms of poor bolting procedures and imperfect conditions of flange plate surfaces," McCoy adds. "Unlike other gaskets that creep or cold-flow under load, and you lose gasket volume, the SteelTrap eliminates that problem – takes it to zero. Because of the convolutions of the metal, the sealing material is trapped on all sides by metal. That's where the gasket got its name."

McCoy adds that many gaskets can be attacked by the sealing medium. Flexible graphic is a very durable sealing medium, but some chemicals will attack it. In those applications the graphite is replaced with PTFE, as long as the application is within PTFE's temperature limitations. "If you have a chemical application that requires PTFE, then you have always lived with creep relaxation, or cold-flow, and consequential sealing loss" says McCoy. "But with the SteelTrap there is no more concern for cold-flow or creep relaxation."

Spiral wound gaskets are designed for use within specified pressure ranges. Since most users have different pressure ranges throughout their plants (e.g.150, 300, 900, 1200, 1500 PSI) that means you need different gasket for each size of gasket you need within each of those pressure ranges. That's a lot of inventory. Because the equivalent graphite-stainless gasket is self-locating and applicable to pressures ranging from 150 to 2,500 PSI, the inventory requirement is much lower. "A tremendous cost savings to the customer," says McCoy.

St. Jean adds that older gaskets technologies such as the ever-popular spiral wound gaskets are still appropriate for a lot of routine applications. "The graphite-stainless gasket is a superior one for many applications," he says. "You can live load a SteelTrap gasket, put springs on both sides of the stud, and you're done. The heat exchangers I've put them in – they were all high temperature applications running at 1000-1100 degrees, and they seem to perform well."

Heat exchangers may be the quintessential test for gasket technology, with opposing temperature zones, and differing loads on both sides the gasket. The resulting stresses translate into a "live load" requirement that too often results in frequent service, including gasket changes that are cumbersome and time-consuming.

"Heat exchangers are engineered-to-order equipment," says Ron Shipman, Chief Engineer at Fabsco Sheet & Tube, Tulsa OK. "At one time we had some leaks in our exchangers, but they had been mainly due to high temperature, high pressure, and cycling service conditions. That's where we elected to use the Selco SteelTrap gaskets, and they have worked well for us. Very seldom do I have a case that won't fix. If I have severe cycling, like in power plants, there's nothing short of welding that can solve their needs, but we do the next best thing with SteelTrap gaskets."

George Pyros, an engineer with power systems giant Siemens Westinghouse agrees. "These gaskets have proven to be a successful solution to preventing leaks in several heat exchangers," he says. "They prevent leakage whether of the gas or the water from the heat exchangers, which are typically used on combined cycle power plants."

While reasonably priced compared with spiral wound gaskets, the graphite-stainless ones are considerably more expensive than standard compression gasket material.

"But that requires cutting," McCoy says, "and perhaps 60% of the material is wasted. Also, you have all the added labor time and cost. Plus, many of the compression gasket materials that are manufactured today have binders in them, and the binders can be attacked by the sealing media. When that happens, the gaskets lose volume and the ability to hold the seal. So, the price difference has little to do with the outcome."

"One application we had was constantly leaking," says Jim Lawrence of Sealing Resources, Sylvania Ohio. "It was a flange on a valve sealing nitric acid at about 130 degrees (F) at a major chemical processing plant. For this application, anything they tried failed immediately. The current solution for this application was a spiral wound PTFE gasket, and it was constantly leaking. We've had great results with the graphite-stainless gasket, so we made the change to that. We also live loaded them with Chesterton 5500 flange disc springs. Now they've gone through two thermal cycles with no failure. They're running 24/7, and now we're looking at converting the entire plant to that sealing solution."

Offering an advanced gasket that provides low seating stress and a thermally stable seal that is fire safe, blowout safe and requires no re-torquing would appear to be a slam-dunk solution at most industrial plants.

"A gasket purchasing decision may come down to: 'Is the problem bad enough . . . are they leaking enough?' But the real question is, do they want the problem to go away?" says St. Jean. "We've had a lot of success with the SteelTrap at refineries that do a lot of hot oil pump suction and discharge valves, where they have a lot of cycling. Unlike some customers, those guys are aware of problems – when there is oil dripping on the ground, or when there are fugitive emissions problems. So maybe they're more likely to want to fix it right."

Another important advantage of advanced graphite-stainless gaskets is the ability to deal with imperfect mating surfaces.

"This is particularly true when you're dealing with hot surfaces," says Greg Gravenmeir at Sealing Specialists of Missouri. "The graphite-stainless design is one of the better gaskets you can use. With the corrosion and pitting that can damage flange surfaces, and Selco's ability to move the sealing ring to different positions on the gasket face, it enables you to put that ring into a position that may be more advantageous. In some instances that might allow you to use a heat exchanger that is not in the best condition."

Bolting, including proper torquing, is extremely important to the success of any gasket. Proper bolting techniques are sometimes overlooked in industry today, which has resulted in poor gasket sealing. "That is another benefit of the graphite-stainless gasket technology - the gasket is much more forgiving for poor bolting procedures," says McCoy. "Thicker standard gaskets are more susceptible to blowing out if they are not bolted down correctly."

For more information about Selco Seal products, contact Sealing Corporation, 7353 Greenbush Avenue, North Hollywood, CA 91605; Phone (800) 300-SEAL, (818) 765-7327; Fax (818) 765-8634; E-mail: Mellowrey@SelcoSeal.com; Visit the web site www.selcoseal.com.