SEALING SENSE

Q. *What gasket thickness should I use in my pump system?*

A. The question of proper sheet gasket thickness for a particular pump system application comes up frequently, but is difficult to answer easily. "Should I use 1/16-in or 1/8-in thick gaskets?" sounds like a simple question. We wish it were.

Thicker gaskets handle more flange irregularities because they compress more. If flanges are corroded or uneven, a thicker gasket might be needed. The better solution is to fix the flanges, but that's not always realistic. So why is thinner better?

Most gasket manufacturers recommend using thinner gaskets wherever possible. Thin gaskets offer many advantages:

Higher blow-out resistance due to the smaller surface areas exposed to the internal pressure.

Lower leak rates due to the smaller surface areas.

Better torque retention in the fasteners, due to the lower creep relaxation characteristics of thinner gaskets.

Lower cost of the gasket itself.

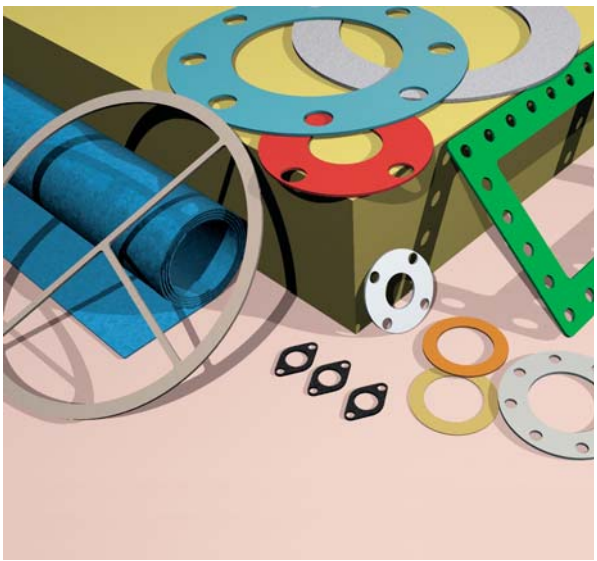
"Wherever possible" is difficult to define here. It is not always possible to use thin gaskets. Thicker gaskets conform better to badly damaged or warped flanges, because a gasket's ability to fill flange irregularities is based on the amount of gasket compression at a given load.

Since compressibility at a particular load is expressed as a percentage of the gasket's original thickness, a thicker gasket with a larger original thickness actually compresses a larger distance. For example, 10 percent compression of a .063-in gasket means a compression of .0063-in, or just over 6-mil. In a 10 percent compression of a .125-in gasket, the gasket will compress over 12-mil. This extra gasket compression means the thicker gasket will fill-in deep scratches or low spots better than a thinner gasket.

However, the apparent advantages of using a thicker gasket can be misleading.

While the thicker gasket seals more flange irregularities, it can lead to more problems down the road. The higher creep relaxation means the pump system user may need to re-torque the fasteners to maintain adequate compressive load on the gasket over the life of the joint.

This situation compounds by the increased gasket surface area exposed to the internal pressure, which actually creates higher total forces trying to push the gasket out of the joint. Thicker gaskets appear as "taller" surfaces to the pressure, meaning a larger surface area (pounds per square inch multiplied by greater square inches yields greater pounds of force). Thinner gaskets present a smaller surface area to the pressure, meaning there is less outward force on the gasket.



Friction between the gasket and flange is one of the principle factors determining the pressure capability of the bolted flange joint. Friction is a combination of the friction factor between the gasket and flange surfaces and the total bolt load. Because thin gaskets have lower creep relaxation, the joint retains more bolt load. Less force outward and higher friction forces translate into better blowout resistance!

Lastly, since all gasket materials are permeable

to some degree, media can pass through the body of the gasket.

Thicker gaskets create a wider path for permeation to occur, and therefore higher leak rates. Note also that the reverse can also occur. If a gasket is too thin to conform to flange irregularities, the media can leak over instead of through the gasket, and the leak rate could be higher than with the thicker gasket. Thinner gaskets present a narrower path for permeation.

Flanges that are flat enough to handle the thin gaskets seal tighter with the thin gasket. If the flanges are not flat, however, the thin gaskets might actually leak more!

Flanges requiring thicker gaskets create problems that a gasket manufacturer cannot control. The best solution is to use or design flanges with higher available compressive loads, keep the finish in good condition, and use 1/16-in or even 1/32-in thick gaskets.

Pump system users who design flanges for conventional compressed non-asbestos sheet should consider using the higher "M & Y" factors for 1/8-in in their design calculations, but install 1/16-in thick gaskets. These suggestions eliminate some of the most frequent causes of joint failure with this type of gasket material.

The type of sheet gasket material, and the compressive load available, also affect the thickness required to seal a particular joint. Gaskets with higher ASTM Standard F36 compressibility values will not require the same thickness as harder, less compressible types.

Fortunately, there are some rules of thumb. Standard ANSI RF (raised face) flanges in as-new condition typically handle 1/16-in gaskets, up to 24-in diameter. Many users switch to 1/8-in for larger diameters. Gaskets for FF (flat faced) flanges are often 1/8-in, since those flanges are often thinner and less flat. Rubber gaskets for FF flanges are typically 1/8-in thick, again due to less rigid flanges. Thicker gaskets can be very successful; some gasket manufacturers recommend higher installation torques when using thicker gaskets.

Less than perfect flanges normally need to be sealed. This is usually accomplished by carefully considering all the variables in the application when selecting the style and thickness of a gasket material. Consult your gasket supplier for specific guidance on any pump system application. Proper installation is, as always, essential. As noted below, the FSA has a number of industry-developed publications designed to assist with resolution of gasket issues, from selection to installation. **P&S**

Next Month: How do you choose between all the various types of gasket materials?

We invite your questions on sealing issues and will provide our best efforts to answer based on FSA publications. Please direct your questions to: sealingquestions@fluidsealing.com.