

To: General Distribution Date: June 25, 2018
From: Applications Engineering cc:
Subject: Gasket removal and installation

Gasket removal and installation

The gaskets that keep flanged joints in piping systems from leaking are relatively low-cost, but high-consequence components that can spell the difference between efficient, profitable operations and unscheduled outages, lost production and penalties for non-compliance with environmental regulations. However, they often do not receive the attention they warrant

Gaskets perform two basic functions – 1) creation of an initial seal and 2) maintenance of that seal over an extended period of time. To perform these functions effectively, the gasket must retain its integrity during handling and installation, and be sufficiently deformable to flow into imperfections in flanges. Gaskets must also be strong enough to resist crushing under applied loads and blowouts under system pressures.

Moreover, gaskets in flanged joints have to be chemically compatible with system fluids, withstand extreme temperatures, be resilient and have sufficient creep-resistant to maintain adequate load. It is important that the gasket not contaminate the system or promote corrosion of the seating surfaces, and can be easily and cleanly removed at the time of replacement.

Removal of spent gaskets can be a tedious, laborious, and sometimes dangerous task that could result in damage to the equipment and even injure workers. Flanged joints are often in difficult-to-access areas that require working in awkward positions in confined spaces near other equipment that can result in burns and other injuries. In addition, flanged joints can be hard to separate, making it difficult to see where the gasket is located and remove it when the gap between the flanges can be ½" or less.

Under such conditions it is not uncommon to have gaskets installed over old gaskets, or piece of the old gasket that were not removed. This is not a recommended practice, but does happen. Unfortunately, even a small fragment of gasket left on a flange can make it impossible for the new gasket to conform properly, resulting in an immediate leak or a blowout. Besides

causing premature gasket failure, such fragments can break loose from the flange and contaminate the fluid in the system or impair the performance of downstream equipment such as pumps and valves.

Avoid use of lubricants or other gasket treatments

In some cases, installers apply bolt-thread lubricants to gaskets to facilitate removal. If the gaskets contain non-oil-resistant binders (i.e. SBR, EPDM, etc.), such lubricants can chemically attack them, soften the binders and reduce the crush strength of the gasket. Even when compatible with the gasket, these lubricants also reduce the friction between the gasket and flange faces causing them to extrude and eventually blowout. Metal particles in the lubricants can bond to flanges and fill in surface serrations that bite into the gaskets and hold them in place. In addition, the lubricants can enter the process stream and contaminate the system fluid. Lastly, if the service operates at elevated temperatures the oil/grease in the lubricant can bake off, leaving a problematic void between the gasket and flange faces.

Some installers use caulk or RTV (room temperature vulcanizing) silicone to affix gaskets to flanges or to compensate for damaged or irregular flange surfaces. However, most caulks and RTV silicone contain acetic-acid-based cure systems that can attack elastomeric gaskets and gaskets containing rubber binders. Because of their lubricity, caulks and RTV silicone can also cause gaskets to shift within the flange assembly and, as with the thread lubricants discussed above, can lead to the same loss of friction, reduced crush strength and reduced blowout resistance. If an installer needs to “stick” a gasket in place during installation, spray adhesives, such as 3M 77, can be used. However, the adhesive should be sprayed VERY sparingly on the flange face, and allowed to gas off before the gasket is applied.

Many gaskets, except those made of PTFE which do not require it, are coated with anti-stick agents. If the installer feels it is necessary to apply additional products to the gasket to prevent it from sticking to the flange, it is always advisable to use a light coating of a dry material, such as talc, graphite or mica. Metallic-based agents should never be used because, as with certain lubricants, metal particles may accumulate in surface serrations, making the flange surface too smooth to be effective.

All Garlock compressed sheet products (with the exception of 120” x 120” and 150” x 150” size sheets) are coated with a proprietary, anti-stick agent called FLANGE-FREE™. The

new material is a high-temperature, inorganic coating that dramatically reduces the time and effort required to remove gaskets after extended service at elevated temperatures. In most cases the gasket can be removed in seconds versus hours and with just a fraction of the force required to remove untreated gaskets. Unlike most anti-stick agents, the FLANGE-FREE™ is bonded to the surface of the gaskets and does not contain chemicals that can cause them to crack or otherwise degrade.

In the process of developing FLANGE-FREE™, it was learned that the binders in compressed sheet gaskets act as viscoelastic materials that tend to flow at elevated temperatures and pressures. As the binders ‘wet out’ and make intimate contact with the metallic face of a flange, chemical adhesion, mechanical interlocking and other modes of adhesion come into play. The new anti-stick compound acts as a barrier that significantly reduces the binder’s ability to ‘wet out’. Because the gaskets can be removed intact, proper disposal becomes easier as well.

Proper gasket removal

Replacement of used gaskets begins with the removal of all flange fasteners, including bolts, studs, nuts and washers. All fasteners should be inspected, and if any are found to be worn, corroded or otherwise damaged they should be replaced. The flanged joint should be carefully opened using a special flange spreading tool or soft wedges so as not to damage the flange seating surfaces. The old gasket can then be removed.

This is best accomplished by using an aerosol gasket remover or, if necessary, a brass scraper that will not nick, scratch or gouge the flanges, the surfaces which are critical to achieving the necessary friction for an effective seal. After removal of the old gasket, the flange facings should be inspected for imperfections that can adversely affect the new gasket’s ability to seal. If surface damage exists, it may be necessary to re-machine or replace the flange.

Acceptable surface finishes should range between 125 and 250 micro-inches.

Flanges should be free of foreign material. Residual debris can be removed from the serrations by cleaning the surface of the flange with a brass wire brush in a rotary, not linear motion. After the old gasket has been removed and the flange faces cleaned and conditioned, the replacement gasket can be installed.

Selecting the new gasket depends upon a number of variables. Whenever possible, thinner gaskets should be used unless the flanges are warped, bowed or severely pitted, in which

case a thicker gasket will be needed to compensate for these irregularities. It should be noted, however, that thicker gaskets require higher compressive loads. Fiber, PTFE, graphite and metal gaskets typically require higher compressive stresses in order to seal properly (3600 to 4800 psi). These products are also able to handle high compressive stresses (10,000 psi to 40,000 psi), which make them ideal for ASME Raised Face (RF) flanges. Elastomeric (rubber) gaskets seal at very low stresses (200 to 600 psi), but are unable to handle high compressive stress (900 to 1200 psi maximum), which makes the products ideal for ASME Flat Face (FF) flanges made of soft or brittle material, such as cast iron, fiber reinforced plastic (FRP), or PVC.

Once the replacement gasket has been selected, it should be inspected for correct I.D., O.D. and appropriate thickness. If it has cracks, gouges, folds or other surface damage, it should not be used. For ease of installation, all fasteners should be lubricated with an oil-and-graphite mixture or other suitable thread lubricant, being careful not to allow it to come into contact with the gasket. Flanges with vertical seating surfaces should have at least two fasteners inserted into the bottom holes to support the gasket.

Proper gasket replacement

The gasket can now be inserted between the flange seating surfaces. To avoid damaging the gasket, do not use an instrument to push it into place. The flange spreader can then be carefully removed, allowing the flanges to come together, and the remaining fasteners inserted and tightened or “snugged”.

The pattern in which the bolts are tightened is extremely important. If done improperly, the flange can move out of parallel. Refer to the gasket manufacturer’s literature to determine the appropriate bolting pattern for the application. Using calibrated torque and box-end type wrenches, tighten each fastener to no more than one-third of the desired torque value to uniformly compress the gasket. Repeating the same pattern, increase the torque wrench setting to two-thirds of the desired value. The final step of gasket installation that is commonly overlooked is the retorque, which should be performed ideally 12-24 hours after initial installation. However, if it is not possible to wait 12-24 hours before the system is started / pressurized, retorquing an hour or two later can still be beneficial. Garlock does NOT recommend retightening flange assemblies once the system is pressurized. Doing so can be dangerous, and could potentially result in a leak or blowout.