# SEALING SENSE

**Q. How do you select and install the right gasket?**

**A. With the increasing concern for safety and environmental issues, reducing leaks from flanged assemblies for piping into and out of a pumps and valves has become a high priority. This should be taken into consideration at the time of installation to prevent more serious impact on the operating pump system later on. Never has it been more important to choose the correct gasket material, install it and maintain it to ensure optimum performance.**

## Selection

With the diversity of gasket materials available in the marketplace, it becomes challenging to find the product that will meet the specific demands of any given application. More effective selection of the best product begins with an initial assessment of conditions.

Four basic conditions must be considered when selecting a gasket material:

- Operating conditions
- Nature of the media and chemical compatibility
- Flange design
- Environmental or regulatory issues

The operating conditions include parameters such as pressure and temperature, as well as their fluctuations. If the system is subject to severe pressure spikes or thermal cycling, these things can adversely affect the performance of a gasket material that otherwise would perform adequately. Vibration also has to be considered.

Chemical compatibility of the gasket material with the fluid media must be addressed, too. What is the nature of the media? Is it is a gas, a liquid or a combination of both? In addition, chemical properties such as pH and concentration must be taken into account. The gasket material must not contaminate or be chemically attacked by the sealed product. The affect of temperature fluctuations on dew point excursions also may have to be considered, since they can increase the aggressiveness of the media. In critical applications, it may be necessary to perform laboratory tests to simulate the operational conditions and thereby assure chemical compatibility.

The flange design plays a very important role in selection of the gasket material. Plastic, FRP, glass or other fragile flange material will require a gasket material that seals with low bolt loads. Gasket selection for these flanges differs from that for metal flanges at high pressures where the bolt load must be high to assure sealability. Flange geometry is another important consideration.Tongue-and-groove flanges can apply high seating stress when compared with full-face flanges. The sealing surface finish and its condition, such as the existence and extent of pitting or corrosion, warping or rotation, also can determine the selection of the best gasket material. The number of bolts, bolt material and, consequently, the bolt load also will influence selection.

Environmental and regulatory issues must be carefully analyzed. There might be standards or regulations that prevent the use of certain types of gasket materials in a given application. Examples of such applications include where a fireproof material is mandatory, or where a food or pharmaceutical is being sealed and an FDA-compliant product is required.

Many gasket failures result because these four basic steps were not considered. With proper analysis of the application, a major step will be made toward selection of a gasket material that will perform reliably in service.

## Installation

Once adequate attention has been given to all aspects of gasket selection, proper installation is necessary for the ultimate success of this component in a bolted joint.

One of the most common causes of leaky joints is improper gasket installation. The following gasket installation procedures can be useful for all bolted flange connections:

1. *Inspect the gasket.* It is important that the correct gasket has been chosen. Verify that the material and design is as specified, and visually inspect the gasket for any obvious defects or damage.
2. *Inspect the gasket seating surfaces.* Look for tool marks, cracks, scratches or pitting by corrosion. Radial tool marks on gasket seating surfaces are virtually impossible to seal, regardless of the type gasket used. Therefore, every attempt should be made to minimize these.

3. *Use only new studs or bolts, nuts and washers.* Make sure they are of good quality and appropriate for the application.
4. *Lubricate all thread contact areas and nut facings.* The importance of proper lubrication cannot be overstated! A proper lubricant will provide a low coefficient of friction for more consistent bolt stress. An anti-seize compound, when used as a bolt and nut lubricant, will facilitate subsequent disassembly.
5. *Loosely install stud bolts.* With raised-face and flat-face installation, loosely install the stud bolts on the lower half of the flange. Insert the gasket between the flanges to allow the bolts to center the gasket on the assembly. Install the remaining bolts and nuts and bring all to a hand-tight or snug condition. In a recessed or grooved installation, center the gasket midway into the recess or groove. (If the joint is vertical, it may be necessary to use a minimum amount of cup grease, gasket cement or some other adhesive compatible with the process fluids, to keep the gasket in position until the flanges are tightened.) Then, install all bolts and nuts to a hand-tight or snug condition.
6. *Identify the proper bolting sequence and number bolts accordingly.* Each bolt should be numbered so that bolt torque sequences can be easily followed. Failure to follow proper bolt torque sequences can result in cocked flanges. Then, regardless of the amount of subsequent torquing, flanges cannot be brought back to parallel. This can contribute heavily to a leaky joint.
7. *Torque the Bolts.* Bolts should be torqued in a proper bolting sequence, in a minimum of four stages, as specified in Steps 8, 9, 10 and 11.
8. *Torque the bolts up to a maximum of 30% of the final torque value required following the recommended bolt torque sequence.*
9. *Repeat Step 8, increasing the torque to approximately 60% of the final torque required*
10. *Repeat Step 8, increasing the torque to the final torque value.*
11. *Retorque all studs*. All studs should be retorqued with a rotational pattern at the final value of torque until no further rotation of the nuts can be achieved. This may require several passes, as torquing of one stud typically causes relaxation in adjacent studs. Continue torquing until equilibrium has been achieved.
12. *Some flange joints should be retightened just before being put in operation, to compensate for bolt and gasket relaxation.* Success also has been reported with heat exchangers, with certain gasket types and flange facings, when bolting is retightened during initial heat-up, before loss of lubricant (or bolt seizing).

*Next Month: Potential problems and solutions for application of spiral wound gaskets in pumping systems.*

*Sealing Sense* is produced by the *Fluid Sealing Association (FSA)* as part of our commitment to industry consensus technical education for pump users, contractors, distributors, OEMs and reps. As a source of technical information on sealing systems and devices, and in cooperation with the *European Sealing Association (ESA)*, the *FSA* also supports development of harmonized standards in all areas of fluid sealing technology. The education is provided in the public interest to enable a balanced assessment of the most effective solutions to pump systems technology issues on rational Total Life Cycle Cost principles.

The *Metallic Gasket and Nonmetallic Gasketing* divisions of the *FSA* are two of six with a specific product technology focus. As part of their mission, these divisions develop publications such as the *Metallic Gasketing Technical Handbook,* as well as joint *FSA/ESA* publications such as *Guidelines for Safe Seal Usage - Flanges and Gaskets and Gasket Installation Procedures.* These are primers intended to complement the more detailed manufacturer's documents produced by the member companies.

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