FLUID SEALING ASSOCIATION FSA

From the voice of the fluid sealing industry

SEALING SENSE

What are the most important considerations before and after ordering a nonmetallic expansion joint?

This month's "Sealing Sense" was prepared by FSA Member Bruce Stratton.

Nonmetallic expansion joints for piping systems are often neglected when planning ahead for an upcoming outage or standard preventative maintenance plan. They are a product that seems to fall between what is typically defined as an engineered item and a commodity item. Therefore, there always seems to be a scramble at the time of replacement.

Figure 1. Verifying the lateral offset

Before Ordering

Some important considerations before ordering an expansion joint for replacement should be:

- What is the visual condition of the joint? Is there cracking, leaking, soft spots, etc.?
- What is the age of the joint?
- What are the physical dimensions (face-to-face, angular, lateral or torsional offset)?
- What are the service conditions of the application (media, temperature, pressure and movement)?

These are all important to consider and can be determined by a good field survey. A complete field survey can save money and grief during and after installation, including future down time. Visual examination of the joint being replaced and its length of service provide insight for selection of the best replacement. For example, damage from chemical attack, over elongation and premature deterioration can signal the need for changes in materials or design.

Installation cost can be reduced based on the field survey. The manufacturer can produce the optimum joint size to fit your opening. This will allow the joint to be installed stress free without the use of alignment pins, "come-a-longs" and the brute strength of your maintenance team. With the proper joint size more than 50 percent of your installation labor time can be saved.

Joint Size

To reduce future downtime, make sure that both the proper joint size for the opening as well as the correct style of joint for its service condition are chosen. The proper joint size ensures that some or all the compression, elongation or lateral movement capability is not consumed at installation. This condition would impair the ability of the expansion joint to accommodate the intended movement. For example, an expansion joint with a standard 8–inch inside diameter (ID)

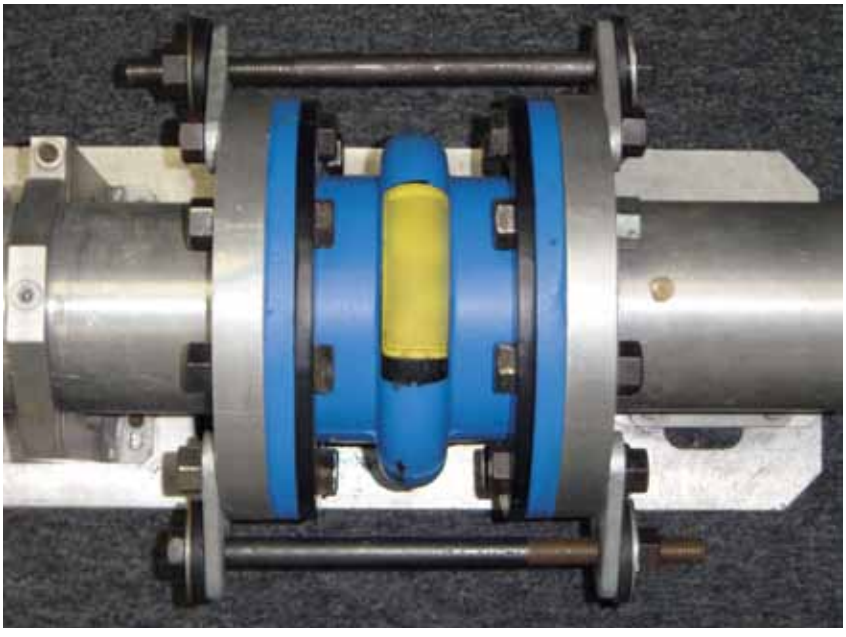

Figure 2. Properly installed joint with control rods

x 6–inch face-to-face (FF) and an opening of 8-inch ID x 6 ½-inch FF. We assume that the joint has a movement capability of 1 inch of compression, ½-inch elongation and ½-inch lateral. During installation, this joint would have to be pulled ½ inch in elongation. This leaves no more movement capability in elongation, and the system is not yet in operation.

Joint Style

The correct style of expansion joint is also key for optimal performance and service life. The main aspect is not to assume that the expansion joint currently in service is necessarily the correct one or even the best possible one. The field survey information and design specifications will determine what the pressure, vacuum, temperature, media, size and movement requirements are. From this information, the proper expansion joint can be selected and ordered.

Installation

Once the correct style and size of expansion joint is determined and it has been ordered and received, it must be properly installed. Without proper installation, all the front-end field survey work that was performed could be negated in an instant.

Most nonmetallic expansion joints are supplied with a full-face flange (rubber and fabric construction) with split retaining rings (typically in a plated steel construction). Proper installation of the expansion joint can seem pretty basic but, if not followed correctly, could result in a leaking joint or could even lead to premature failure.

Here is a basic sequence for properly installing an expansion joint:

1. Verify that the pipe flanges are in good condition (basically flat and smooth). Then place the expansion joint in the pipe opening. If it is a tight fit and a lubricant is needed, most manufactures would recommend a solution of graphite in water or glycerin, but check with your manufacture to be sure.
2. Take one segment of the retaining rings with a bolt or stud, nut and (2) washers. Place the bolt through the middle hole of the retaining ring and put it in place. Do NOT tighten at all, leave it very loose. Repeat for the rest of the retaining rings. Then place all the other nuts, bolts and washers in the joint

and only hand tighten. Note: bolts should be assembled from the expansion joint side as opposed to the pipe flange side.

3. Most manufactures recommend torquing the expansion joint by the visual budge in the outside diameter of the expansion joint rather than by a set torque value. This is because the construction of these joints can vary. Many rubber compounds jave different thicknesses and hardness, and a number of different fabrics are used. Typically, three rounds of tightening are required to achieve the proper bulge in the (outside diameter) OD of the joint to achieve a properly sealed joint. Using a standard star pattern, start with a bolt from the center of a retaining ring segment (leaving the retaining ring splits for last). After the first round of tightening, make sure all the retaining ring splits are tight with no more than a 1/8-inch gap. While completing the three rounds of tightening using the star pattern, ensure that a consistent bulge is created in the OD and all the retaining ring splits are kept within 1/8 inch. If this is all complete, the system is ready for start-up.

Maintaining the Seal

Check the bolt tightness at least one per week after installation regardless of whether the system has been running. As with any rubberlike material, it will relax after a period of compression and the bolts can loosen requiring a retightening. It is particularly important to check bolts during temperature cycles or during shut downs.

After the installation is complete and the system is in operation, a regular inspection of these joints should take place. It doesn't need to be a major undertaking, just a quick visual inspection whether it's once per year or once per month for more demanding/critical applications. This will help achieve the optimum service life of the rubber expansion joints in a plant.

Conclusions

These considerations before and after ordering a nonmetallic expansion joint will help your next project run even more smoothly with a properly fitted expansion joint that has the best service life possible. Consulting with your expansion joint manufacturer for technical assistance will help ensure successful selection, installation and service life.

Next Month: *How can installation procedures improve gasket life?*

We invite your questions on sealing issues and will provide best effort answers based on FSA publications. Please direct your questions to: sealingsensequestions@fluidsealing.com.

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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), 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 for pump systems technology issues on rational total life cycle cost principles.

The Piping Systems Non-Metallic Expansion Joint division of the FSA is one of six with a specific product technology focus. As part of its mission it develops publications such as the newly revised seventh edition *Technical Handbook Non-Metallic Expansion Joints and Flexible Pipe Connectors* and the *Non-Metallic Piping Expansion Joint Installation Guide*. The former provides construction, installation, and application details while the latter is a "hands-on" simplified guide for maintenance operators and engineers. Both are primers intended to complement manufacturer's documents produced by the member companies. In addition, standards such as *FSA-PSJ-701-06 Piping Systems Non-Metallic Expansion Joint Hydrotesting and Vacuum Testing, FSA-PSJ-702-06 Rubber Flanged Non-Metallic Expansion Joint Installation, Maintenance, and Storage,* and recently revised *FSA-PSJ-703-11 Guidelines for Elastomers Used in Piping Systems Non-Metallic Expansion Joints* have been developed in response to important user issues.

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