SEALING SENSE

Q. *How important are flange design and pipe alignment for optimum installation and performance of rubber expansion joints?*

A. Flange type and pipe alignment are two of the most important considerations for correct installation and optimum performance of rubber expansion joints. ("Rubber" is the more commonly used industry term that refers to non-metallic materials, including all elastomers.) Attention to these two factors is essential to ensure a trouble-free start up, as well as reliable long-term operation.

It is a common misconception that the compliant characteristics of rubber expansion joints will seal to nearly any flange type or pipe misalignment. While it is true that there is no product more compliant than rubber, it, too, has its limitations. This is particularly true when it is subjected to all directional movements, vibration and shock under relatively high temperatures and pressures. To visualize this point, we can look at what a car tire has to endure while delivering high performance with a long maintenance-free life. It is not uncommon for this rubber product to experience over ten million cycles with fatigue never a concern. Just as you would not consider installing a car tire on a bent truck rim, you can see why flange type and pipe alignment also play a very important role in the successful installation and performance of rubber expansion joints.

Flange Types

Pipe flanges can vary dramatically, so some expansion joint manufacturers simply state that their products require full FLAT-faced flanges to seal against. The problem is that most pipe flanges have a raised face or recessed areas. Most manufacturers will allow a maximum of 1/16" raised face, and that helps account for the majority of pipe flanges. Flanges with a larger raised face or recessed area deeper than 1/16" can be a problem. Stub flanges (Van Stone), grooved pipe flange adapters, wafer valves and slurry pumps are several examples of this.

Figure 1. Newly installed expansion joint adjacent to slurry pump

Improper installation can lead to a dramatic failure, as seen in Figure 1, where rubber expansion joints have been installed against a slurry pump in a new construction project. From this photo, it is apparent that you would have needed to wear your raincoat during start-up of this pump. The expansion joint, though, was not defective—in fact, it had been factory hydro tested. There was also nothing wrong with the pipe alignment. The cause of this heavy leakage was a direct result of the raised rubber face on the pump flange.

Figure 2. Raised rubber face on pump flange

In general, rubber against rubber does not seal well and should be avoided. The large raised rubber flange (see Figure 2), however, is what made sealing

in this application virtually impossible. As a solution, the expansion joint manufacturer recommended that a flat-faced steel spacer plate be installed between the pump flange and the rubber expansion joint flange. The steel spacer provided a hard surface for the two rubber flanges to seal against while also covering the raised face area. With the spacer installed, the system was later tested with no sign of leakage.

Pipe Alignment

Many things can contribute to pipe misalignment, both in new construction and replacement applications. Fast-paced projects with many pre-fabricated items can result in pipe alignment problems. Existing systems are subject to ground settlement, pressure thrust forces and equipment substitutions, which contribute to misalignment. Regardless of the cause, most expansion joint manufacturers recommend that pipe alignments be within ⅛" in all three directions.

While it is true that the rubber expansion joint has allowable movements greater than ⅛" in all three directions, these ratings are for system flexibility once the joint has been installed and the rubber flanges are properly torqued. The rubber flange is not designed to be pulled into place (especially by the bolt holes) and may be damaged as a result. The stiffness of the joint, while low when compared with the pipe stress they replace in the system, is high enough to make it hard for the installer to pull the joint into place. Lastly, in this case some of the allowable movement would be consumed and the joint would be under permanent stress from day one. This would also result in a reduced useful life.

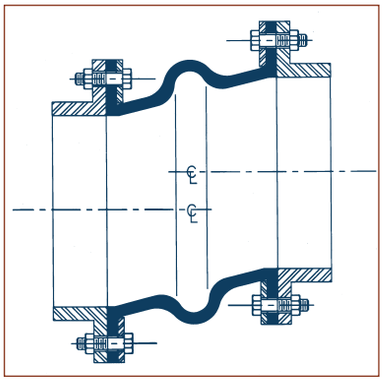

Figure 3. Lateral offset built into expansion joint

Generally, for permanent misalignments over ¼", most manufacturers recommend ordering a joint built to the field dimensions. This approach allows for easy installation and ensures that the full movement capability and life expectancy of the joint is maintained.

Next Month: Applying and maintaining an API Plan 53 system for dual mechanical seals.

Sealing Sense is produced by the *Fluid Sealing Association* 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,* 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 *Piping Systems Non-Metallic Expansion Joint* division of *FSA* is one of six with a specific product technology focus. As part of its mission, the division develops publications, such as the *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-NMEJ-701-98 Non-Metallic Expansion Joint Hydrotesting and Vacuum Testing, FSA-NMEJ-702-98 Rubber Flanged Non-Metallic Expansion Joint Installation, Maintenance, and Storage* and *FSA-NMEJ-703-99 Specifications of Elastomers Used in Piping Systems Non-Metallic Expansion Joints* have been developed in response to important user issues.

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