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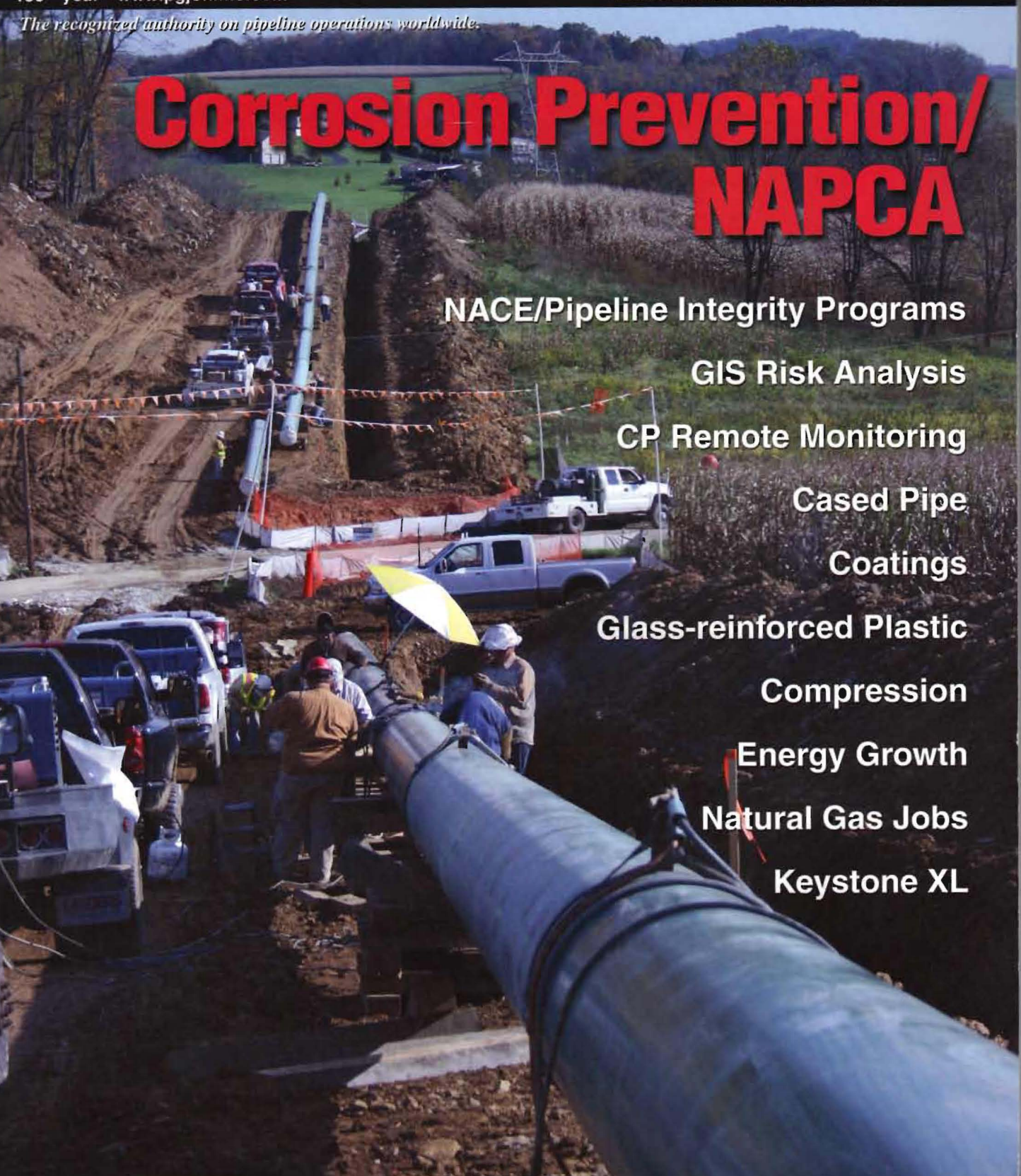

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Why Some Flange Isolation Kits Fail

By **Jay Keldsen,** Sales Director – **Infrastructure Group, PSI/Pikotek,** Houston

Flange isolation kits are critical components in pipeline operations where they separate dissimilar metals to prevent galvanic corrosion and provide electrical isolation for cathodic protection systems. Relatively low-cost but high-consequence, these kits consist of a gasket that both seals and electrically insolates the pipe joint, together with sleeves and washers to isolate the fasteners (Figure 1).

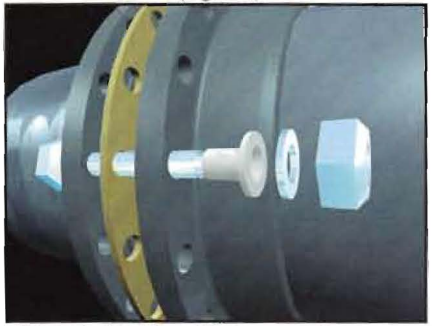

Figure 1: Isolation kit components.

Failure of these kits is more common than many users realize. The reasons are still being studied, but recent evaluation of two such failures provided valuable insights into the causes.

The gasket in Figure 2 appears to have a seamless, molded sealing element with inconsistent quality control of the volume-to-void relationship. The groove depth for the sealing element also exhibits unacceptable variances.

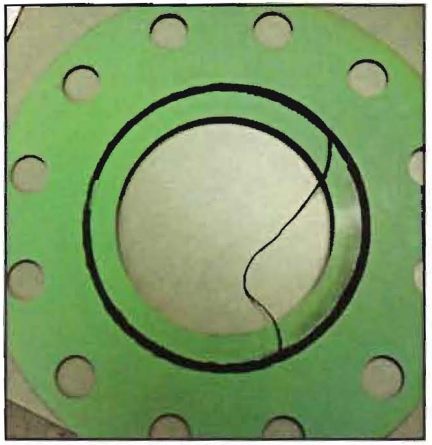

Figure 2: Leaking oil company gasket.

The gasket in Figure 3 failed on hydrotest. The quality of the laminate, sealing element and groove dimensions are all questionable.

In addition to these problematical gaskets, failures have occurred with flange isolation kits on product and natural gas pipelines. Following are factors to be considered in specifying such kits.

As noted, gasket quality has a significant impact on performance, as does the design of the sealing element itself. With the globalization of sourcing, inexpensive raw materials that supposedly meet NEMA standards for phenolic or G-10 classification are being offered to manufactures to reduce costs. These materials

Figure 3: Gasket for natural gas project.

may or may not be effective as gaskets. For example, there are numerous options for phenolic that technically meet NEMA standards, but have not been properly evaluated for suitability as a gasket material. It should be noted that some phenolics are more porous than others.

Specifications for flange isolation kit sleeve material frequently call for the sleeve to be "full length", an undefined measure for which there are no known industry standards. A better specification would require the minimum

Figure 4: Bolt sleeve failure due to shear stresses.

standard length of the sleeve to extend at least halfway into the back-up steel washers.

The 45-degree angle with respect to the bolt's axis in Figure 4 shows that the sleeve failed in shear mode. The contractor ordered G-10 isolation washers and sleeves from one supplier and the steel washers from another. Normally the isolation and steel washers are supplied as part of a kit. In this case, the steel washers had a slightly smaller I.D. than the G-10 washers, so there was no clearance between the steel washers and the sleeve. As the nuts were tightened, they grabbed the sleeves and twisted them. To avoid this problem. both the steel and isolation washers must be manufactured to precise dimensions with matching I.D.s and O.D.s for more uniform loading and to allow the sleeve material to fit within the I.D.

In Figure 5, the white isolation washer has "squished" out from the compressive load of the blue steel washer. In this case, the problem was caused by using the wrong washer material for the loads being applied and the dimensional variance between the steel and isolation washers. It also can be caused by overloading. the compressive strength of the washer.

Gasket Life And Documentation

Operators often have little knowledge regarding the type of gaskets in their pipelines or the materials they are made of. Many have been operating the same lines for more than 30 years,

Figure 5.: Over-compressed white isolation washer.

carrying fluids with different additives, chemical inhibitors, odorants and MTBE. The gaskets in Figure 1 and 2 have no markings indicating their material, date of manufacture, pipe size and pressure rating. This information should appear on all gaskets and flange isolation kits, and existing pipelines should be surveyed for the type of gaskets in service, their expected longevity and length of time in service to determine the need for replacement.

Gasket failures can be reduced dramatically by specifying higher grade products in new installations, and ensuring the product specified is the same as the one being used. In addition, the specifics of gasket material should be documented for each flange, so new gaskets introduced into the system can be evaluated for their compatibility with different media or additives in the line.

The importance of initial gasket quality cannot be overstated. Unfortunately, "garage shop or equivalents" are often being used without the operators' or engineers' knowledge. Gaskets are performance-critical items even though their cost is insignificant relative to the systems in which they are installed. As such, these products warrant greater attention than they receive. ***P&GJ***