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# A PRACTICAL APPROACH TO EVALUATING FASTENER PRELOAD RETENTION WITH ELASTOMERIC GASKETS

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## ABSTRACT

Fastener preload retention is critical to ensuring overall long term joint integrity. The range of allowable gasket stress in conjunction with the acceptable bolt preloading can pose a challenge to engineers recommending proper assembly procedures. Users of PTFE based gasket materials are often encouraged to re-torque flange bolts within 24 hours of flange assembly in order to re-establish gasket stress and bolt load loss due to creep relaxation, however little is known regarding this behavior with elastomeric gaskets.

This paper explores the characteristics of various elastomeric materials in raised face (non-confined) and tongue & groove (confined) flanges, benchmarked against graphite materials, and the impact that they have on sustained flanged connection reliability.

## INTRODUCTION

Elastomeric gaskets have long been used in Industry and railcar applications. Although many connections are suitable for an elastomeric gasket, some configurations present a unique challenge with respect to creating proper gasket loading without mechanically damaging the gasket. With heightened awareness to proper installation and bolt-up, maintenance facilities need to understand the specifics of these types of connections when installing elastomeric gaskets.

Elastomers require a final assembly gasket stress of 600 to 1,200 psi, as shown in Figure 1, which is considerably lower than a Filled PTFE gasket, another gasket commonly used in Industry and railcar applications, as shown in Figure 1.

| Gasket Material | Minimum Gasket Stress (psi) to Seal | Maximum Gasket Stress (psi) |
|---|---|---|
| 1/8" Elastomer | 600 | 1,200 |
| 1/8" Filled-PTFE | 4,800 | 15,000 |

FIGURE 1: MINIMUM/MAXIMUM GASKET STRESS[1]

It is believed that connection failures can occur as a result under loaded fasteners in conjunction with overloaded elastomer gaskets on railcars. The fasteners, which provide not only initial preload on the connection, but also ensure this preload is maintained on the connection, are typically torqued to achieve a fastener stress in the range of 25% - 50% of yield.

Gaskets must be adequately loaded in order for them to effect and maintain a seal. Fasteners behave like stiff springs and must be adequately stretched in order for them to maintain this load on the overall connection.

The goal of this paper is to investigate the behavior of elastomeric gaskets, with respect to preload retention in confined and non-confined geometries, with a specific focus on the suitably in railcar applications. During this investigation, the influence of relative hardness of these elastomeric materials on the load retention characteristics is explored to determine the suitability of higher durometer materials as a potential improvement. Additionally, this paper explores real, empirical maximum stress limits for various elastomers in both confined and non-confined applications. The results published are a combination of laboratory and field testing.

[1] Garlock Sealing Technologies, "Engineered Gasketing Catalog"