

Performance of Resilient Metal Seals

The performance of a resilient metal seal depends on two basic factors: elasticity and plasticity. The concept is similar to an elastomer seal such as Viton or Buna. The difference is that the elastomer compound serves both functions where a metal seal must use two components: a substrate and a soft outer layer.

Elasticity

Each seal has a resilient metal substrate in the form of a spring (Helicoflex[®]), tubing (O-Flex[™]), or formed strip (E-Flex[™], C-Flex[™]). This substrate serves to provide a specific load that is used to deform a soft outer layer. The substrate also has a certain amount of spring back that helps maintain constant contact force during service. This spring back is not necessarily designed to compensate for axial or radial flange separation. Instead, it ensures that the seal maintains enough contact force to properly seal a static joint in service.

Plasticity

The soft outer layer is usually a plating/coating or a wrapped jacket. This outer layer is designed to plastically deform based on the specific load generated by the substrate. As the soft outer layer is deformed, it flows into the flange/groove imperfections and creates a seal. The tightness of the seal will depend on the amount of specific load, the ductility of the outer layer and the groove surface finish. An ideal groove/flange finish has machining marks that follow the circumference of the seal. Any radial marks or scratches may not be completely filled by the soft outer layer and could create a leak.

