What factors should be considered when installing a spiral wound gasket?

Spiral wound gasket designs are typically used in standard ASME B16.5 raised face or flat faced pipe flanges. They are also often used in pump applications with recessed flanges.

Their basic construction consists of a winding element, an outer guide ring, and often, an inner ring. The inner ring serves to prevent inward-buckling of the windings. Current ASME Pipe Flange Standard B16.20 requires inner rings for larger diameter spiral wound gaskets and with specific fillers to prevent buckling.

The winding, whose construction is shown in Figure 3, functions as the sealing element. It is made up of a metallic component and a nonmetallic filler material, e.g., PTFE, flexible graphite, etc. The metal and filler material will depend on application specifics such as temperature, and process media.

In every case, the guide ring (and inner ring, if applicable) has a thinner profile than the sealing element. This guide ring controls the compression of the sealing element, prevents over-compression and allows the sealing element to achieve the specific density required to promote tightness and recovery.

Additionally, spiral wound gasket may only have an inner ring inboard of the sealing element. These are typically used in male/female flange configurations. In this case, the inner ring can serve to help prevent over-compression and inward buckling of the sealing element.

Pump applications often utilize recessed flange grooves to accommodate pump design and minimize casing sizes. These recessed flange grooves require a spiral wound gasket design that typically does not utilize outer or inner rings.

When the winding element is compressed, the groove acts as a compression limiter. Considering the importance of this recess one concludes it plays a critical role in the performance of the spiral wound sealing element. The groove depth, width, surface finish and mating flange are critical aspects that can affect performance.

Standard spiral wound constructions consist of a winding element that is .175-in thick with a corresponding outer guide ring thickness of .125-in (nominal). This allows for an approximate 30 percent compression to the winding element when installed. The groove recess should allow a comparable compression during assembly to maximize the performance of the seal. This example represents a typical construction design and other thicknesses can apply. The deflection percentage mentioned is a typical value for any thickness.

The radial dimensions of the groove also can be critical to the performance of the seal. The outer guide ring on a typical spiral wound gasket can prevent the winding from relaxing by maintaining radial pressure on the perimeter. The groove can act in much the same way by containing the winding element. This containment can prevent the seal from shifting or flowing which would cause relaxation. These recess radial dimensions can assist in maintaining load and typically would be 1/32-in larger radius than that of the gasket (radial clearance) up to 60-in diameter and 3/32-in on larger gaskets with typical constructions and densities.

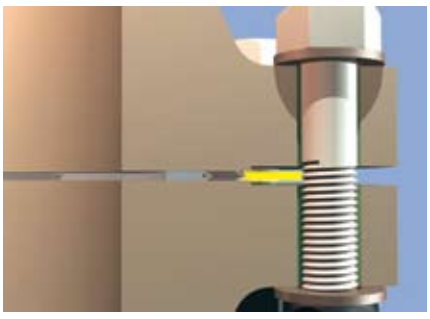

Figure 1. Spiral wound gasket with both guide & inner rings – raised face flange.

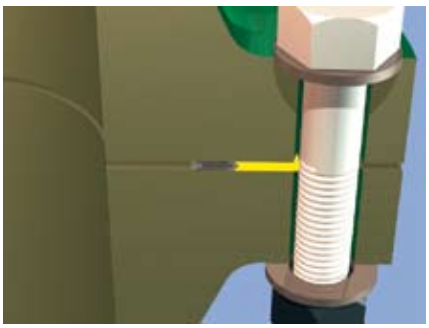

Figure 2. Spiral wound gasket design with guide ring – flat face flange.

Figure 3. Winding elements.

The gasket seating surfaces, consisting of the bottom of the recess as well as the mating flange, should have a surface finish suitable for a standard spiral wound gasket. A surface finish in the range 125-Ra to 250-Ra is generally recommended.

Groove depth tolerance and preload of flange faces after compression of the gasket can be critical factors. Associated pump components often require a certain relative stack up tolerance to maintain proper positioning of component parts. This can dictate that a certain preload on flange faces be maintained to ensure that separation of flange faces under operating load conditions does not occur and proper geometry between associated parts is maintained. It is therefore important to ensure adequate torque or seating stress is applied to properly compress the gasket and, if applicable, preload faces so that components are maintained in proper relation to each other.

As gaskets designed for different operating conditions often vary in density and compression characteristics, it is wise to use recommended torque values and fastener lubricants per manufacturers' specifications.

Adequate torque to compress the gasket and accommodate any required preload of faces is important, as is ensuring that excessive load is not applied which may damage components or, in certain geometries, cause flange rotation and unload the gasket causing leakage. Additionally, complete compression of the gasket and preload of flange faces can help isolate the gasket from a significant amount of the detrimental effects of load cycling.

Finally, it should be noted that the use of grease or any other such foreign substances on spiral wound gasket surfaces or associated sealing surfaces during assembly should be avoided as their impact on long term sealing may be detrimental.

Figure 4. Spiral wound gasket design for recessed flange groove.

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P&S

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