STRONGER THAN YOU THINK

NEW PERFORMANCE IN GRAPHITE FLAT GASKETS

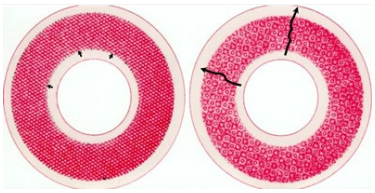
By Marco Schildknecht, Frenzelit Inc.

Graphite is the strongest performer in the world of soft flat gaskets. The media resistance is almost universal. The maximum temperature limit exceeds the capacity of binder based fiber gaskets significantly. There is practically no compression setting under heat in high-quality graphite gaskets. However, there are some challenges with graphite that need to be addressed.

Challenge 1: Tensile strength and mechanical stability of pure graphite

Due to the rather low tensile strength, foils of pure expanded graphite are mechanically very sensitive. Most of the time this weakness is countered with flat metal or tanged metal reinforcements. While those reinforcements solve the tensile strength problem they do not necessarily address the sealing problem itself in the flange.

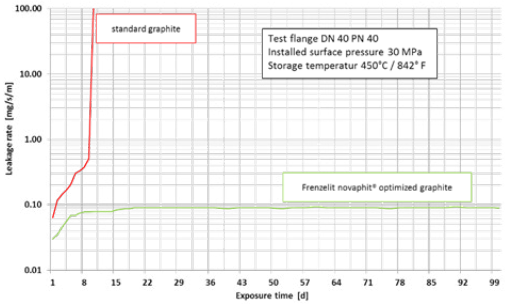
Modern graphite gaskets use expanded metal inserts instead. The picture below shows the distribution of pressure of a tanged metal insert (right) vs an expanded metal insert. As can be seen in the picture the tanged metal insert can create a leakage path through areas with low pressure while the expanded metal insert (left) creates closed structures that block a potential leakage path.



Picture: Pressure distribution comparison of expanded metal insert vs tanged metal insert

Challenge 2: Oxidation of graphite

Graphite has the natural tendency to oxidize with exposure to oxygen, which limits its maximum operating temperature. Treating the graphite with suitable antioxidants can allow the usage of the material up to 1000° F.



Picture: Leakage rate comparison of optimize graphite vs standard graphite

Challenge 3: Sticking of graphite

Every user of graphite gaskets knows about it; during maintenance when removing the gasket, the sealing surface has to be thoroughly cleaned. Depending on the application, the gaskets adhere more or less to the sealing surfaces, making the replacement of the gasket very time-consuming. Even worse in the long run, damaging the flange surface while cleaning is almost certain.

Picture: Flange sticking of a standard graphite gasket vs graphite gaskets with inerted surface treatment

But there is a solution. With a special surface treatment, it is possible to reduce the sticking of the gasket in the flange. Inerting the graphite with special inorganic substances allows the gasket to be removed with almost no sticking at all. Almost like an anti-stick coating.

As a bonus, this special treatment increases the temperature stability of the gasket even more and can be applied to all graphite materials. This type of inerting graphite - other than simple anti-stick coatings – is chemically and temperature-wise as stable as the graphite itself. It does not suffer from aging or degrading at all.

Challenge 4: Flange performance

Given all the challenges previously discussed, conventional graphite gaskets might have difficulties to provide proper sealing in certain application conditions.

The good thing is once the graphite gasket material producer has optimized the product, it is even possible to replace spiral wound gaskets and corrugated gaskets with this new generation of graphite gasket materials.

Some manufacturers testify their products for temperatures up to 1000 °F and 3625 psi system pressure.

Summary

The new generation of graphite can be used for higher temperatures and shows better sealing properties. If made right, modern graphite gasket materials let both benefit - the gasket cutter and the end-user. The cutter by reducing inventory as the material can be used as one-type-fits-all graphite and the end-user, as it will reduce maintenance time and will allow longer maintenance cycles.