Spring-Energized Metal Seal

High tech metals seals are used when the application conditions are outside the specification limits of a polymer (when the temperature is too cold or too hot, vacuumed). The seals developed here consist out an spring optional liner, and jacket and made out a soft material (aluminium, silver, copper or nickel). Manufactured by harder plating (a spring energised seal), these seals are very highly resilient to corrosive chemicals and intense levels of radiation and are especially relevant where seal longevity is needed. The spring seal is especially designed for the nuclear industry for the main reactor pressure vessel (collaborations with UKAEA on JET, SCK CEN) and can find other applications such as oils & gas, space, and valves and for life science.

Description of the technology

Traditional sealing methods have limitations that prevent the usage in some extreme environments: the energized metal seal (with an elastic core or the system itself has an energized method). The metal seals developed here by harder plating (a spring energised seal) consist out an spring optional liner, and jacket and made out a soft material (aluminium, silver, copper or nickel). These seals perform well in a wide range of temperatures (-523°F/ -273°C to 1700 °F /) and pressures. Not only the thermal characteristics are promising but also show excellent resistance to corrosion and radiation. This spring seals comes together with an additional primary or secondary coating of PTFE and-/or T-800 anti-wear coatings and as a soft layer on the mating surface of the seal for improved sealing levels.

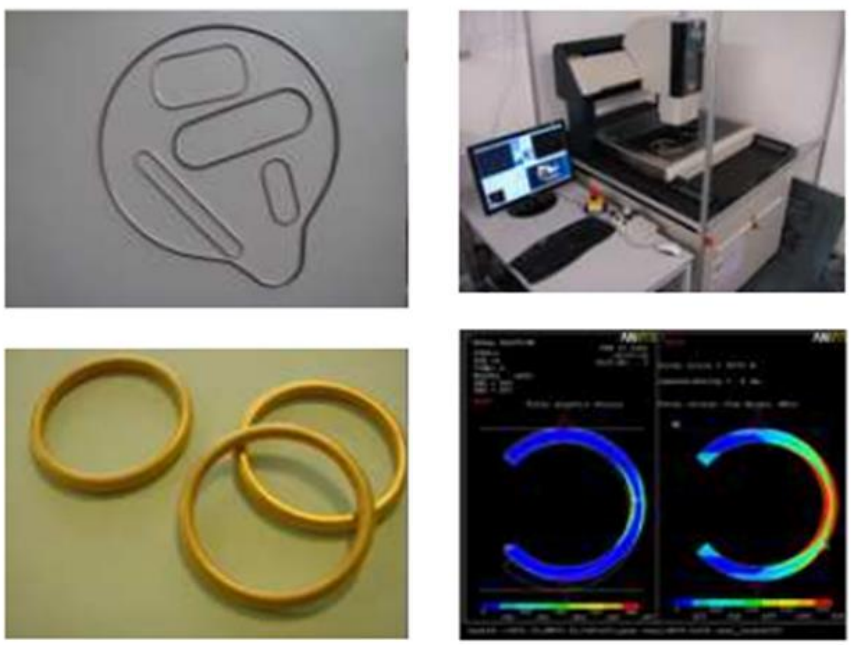
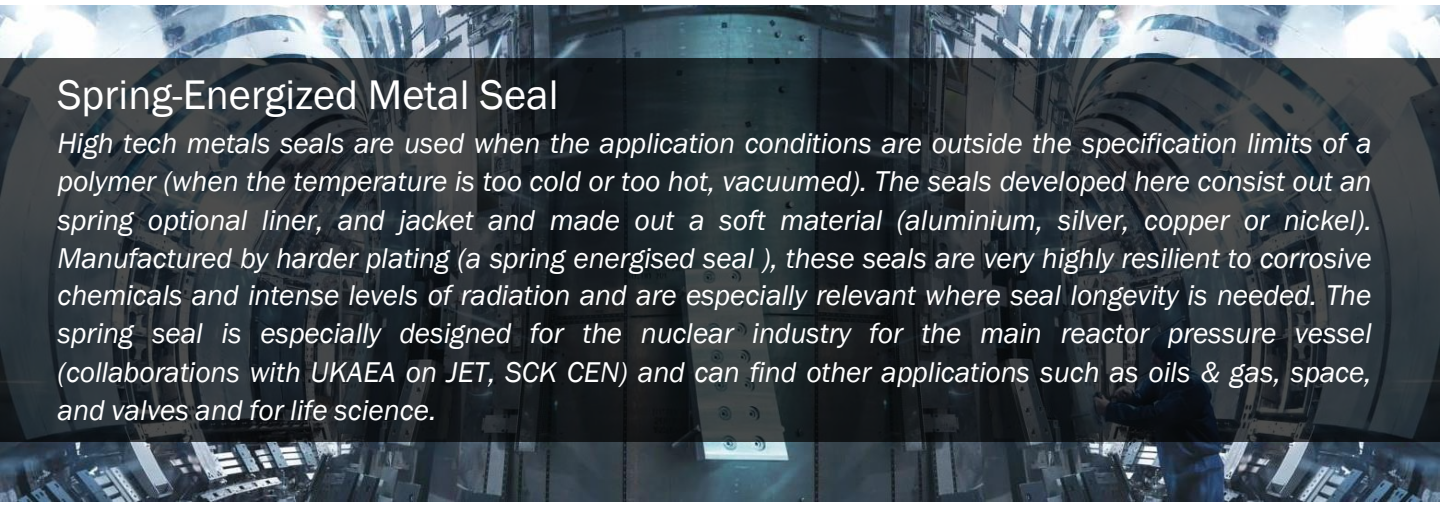


Fig.1 : Examples of Spring-Energized Metal Seals



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Innovation and advantages of the offer

The main benefits of this technology and know how are related to the resistance to higher temperatures, radiation-tolerance, longevity and low permeability are. The typical plating or coating thickness for seals is 50 microns. Adhering to the base material, this layer will flow into the groove surface asperities under the seating stress. Softer materials such as tin and PTFE require a lower seating stress than for instance silver or gold. Nickel, being a relatively hard plating material, requires the highest seating stress. Soft metal-based plating can achieve a He-tightness of 10-10 $Pa.m^3/s$. PTFE coating will have a limit of 10-6 $Pa.m^3/s$ because of the porosity of PTFE for Helium.

Non-fusion Applications

The spring seal is especially designed for the nuclear industry for the main reactor pressure vessel and for the other applications as space, nuclear, oils & gas and valves and for life science. The original design performed so well that it has been developed for the usage of everything e.g. space-craft, to medial implants, etc.

EUROfusion Heritage

Nuclear fusion applications combine the most extreme parameters of pressure and temperature, and demand the most stringent leak values. The technology and know-how in high performances metal seals are based on several applications and project with UKAEA on the JET Project, SCK Belgium or ITER Belgium.

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