How can I extend my exploration rotating equipment life?

Mechanicals seals are employed in many items of rotating equipment in many industries throughout the world. Reliability engineers in the Oil and Gas industry commonly understand that mechanical seal longevity is a function of the seal environment. i.e. the best seal technology in the world will not perform to its maximum potential if it is installed in a poor seal environment.

Standards

Over the last two decades the Centrifugal Pump Specification; API610 Editions 6 to 10 has recognized the fact that a good seal environment improves seal life. As such over the last two decades, API610 has increased the “stuffing box bore” or “seal chamber” size defined in the specification.

The standard has changed the cross sectional area between the rotating shaft and pump housing from 0.500” (12mm) to 1.375” (35mm) over the various specification Editions, as shown in Figure 1.

The underlying principle of this change is that more fluid around the mechanical seal faces improves heat dissipation and cooler seals last longer.

API682 is the premier mechanical seal specification for the Oil and Gas industry. The standard describes the principles of mechanical seal longevity and it widely promotes cartridge seals with multiple springs which urge the two counter rotational seal faces together.

Unfortunately the API682 standard does not define the position of the multiple springs in relation to the process media. Given the multiple springs are typically very small, around 4mm in diameter, their position within the seal is important.

In an attempt to conform to the API682 standard, many mechanical seal manufacturers have deployed “component seal technology” fitted onto thick cartridge seal sleeves for their API682 qualification tested product offerings, as shown in Figure 2 (above right).

This means that the small 4mm diameter springs and setscrews holding the inboard rotary seal holder onto the cartridge sleeve, are mounted directly in the process media. It also means that the majority of the equipment seal chamber cross section is now filled with metallic seal components and not cooling and lubricating process fluid, thereby negating the best practice intentions of API610 seal chamber cross sectional changes.

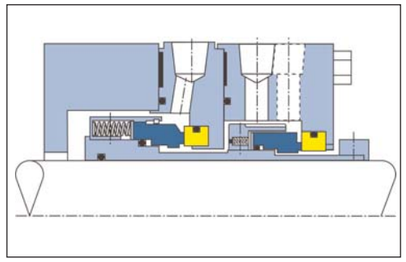


Figure 2 – Typical API682 seal design with Multiple Springs located in the Process Media.

The Exploration Industry is changing

The Offshore and Onshore Exploration industry has changed in the last decade. Today, as oil fields deplete, increasing amounts of sand is being pulled up with the crude oil. This sand slurry enters the process stream and creates havoc to the process equipment.

As sand contaminates the mechanical seal chamber, it clogs the exposed process-side multiple springs, leading to premature seal failure, as shown in Figure 3.

If the seals multiple springs become clogged and seized, they become ineffective in their intended duty. This clearly affects the rotating equipment life. If seal faces are not adequately cooled and lubricated by a suitable volume of process fluid surrounding them, they overheat. This clearly effects the rotating equipment life.

Options

If you do nothing except specify and select an API682 compliant mechanical seal with multiple springs and setscrews positioned out of the process media you will increase the probability of equipment longevity. Furthermore, if you specify and select a mechanical seal which has an idealized seal environment around the seal faces, you will again increase the probability of equipment longevity.

Figure 4 shows a cartridge mechanical seal design that meets this “common sense” criteria. Such designs are highly suitable for today’s oil extraction environment and thereby “future-proof” rotating equipment assets as engineers search and pursue oil extraction from further afield.

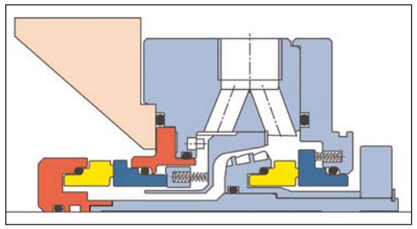
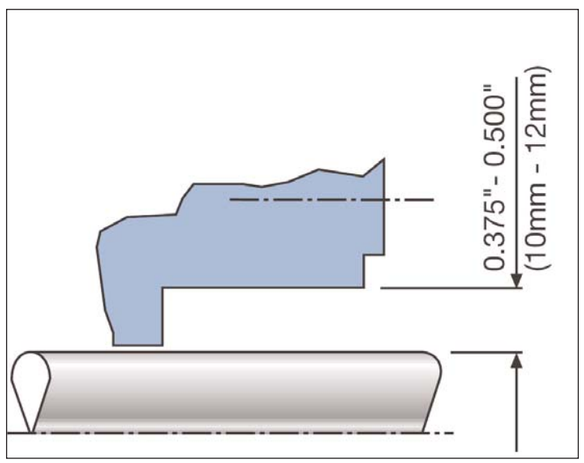
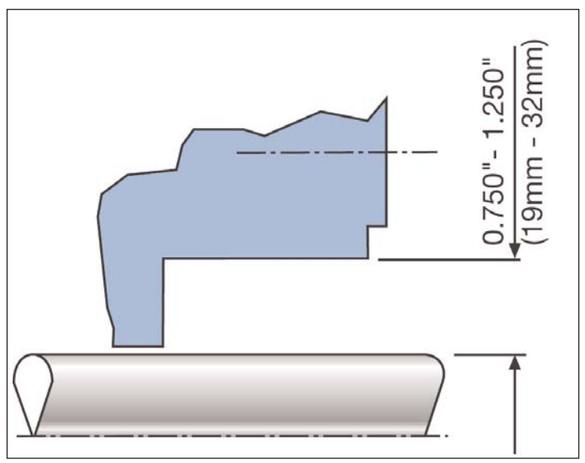


Figure 4 – Typical API682 seal with the Multiple Springs located out of the Process Media.





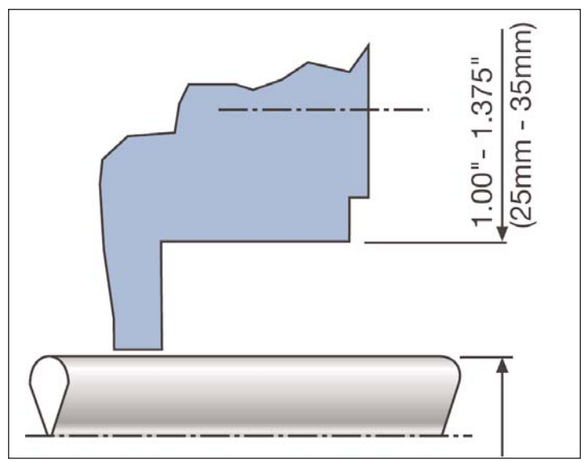


Figure 1 – Seal Chamber changes defined in API610 Ed.6 (1981) to Ed.10 (2004)