

CORROSION-RESISTANT CENTRIFUGAL PLASTIC PUMPS

HORIZONTAL PUMPS: SINGLE MECHANICAL SEAL

Savino Barbera utilises their own design of mechanical seal for its horizontal pumps type OMA. This kind of mechanical seal for rotary shafts is used in all cases where leakage of liquid (aggressive, toxic...) cannot be tolerated and it has been field proven over more that 30 years.

Working principle is simple: two seal elements, a rotary and a stationary ring, are pressed together while a coaxial pressure assures the contact between their surfaces.

The success of a mechanical seal depends on:

1. *right surface conditions of the rings*

- *flatness* and *finishing* of sliding surfaces must be of very high accuracy. They are obtained by grinding and lapping.
- a thin hydrodynamic film (3÷5 µm), formed from the liquid being sealed, must lubricate sliding surfaces of seal rings.
- particular attention must be paid to *PV value* (pressure X velocity). This factor largely determines the load on the rings, the selection of rotary parts materials and the choice between balanced or unbalanced seal configuration.

2. *right choice of constructional materials*

- materials of parts being exposed to fluid must be compatible with the pumped product and with the working conditions: composition and chemical reactions, temperature, suspended solids, crystallization, calcareous deposits...
- further parameters are necessary to choice the seal rings material: hardness, wear and thermal shock resistance, conductivity and thermal dilatation, friction coefficients and self-lubricating properties...

3. *right operating conditions*

- mechanical seal must never run dry.
- in case of long machine standstills and with empty pump, the thin hydrodynamic film between the faces may crystallize, create deposits or cause sticking: it's necessary let the pump casing full of liquid, even when pump is idle.
- working temperature of pumped liquid must not reach the boiling point: this avoid the liquid film vaporization and consequent serious damages of the seal.

Savino Barbera single mechanical seal is:

- **BALANCED**

This configuration makes possible to obtain a pressure, between the seal rings, independent to the pumped media. The balanced seal assures lower interface temperatures and wear consumption of sliding parts. In situations where it's difficult to keep stable the necessary fluid film between the seal faces (pumping liquids with a low boiling point or with operating conditions approaching the vapour tension...), this seal arrangement results essential.

- **INTERNAL**

The assembly inside the pump casing:

- is designed for best possible cooling of the sliding parts, due the fact that the surface being exposed to fluid is bigger.
- keep stable the seal, especially during pump starting up and stop, since the same pressure of pumped liquid makes the contact between the faces easy.

- **BELLOW MOUNTED**

The seal incorporates an optimised bellow design, as rotary ring support. The benefits are:

- adjustment of axial/radial motions and misalignment compensation. Effective contact of sealing faces is maintained.
- easier balance of the mechanical seal.
- better distribution of the spring load on the sealing elements.
- sure sealing performance on the pump shaft and improved rotation trasmission to the dynamic ring.

- **WITH UNIQUE SPRING AND INDEPENDENT TO THE ROTATION DIRECTION**

- the spring accomplishes the function of load on the seal rings.
- Self-cleaning construction: thank to centrifugal forces generated in the pumped product, the spring and bellow rotation permits to throw off solids, slurries and impurities.

- **ASSEMBLED WITHOUT SETTING NEED**

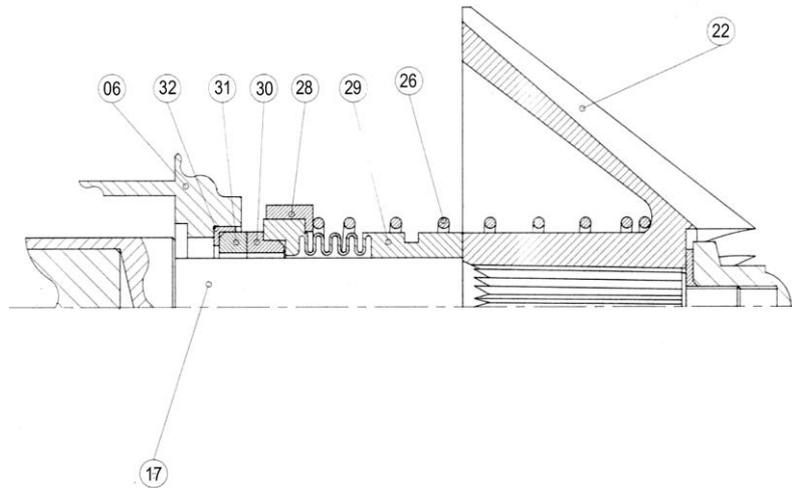
Simple fitting procedure. No dimension to take:

- the seal housing is determined by the inner seat in the pump casing (static ring)
- the rotating element is installed beetwen the shaft impeller hub and the static ring.

COMPONENTS

The Savino Barbera *single mechanical seal* (item 26/32) is made up of two elements:

- a static element, mounted inside the pump casing (item 06)
- a dynamic element, mounted on the pump shaft giving the rotation (item 17)



The static element is composed by:

- a static seal ring (item 31) made of sintered ceramic or silicon carbide
- a "L" sealing gasket (item 32) made of EPDM, FPM or PTFE

The dynamic element is composed by:

- a dynamic seal ring (item 30) made of sintered ceramic or silicon carbide
- a PTFE bellow (item 28-29) assuring the coplanarity of the seal rings (both in the static and in the dynamic phase) even in case of misalignments of pump and shaft. Bellow-dynamic ring and bellow-pump shaft couplings are realized through diameter interference.
- a PFA covered stainless steel spring (item 26) giving the right load on the faces of seal rings.

MATERIALS

Savino Barbera selects the materials on the basis of a detailed knowledge of specific working conditions declared by the customer (liquid nature, concentration, temperature, suspended solids...) and according to chemical, thermal and mechanical resistance features of the materials themselves.

SINTERED CERAMIC (Al₂O₃ al 99,5%)

Base material for high quality seal rings and wear elements. Elevated hardness, resistant to wear and to chemical attack: particularly suitable for abrasive fluids.

Not recommended only with: hydrofluoric acid, hot caustic solutions and in presence of high thermal shocks.

SINTERED SILICON CARBIDE (SiC)

Excellent material for mechanical seal rings. Its properties are: elevated hardness, high wear resistance, high thermal shock resistance, low thermal expansion, high thermal conductivity, low friction coefficient, corrosion-resistance (it is chemically inert even to hot caustic solutions or acids such as hydrochloric and hydrofluoric acid)

Silicon Carbide is used for eavy duty applications. Its price is comparatively higher.

POLYTETRAFLUOROETHYLENE (PTFE)

Tetrafluoroethylene polymer know for its particular properties:

- *chemically inert to all chemical reagents, up to 200°C*
- *high temperature strength and low thermal transmission coefficient*
- *excellent dielectric characteristics*
- *highly aging resistant*
- *self-lubricating properties and minimum friction coefficient*

Ideal for the dynamic bellow of the mechanical seal. Due to the absence of elastic properties and for its creep in case of deflection, PTFE is exceptionally adopted as gasket for the static seal ring.

GRAPHITE CHARGED PTFE

This filling maintains low the friction coefficient, increases PTFE hardness and reduces its deformation under load. Material exceptionally used for the dynamic ring.

Suggested in case of high-speed rotation, prevents rings from sticking. Moderate wear and abrasion resistance.

ETHYLENE-PROPYLENE RUBBER (EPDM) AND FLUOROELASTOMER (FPM)

Elastomers widely used in plant engineering and hallmarked by good resistance to chemical agents.

Selected for gasket material (static ring seal), according to specific working conditions.

PFA FLUOROPLASTIC

Chemically inert, PFA performs like PTFE. The coating made of this fluoroplastic is resistant to all chemicals with different concentrations and combinations and at working temperatures higher than those of the materials of Savino Barbera pumps (45°C=PVC, 90°C=PP, over 100°C=PVDF).

PFA permits welding processes: for this reason it is chosen for special applications such as coating of mechanical seal springs and of O-rings.