SAVINO BARBERA
di Barbera e Castiglioni snc
via Torino 12
10032 Brandizzo To Italy

Tel + 39 (0) 11 913 90 63
Fax + 39 (0) 11 913 73 13

www.savinobarbera.com
info@savinobarbera.com

CORROSION-RESISTANT CENTRIFUGAL PLASTIC PUMPS

HORIZONTAL PUMPS WITH DOUBLE MECHANICAL SEAL

The double seal design is preferred when:

1. the mechanical seal is not totally hermetic: sometimes it happens that the mechanical seal doesn't present any leakages of the pumped liquid but is not totally free from "dispersion" (on atmospheric side).

   The phenomenon of *dispersion* is due to the possible *vaporization* of the thin fluid film between the seal rings. It can occur even when this hydrodynamic film is made unstable by other factors such as:

   - rotation speed of the pump
   - heat generated by the slidindg of the rings
   - temperature and boiling point of the pumped liquid or its components.

   Exceptionally, the *vaporization* of the liquid film can cause dry running and, more often, crystallizations or solid deposits: both situations may seriously damage the mechanical seal.

2. the liquid film can crystallize, oxidize, leave solid deposits in the area in contact with the atmosphere or can get dry causing "sticking" of the seal rings, if the pump is idle and without liquid.

3. toxic, inflammable, explosive, corrosive or anyhow dangerous liquids and vapours can disperse in environment in case of both correct and defective functioning of the seal.

4. sometimes the pumped liquid is not able to assure the necessary cooling and/or the lubrication of the seal rings (for viscosity, thermal conductivity, boiling point…), or the pump may accidentally run dry.

5. the circuit where is installed the pump has a pressure lower than that of the atmosphere and it can be necessary avoid the entrance of the air through the seal rings.

6. the pumped liquid can contain solids and/or abrasive particles with dimension or nature such as to enter the seal rings damaging its functioning.

In all these cases it should appropriate to adopt a double mechanical seal (one sealing the product and one on the atmospheric side) with the interposition of an *auxiliary fluid* circulating in a special chamber, with the function of hydraulic barrier (if in pressure) or just like simple separation (if not pressurized).

From the constructional point of view mechanical seals are divided in:

- ***Back-to- back***: it consists of two single seals mounted in a opposed arrangment (inboard and outboard seals, see fig.1):

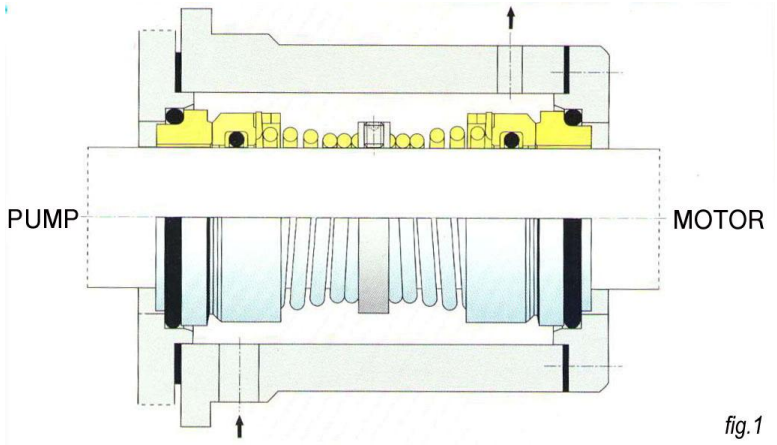

fig.1

- ***In tandem***: it consists of two single seals mounted in the same direction (towards atmospheric side, see fig.2):

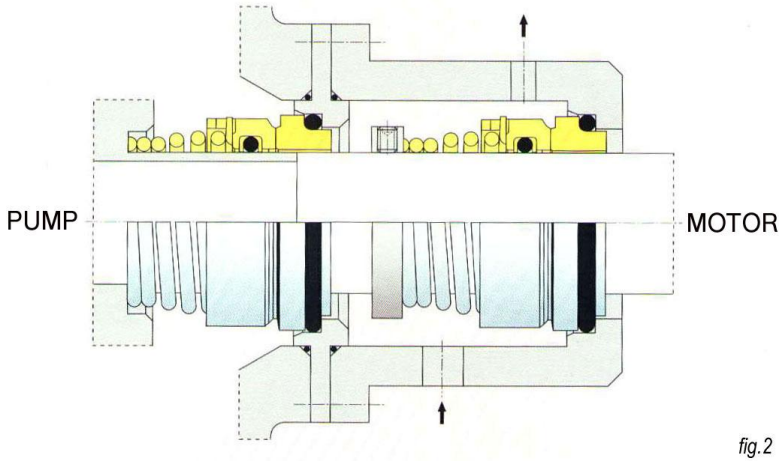

fig.2

The “primary” seal accomplishes the function of seal of the liquid being pumped, whereas the “secondary” seal carries the pressure of the *auxiliary fluid* to atmosphere.

The *auxiliary fluid*, circulating in the special chamber in contact with both seals, is provided through an independent circuit to the liquid being pumped and must be:

- clean
- without tendency to leave deposits, crystalize, release vapours…
- not too viscous
- with a good thermal conductivity
- with a high boiling point
- stable in working conditions
- non toxic, inflammable, explosive or anyhow dangerous

Usually clean water is ideal for this duty.

Important: particular attention must be paid to verify the compatibility between the liquid being pumped and the *auxiliary fluid*, owing to unwanted contaminations (diluitions, chemical reactions, pollutions…).

With the obvious exception of the primary seal rupture, the allowed “contamination” is described as follow:

- **“Pressurized seals”: usually *back-to-back* ones.**
  The liquid film, between the rings of the primary and secondary seal, is composed only by the *auxiliary fluid* and usually circulates as barrier film at a pressure greater than the process fluid (0,5÷2 bar, depending on the circumstances). In this case, the “contamination” is due to the pouring of the auxiliary fluid in the pumped product, in function of the differential pressure created.

- **“Non pressurized seals” or “flushed seals”: usually *in tandem* ones.**
  The *auxiliary fluid* (in function of separation, washing, cooling, vapours condensation…) usually circulates at a pressure not much greater than the atmosphere (0,3÷0,4 bar) and anyhow lower than the pumped product.
  The differential pressure to the atmosphere is justified only by the necessity of assure both the complete filling of the flushing chamber and the creation of a suitable liquid film between the secondary seal rings.
  In this case, the “contamination”, even if minimum, can come from the pumped product to the *auxiliary fluid*.

Some factors must be considered to determine the delivery of the *auxiliary fluid*:

- the blow between primary seal rings (pressurized seal)
- the necessary cooling of rings of both seals
- the maintenance of the complete filling of the sealing chamber

The outlet of *auxiliary fluid* must be on the top of the sealing chamber in order to avoid the presence of gaseous phases.

It is necessary to monitorate the *auxiliary fluid*: it will help to avoid pumped liquid leakages and/or incidental environmental pollutions, specially in case of rupture or bad running of the primary seal.

Horizontal pumps type OMA manufactured by Savino Barbera, can be equipped with double mechanical seals.

The most common seal arrangement is the double mechanical seal in *tandem* and flushed with clean water:

Primary seal is a standard Savino Barbera seal: single, balanced, internal, flushed by the pumped liquid and manufactured with materials which are highly resistant to wear and corrosion.

The secondary seal (fig 3) is composed by:

- spring, seeger and dynamic ring in INOX 316 (item 26A, 35 and 30A)
- static ring in Carbografite (item 31A)
- sealing O-ring of static and dynamic rings in EPDM (item 33 and 34)

This seal is assembled inside the circulating chamber of the *auxiliary fluid* (item 36 with O-r item 37) to seal on the atmospheric side.

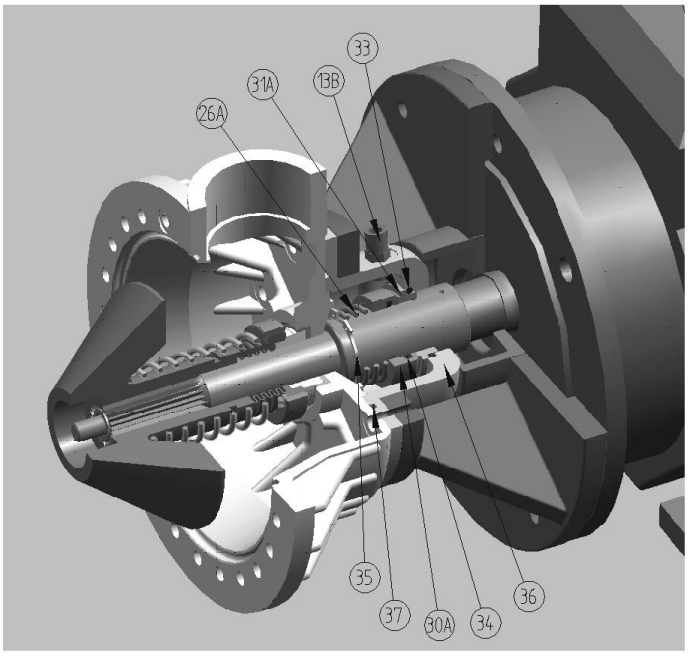

fig.3

The *auxiliary fluid*, fed by separated circuit, has its in and out connections (item 13B) on the top of circulating chamber (fig 4). The *auxiliary fluid* must have:

- pressure of 0,3 ÷ 0,4 bar

- delivery of 20 ÷ 30 l/h
- room temperature, generally

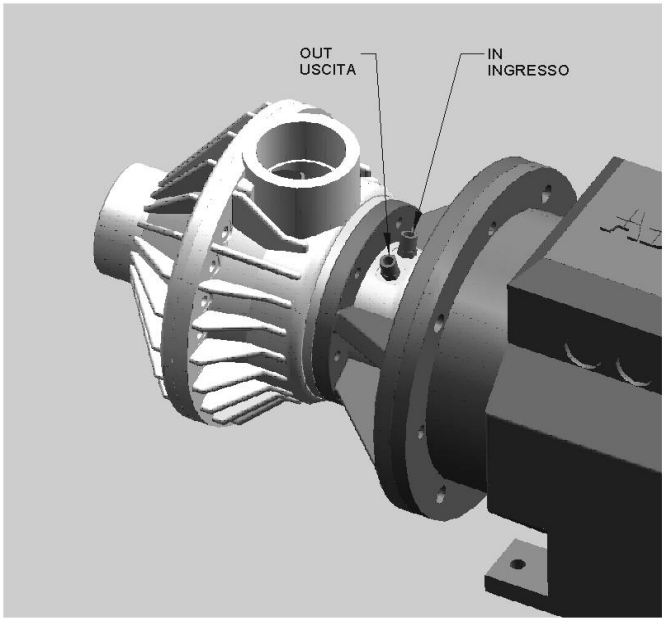

fig. 4

- The sealing chamber must be always fed with auxiliary fluid when pump is running, and kept full of liquid when the pump doesn't work.

The success obtained by Savino Barbera with its double mechanical seal flushed with clean water is mainly due to:

- easy and economic maintenance.
- capacity of condensing incidental vapour leakages and avoiding possible formation of crystals, oxides or solid deposits on the primary seal by contact with the atmosphere.
- reduction of the sticking risk for primary seal rings, if pumps are left dry during downtimes.
- protection of the primary seal from the serious damages caused by erroneus dry running.
- best cooling of the primary seal with reduction of the risk of vaporization for the liquid film between the sliding rings.
- Protection of the external mechanical parts of the pump (motor included), the installations and the working environment from incidental leakages of the liquid being pumped or its vapours.

Important: if you don’t use clean water as *auxiliary fluid*, Savino Barbera must be informed to verify the compatibility of used materials as secondary seal or to sobstitute the liquid with anoter product suitable for the specific duty.