



Mechanical seals in PEMO PUMPS

Pemo Pumps technology for the transfer of slurries

The image shows an industrial environment with various pieces of machinery. On the left, there is a large green pump with a curved discharge pipe. In the center, a blue electric motor is mounted on a base. To the right, a yellow machine is partially visible. The background includes a metal shelving unit with boxes and a wall with some electrical components. A semi-transparent blue banner is overlaid on the image, containing white text.

Pemo Pumps technology for the transfer of slurries

Mechanical seals failures

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Mechanical seals failures

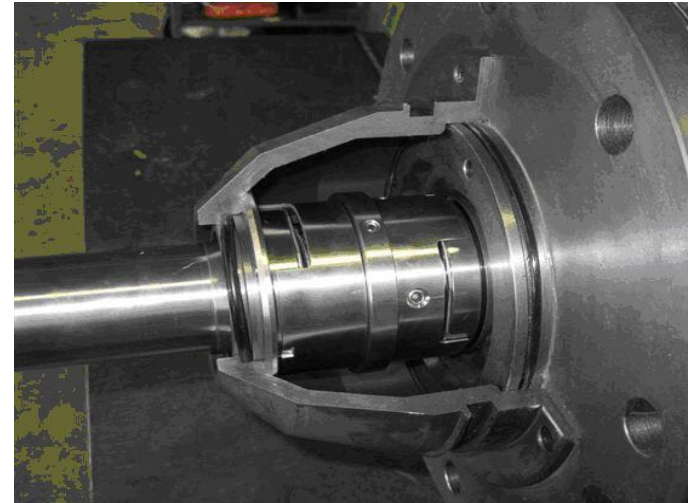
Back to back double seal

In this double seal configuration, two mechanical seal faces are mounted back-to-back (opposing) to one another for separating the wet parts of the pump from the mechanical part (bearings).



Advantages

- Outboard seal provides full pressure back-up.
- Short axial length.
- Unified face alignment.
- Non-fretting.



Mechanical seals failures

Back to back double seal



Disadvantages

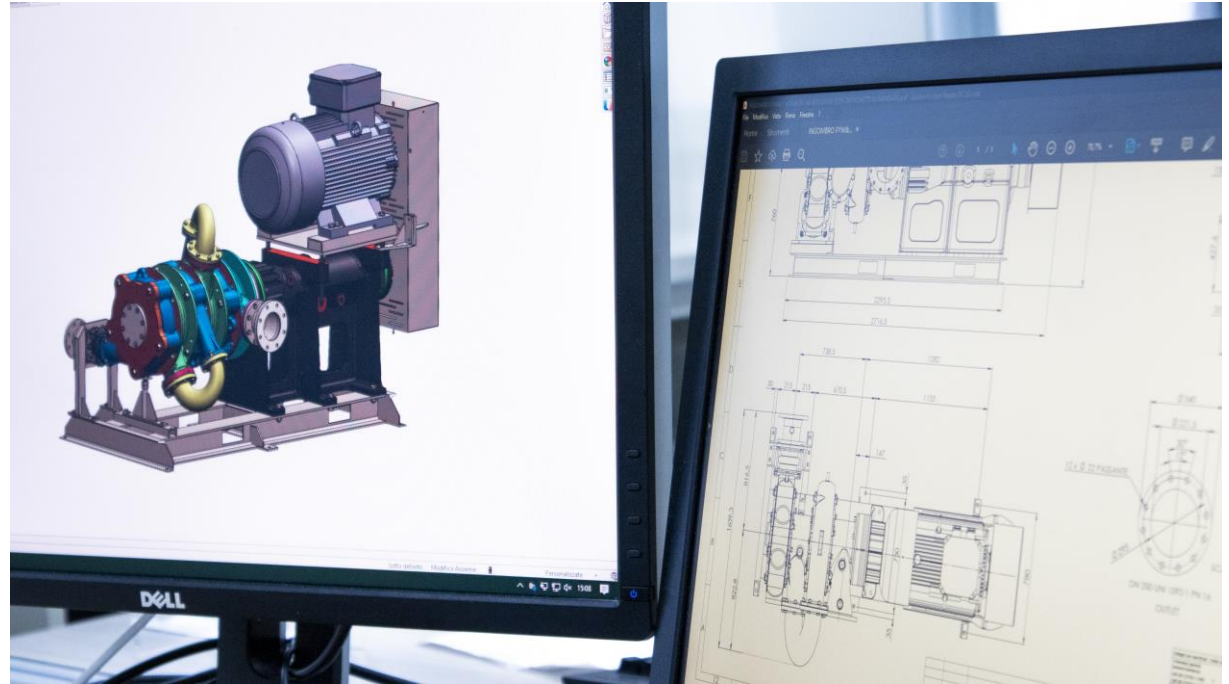
- Limitation on barrier fluid pressure capability.
- Does not handle reverse pressure (unless double balanced).
- Possible product dilution.



Mechanical seals failures

Back to back double seal

Due to PEMO design with side suction, mechanical seals need to be lubricated at only 1-2 bar higher (key parameter) than the inlet pressure, and not the outlet pressure, with a clean media, 1-3 liters/min.



Mechanical seals failures

Back to back double seal

- To operate correctly, Back-to-Back configurations normally require barrier fluid (pressure higher than the pumped fluid).
- The **unbalanced back-to-back** mechanical seal requires a barrier fluid pressure of 1 or 2 bar higher than the seal chamber pressure. The barrier fluid is being pressurized above the seal chamber pressure, so the outboard seal faces are carrying the greater load and should wear out or fail first. When this happens, the barrier pressure will be lost, causing the inboard faces to open.
- If this seal is a **double balanced design**, the fluid between the inboard and outboard seal faces can be higher (barrier) or lower (buffer) pressure than the seal chamber pressure. This means that if the barrier/buffer fluid is lost, both seals will remain closed and operate reliably.

Mechanical seals failures

Back to back double seal

- In back-to-back arrangement (both unbalanced and balanced seal designs), the outboard seal faces almost always are rated for a lower pressure than the inboard seal faces. This is because the outboard seal faces are an outside seal configuration and the faces are exposed to tensile force. Ceramics are generally weaker in tension than compression, so their pressure limit is lower.
- Under normal operation, there is no risk of leakage to the atmosphere.
- If the inboard seal fails first, the barrier fluid will leak into the process which will cause product dilution. This product dilution sometimes is not desirable for products that can not tolerate it.

Mechanical seals failures

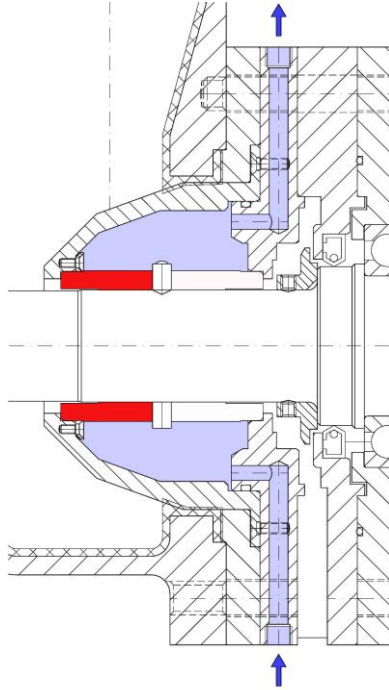
Why do mechanical seals fail?

A mechanical seal might fail due to the following reasons:

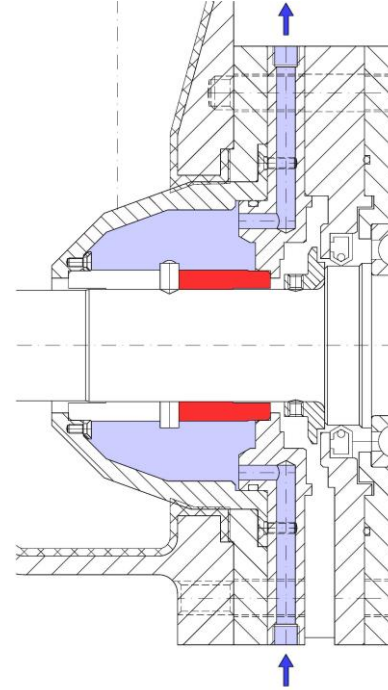
- Installation errors.
- Dirty water.
- Frozen water or too hot water.
- Poor or absent lubrication.
- Insufficient or too high pressure.

Mechanical seals failures

How do we detect when and how mechanical seals fail?



Seal on the slurry side



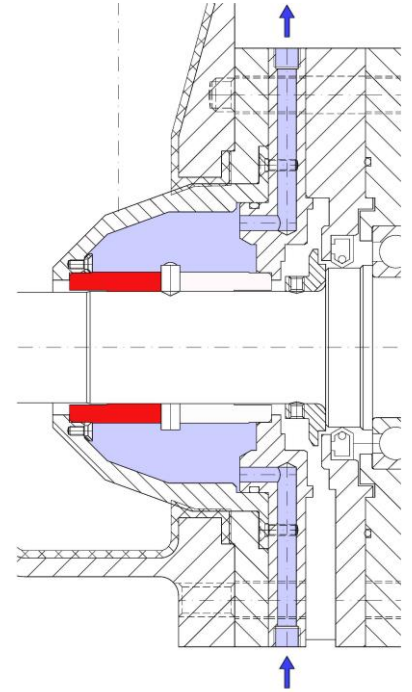
Seal on the mechanical side

Mechanical seals failures

How do we detect when and how mechanical seals fail?

Inboard seal failure causes:

- Frozen coolant.
- Water hammer effects.
- Insufficient flow (too low level in the closed circuit).
- Insufficient or too high pressure to the coolant system.
- No flush and pump drainage before the pump is stopped for a long period: slurry solidifies and wears the shaft and the mechanical seals box when the pump is restarted.

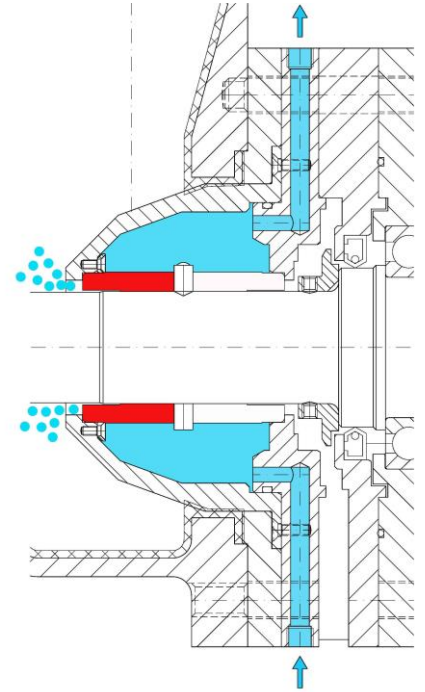


Mechanical seals failures

How do we detect when and how mechanical seals fail?

Inboard seal failure effects:

- When this seal fails first, if the flushing pressure is correct, the barrier fluid will leak into the process which will cause product dilution. This product dilution sometimes is not desirable for products that can not tolerate it.
- In case of closed lubricating system the level in the tank will drop.

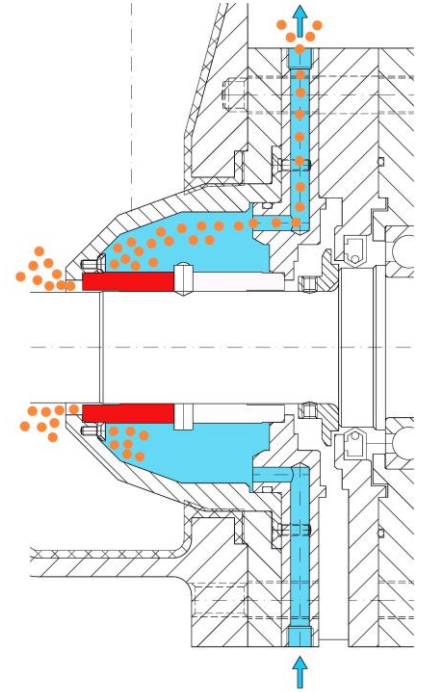


Mechanical seals failures

How do we detect when and how mechanical seals fail?

Inboard seal failure effects:

- When this seal fails first, if the flushing pressure is not correct, we will see contamination in the lubricating media at the top flushing outlet, or inside the lubricating tank.
- In case of closed lubricating system the level in the tank could increase.

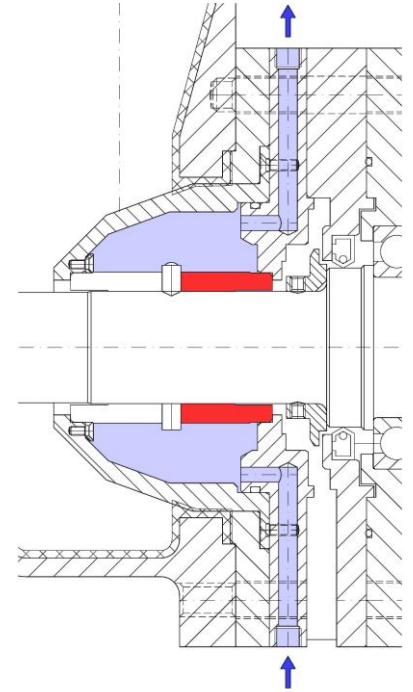


Mechanical seals failures

How do we detect when and how mechanical seals fail?

Outboard seal failure causes:

- Run dry conditions (even 1-2 seconds can lead to failure).
- Frozen coolant.
- Contaminated coolant (the inboard mechanical seal has already failed).
- Insufficient flow (too low level in the closed circuit).
- Insufficient or too high pressure to the coolant system.

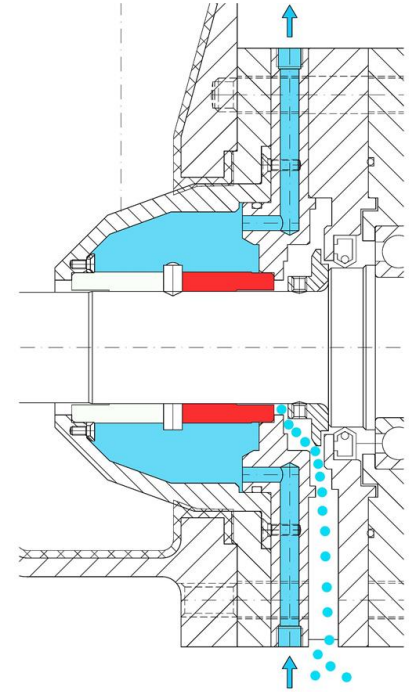


Mechanical seals failures

How do we detect when and how mechanical seals fail?

Outboard seal failure effects:

- When this seal fails first, if the flushing pressure is correct, the barrier fluid will leak through the lower slot of the dedicated flange.
- In case of closed lubricating system the level in the tank will drop.

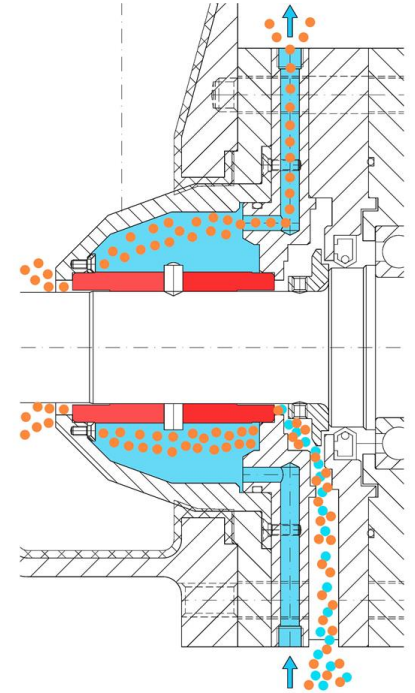


Mechanical seals failures

How do we detect when and how mechanical seals fail?

Outboard seal failure effects:

- When this seal fails, if the flushing pressure is not correct and the inboard mechanical seal has already failed, we will see contamination in the lubricating media at the top flushing outlet or through the lower slot of the dedicated flange.
- In case of closed lubricating system the level in the tank could increase.





Thank you for your attention

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