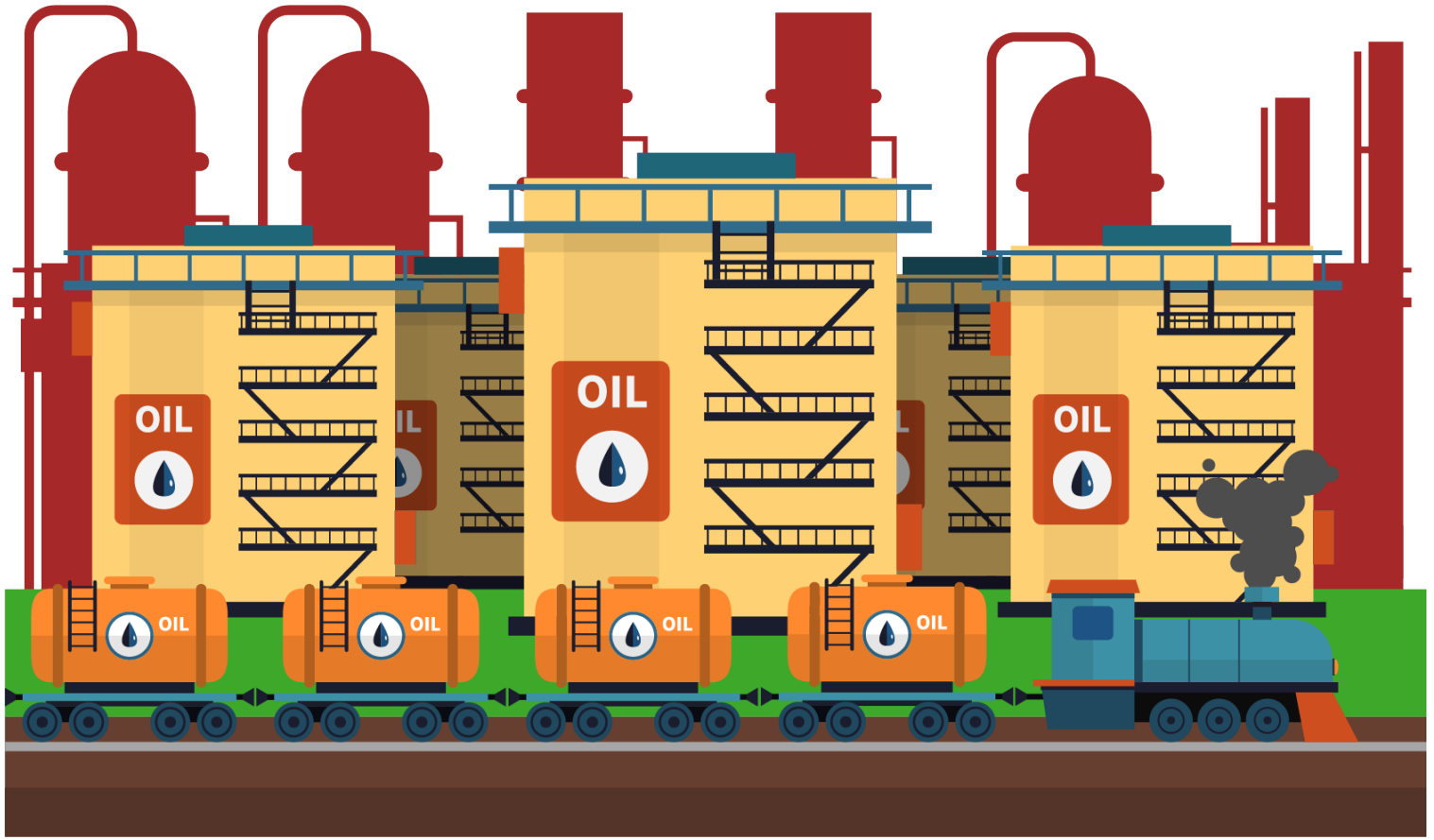
Auxiliary systems for mechanical seals



Auxiliary systems for mechanical seals

Plan72 / Plan 74: instrumented panel for flushing or pressurizing seals with inert gas

Plan 23: Shell & Tube heat exhchanger according to API 682 standard

Mechanical seals are devices installed on pumps, mixers or other equipment having rotating shaft, that can operate under very severe conditions and handling highly toxic, flammable and lethal fluids, where emissions are not allowed. In addition to avoiding emissions to the atmosphere, in pharmaceutical and food plants, mechanical seals must prevent contamination of the process by external agents coming from atmosphere. In these cases, the mechanical seal must be dual and it can be flushed or pressurized by an auxiliary fluid, which prevents the process liquid from leaking to the atmosphere or the atmosphere from entering into the process fluid (see Fluiten's alpha seminar - dual seals).

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Auxiliary systems for mechanical seals

Fluiten has been producing mechanical seals for a wide range of industrial sectors since 1962; its Technical Department has developed a series of auxiliary systems, selected according to the specific application and the plant technical specifications where these devices must be installed.
The different types of system are identified through a code defined by the **API 682 standard,** the Oil & Gas sector is very concerned to the specifications and the selection of these important devices. The most common ones are described in the table on the left side of this page.

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SINGLE SEALS:

Plan 23 / Plan 21: The air or water heat exchanger reduces the temperature of the pumped liquid to avoid vaporization between the sealing surfaces.

Plan 31: The cyclone separates the solid and abrasive parts from the flushing to the seal required for cooling.

Plan 32: Flushing from an external source where accepted enables the seal to work with a clean liquid that ends up in the process.

Plan 51: A static quench between the seal and the atmospheric environment prevents the formation of crystals that would limit the elasticity required for the seal to function properly.

Plan 65A / B: The physiological leakage of the seal in liquid phase is collected and checked in a special tank and signalled by a level alarm.

Plan 66 A/B: the physiological leakage of the seal is signalled by a pressure alarm connected to the atmospheric zone of the seal.

UNPRESSURISED DUAL SEALS:

Plan 52: An auxiliary tank allows to limit the emission of physiological leaks to the atmosphere and improve the cooling of the product side seal.

Plan 55: A control unit allows the circulation of auxiliary liquid to limit the emission of physiological leaks to the atmosphere and improve the cooling of the seal on the product side.

Plan 72: An inert gas scrubbing (normally nitrogen) removes process emissions from the dual seal by pushing them into a safe area, normally associated with Plan 76.

Plan 75: The physiological leak of the seal in the liquid and gaseous phase is collected and controlled in a special tank and channelled to the torch or to the plant gas abatement.

Plan 76: The physiological leakage of the seal in the gaseous phase is controlled and channelled to the torch or to the plant gas abatement.

DUAL PRESSURISED SEALS:

Plan 53A: A pressurised auxiliary tank avoids any level of emission of the process into the atmosphere and guarantees a clean and properly cooled liquid meatus to the seal.

Plan 53B: A system with pressurised auxiliary accumulator avoids any level of emission of the process into the atmosphere and guarantees a clean and properly cooled liquid meatus to the seal.

Plan 53C: a system with an auxiliary piston accumulator that self-regulates the pressure according to the fluctuations in the stuffing box, avoids any level of emission of the process into the atmosphere and guarantees a clean and properly cooled liquid meatus to the seal.

Plan 74: Pressurisation with inert gas (normally nitrogen) prevents process emissions to the atmosphere and ensures the correct functioning of the dual seal.

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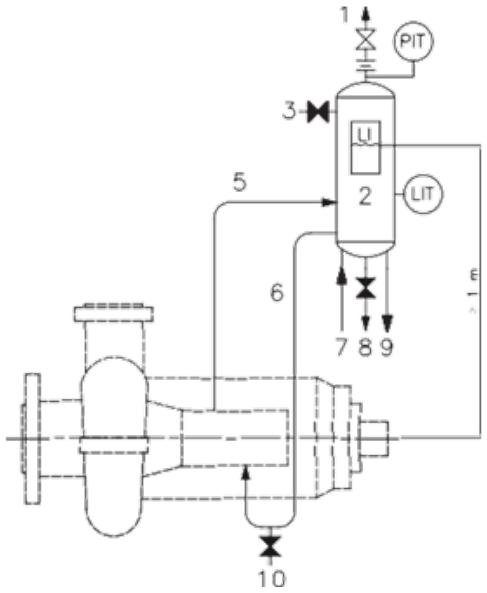

Plan53A: instrumented auxiliary System for pressurizing double seals.

Plan52: auxiliary system for flushing double seals.

CHOICE OF AUXILIARY LIQUID

Barrier liquid: pressurized auxiliary liquid in a double seal.

Buffer liquid: non-pressurized auxiliary liquid in a dual seal.

Quench: fluid washing seal atmospheric side, carried out at atmospheric pressure normally with water, dry steam or nitrogen.

CHARACTERISTICS OF THE AUXILIARY LIQUID:

It must have sufficient lubricating properties; this parameter is influenced by temperature and pressure variations; it must not evaporate or solidify, so it must be selected in relation to the operating conditions and the calculation of the heat generated by the sliding surfaces.

It must be compatible with the process fluid and selected with the approval of the end user and finally must be compatible with the construction materials of the machine and mechanical seal.

The auxiliary liquid must not be harmful to people and the environment, dangerous, toxic, flammable.

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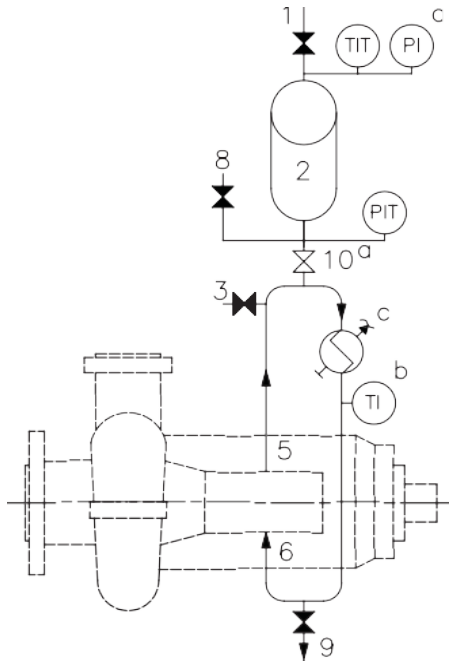
Auxiliary systems for mechanical seals



Plan 53B: with air heat exchanger, instrumented auxiliary system for the pressurization of double seals.

Instruments installed on the auxiliary systems are fundamental for monitoring the correct mechanical seal operation parameters.

An example is the temperature transmitter on the 53B accumulator, which is used to prevent errors on the barrier oil pressure that may occur in relation to the change in ambient temperature. In the desert, for example, the daily temperature range is considerable: this could cause an appreciable variation in the pressure of nitrogen in the bladder, influencing the barrier pressure very much.
The temperature transmitter then reads the nitrogen temperature in the bladder (which is approximately equal to the ambient temperature) and, through the DCS, communicates with the pressure transmitter in real time, modifying the pressure alarm thresholds accordingly. These thresholds are provided by the seal manufacturer, who processes them by means of an algorithm indicated by the API 682 standard.
This algorithm also defines the bladder pre-charge and oil volume values for a refilling in accordance with the temperature read on the transmitter by the operator.
It is worth noting that the temperature transmitter does not have an alarm function, but rather reads the environmental conditions in order to suitably modify the pressure transmitter alarm threshold.
The API 682 standard specifies that, as an alternative to this method, a fixed alarm strategy can be used (even with a simple pressure switch), avoiding the installation of the temperature transmitter, but it has to be noted that this selection involves a reduction in the useful oil volume between maximum operating pressure and alarm point.

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