SEALLESS PUMPS

High temperature canned motor pump (image courtesy of Hermetic Pumpen)

There are many liquids that require tight containment and not allow any leakage. Liquids can be environmentally sensitive such as amines, volatile like LPG or dangerous to human health such as chlorine. When leakage to atmosphere cannot be tolerated pumps can utilise dual seals with complex seal systems or sealless pumps can be installed.

Mechanical seals are wearing parts and can become bad actors. This is particularly so on higher temperature and pressure applications. In these cases, sealless pumps can provide significant benefits.

AFH are experts in the supply of sealless pumps both in canned motor and magnetic drive technology. This paper briefly discusses both technologies and their benefits.

THE CHALLENGE

Mechanical seals have an inherent limitation they leak. Leakage between the seal faces is required for them to work effectively. Leakage to atmosphere can be prevented using complex seal systems (API plan 53A/B/C or gas seals plan 72/74) but these systems can be costly and present their own operational challenges and failure modes.

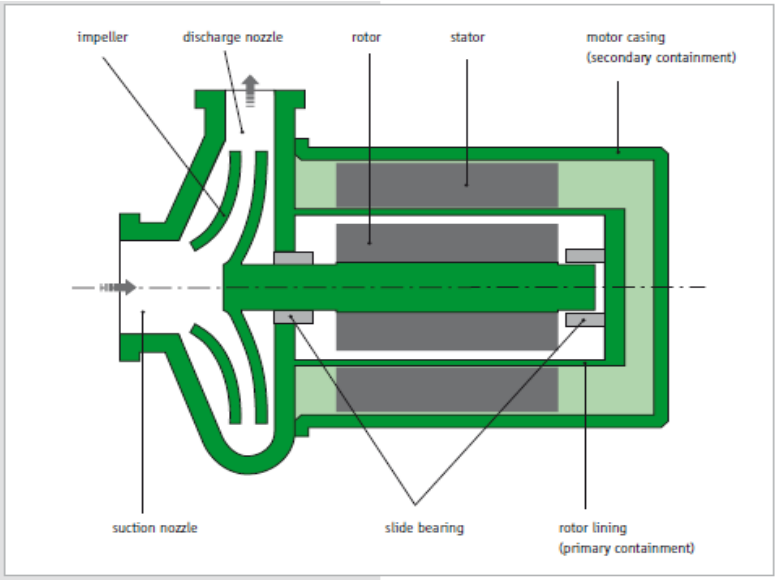
Mechanical seals struggle with high temperatures and high suction pressures. At high temperatures cooling the seal faces becomes a challenge, whilst high suction pressures need to be tolerated by the design of the seal. As these parameters rise to function correctly seals and their associated systems become more complex and expensive.

THE SOLUTION

Moving away from mechanical seals has many benefits. Simpler pumps with no seal systems making the procurement process easier, lower installed costs and lower operating costs. Pumps provide a higher level of safety and pumps have fewer or no wearing parts. Sealless technologies have long histories in many industries including chemical and oil & gas and have designs capable of handling solids and dry running.

Canned Motor Pumps

Canned motor pumps transmit drive in the same way as a conventional three phase electric motor. The pump impeller/s are mounted on the same shaft as the motor rotor. In between the rotor and stator of the motor runs the stator liner, this provides a hermetic seal with no leakage to atmosphere. The motor casing provides full secondary containment. At each end of the rotating element is a slide bearing to support the rotor. These bearings provided by our partner Hermetic are non-wear parts and operate without contact under normal operation. A diagram of the canned motor pump is shown below.

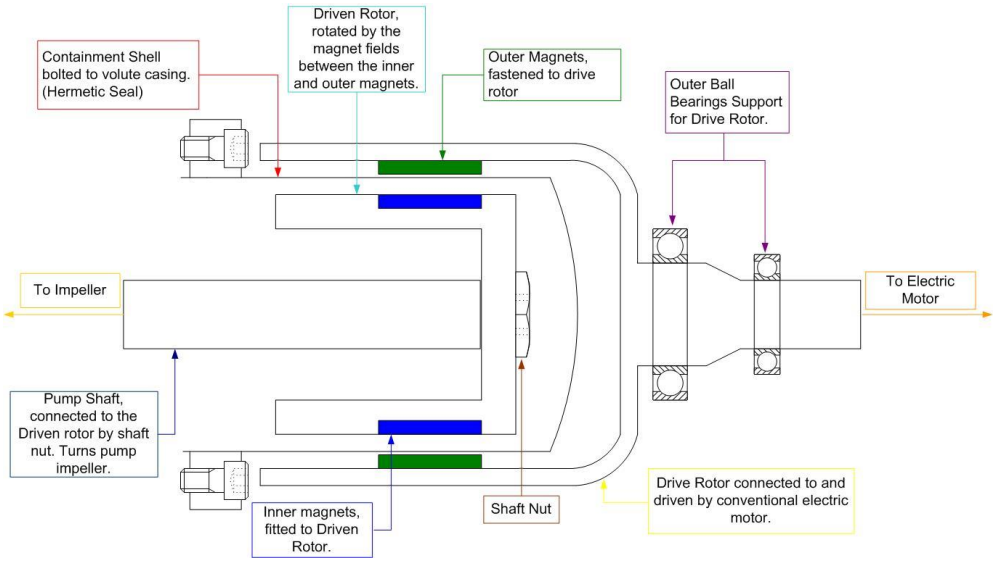


Schematic diagram of canned motor pump (image courtesy of Hermetic Pumpen)

This technology has practically no limit on suction pressure, provides the highest level of safety with secondary containment, easy installation with no alignment or seal system commissioning and low noise levels as no motor fan. The only limit on the technology is the size of the motor currently limited to 690kW and motors are only supplied in Low Voltage (LV).

Magnetic Drive Pumps

Magnetic drive pumps look much like mechanical seal pumps (pump is coupled to a standard motor) the difference is the mechanical seal is replaced with magnetic coupling. The magnetic coupling uses permanent magnets to transmit drive, there are two rotors in the coupling one connects to the drive motor, the other to the pump impeller. Both rotors have rings of magnets which transmit the torque from the motor to the impeller. In between the two rotors sits an isolation shell that prevents liquid from leaking to atmosphere. A diagram of a magnetic coupling is shown below.



Schematic diagram of a magnetic coupling

Magnetic drive pumps are widely used and have the advantage of using conventional motors. With the use of non-metallic isolation shells they can operate with zero losses from eddy currents. Designs are available for handling solids and dry running making the technology now have a wide use.

Technology	Advantages	Disadvantages
Mechanical seals 	• Traditional system incumbent technology • Easier to repair / replace cartridge seals • No limits on power	• Design has inherent limitations around pressure temperature • Leakage • To contain leakage and increase safety complex systems required • Higher installation costs (alignment and commissioning seal system) • Mechanical seal is a wear part and subject to failure
Canned Motor Pump 	• Highest level of safety with secondary containment no chance of leakage • Small compact units • No wear parts lower operating costs • Lower installed cost as no alignment or seal system commissioning • Low noise level as no motor fan	• Motor efficiency • Limitations on motor around supply voltage no MV/HV only LV • Motor certification / options limited
Magnetic Drive Pump 	• No leakage or mechanical seal system • Use of standard TEFC motors • No loss isolation shells, highest efficiency • Dry running designs • Solids handling designs • Only wear part external ball bearings	• On site alignment (unless using close coupled design) • Ball bearings require changing (unless using close coupled design)

Contact AFH today for further information or quotation on sealless pumps.

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