Perfected Sealless Pumps

With the increasing stringency of environmental legislation and the tightening of international standards, ensuring the safety of chemical processes is vital. In addition, alongside the need to consider product liability and operator safety, cutting operational and maintenance costs is important. By charting the evolution of magnetic drive centrifugal pumps one can suggest that sealless pumps could be the key to future success.

By Darren Martin, Global Product Line Manager, HMD Kontro Sealless Pumps

Sealing Concerns

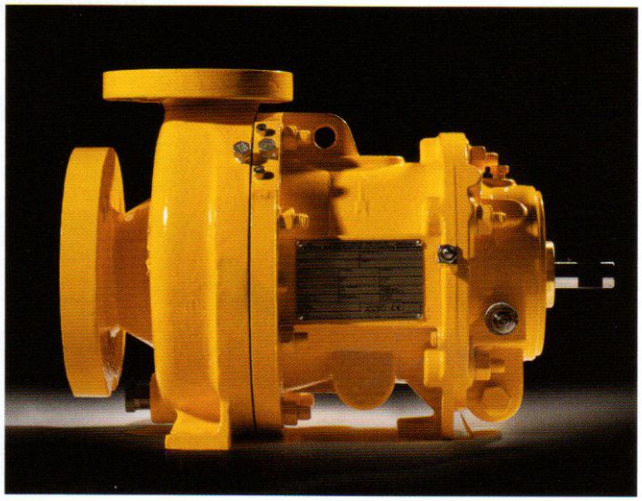
Conventional mechanical seal pumps have been used by the chemical sector, petrochemical refineries, and other industries for many years. They offer a low unit cost, the comfort of familiar products, and common designs across product ranges and manufacturers.

For the chemical industry, and many other processing applications, especially those involving the pumping of highly toxic or corrosive materials around a plant, managing risk is an exceptionally important operational issue; different ingredients are often mixed together to create new substances, some of which could be harmful to plant employees or the environment if leaked or spilled. In addition, the extremely high value of certain products makes it essential to maximize fluid handling efficiency and minimise loss, as any disruption of production can incur unexpected costs, leading to serious financial complications. This makes it vital to select pumps that are safe, reliable, and leak-free.

Whichever seal system is chosen, there is an inherent weakness; the seal must leak to lubricate the seal faces and, if it fails, the product being pumped could be released into the atmosphere. Almost 85% of premature pump failures can be attributed to the mechanical seal. Magnetically driven centrifugal sealless pumps, professionally installed and configured, offer a viable alternative to a typical mechanical seal.

Benefit of Magnetic Drive Sealless Pumps

The basic operating principle of a magnetic drive sealless pump is that the internal pump shaft and supporting journal bearings rotate within the process fluid. The pump shaft is supported by internal plain bearings located in a rigid holder; it has an inner magnet ring connected to one end and the impeller connected to the other. Both the shaft and bearing holder are located inside a can, or containment shell, that completely contains the process fluid.



CSA Side.

HMD CSA Detail.

This containment shell is rated for the same process conditions as the pump casing.

In 1947, HMD Kontro developed the very first version of a sealless pump. Although they have been in operation as a proven technology for decades since, there remains a reluctance to specify them as a solution for solving pumping applications. In part, this barrier to adoption is due to the reluctance and risk averse nature of the industry; the legacy of a few early historical failures is another factor that often plays a part in resisting the alternate technology. Since its inception

however, new technologies and materials have been applied to further advance and perfect magnetic drive sealless pumps, allowing them to offer new advantages in terms of substantial time and cost savings.

Risk Mitigation

A key concern with early sealless pumps models, which has since been addressed, was the inducement of eddy currents into a metallic containment device while a driving magnetic field rotates around it. The resultant heat generation from this process could 'flash' heat sensitive process liquid, disrupting bearing lubrication. The latest sealless pumps have the option of a non-metallic containment shell to prevent this type of overheating and mitigate induction losses. With excellent fire, erosion, and impact tolerance, these pumps are very much suited for chemicals which are toxic, pungent, corrosive, extremely hot/cold, or hazardous. A noteworthy advantage of the next generation containment shells is that power consumption and/or motor size can be reduced to increase overall efficiency. The perception that sealless pumps use more energy and are therefore more costly to run is another barrier for sealless pumps that requires de-bunking. The elimination of heat generation in the latest containment shells enables smaller motors to be specified, with a 20% reduction in power consumption, ultimately making magnetic drive sealless pumps a lower energy solution.

To further mitigate the risk of pump malfunction or failure, many of the sealless pumps offered today come equipped with instrumentation to detect and shut down the pump when issues occur.

Accidentally running a sealless pump dry can cause a loss of process liquid flow which results in heat removal from the containment shell as well as a loss of lubrication for the internal process bearings. A range of detection devices can therefore be employed to protect against dry running. For example, power monitors on the motor and temperature sensors on the containment shell itself.

A more recently adopted detection technology can also be employed to prevent damage by measuring the gas vapor content. Traditional temperature and power control monitoring solutions sense the secondary effects of a gas build-up in the pump, but in most cases, pump damage occurs before any change is registered. By using ultrasonic technology, the occurrence of bubbles in the liquid is detected, and the operator is immediately alerted to the incorrect priming or venting, entrained process gas, or incipient vaporisation in the pump. This new technology is adaptable to any application and can be retrofitted to many existing magnetic drive pumps.

New Regulations

New regulations have led to recommendations, now mandated under ASME and ISO, which may require the fitting of a secondary containment system. In this situation, the leak path of the process liquid is directed into a secondary housing. For magnetic drive pumps, the secondary barrier can be easily achieved with the inclusion of a leakage restriction device on the outer magnet assembly drive shaft.

Working Towards Better Business Outcomes

While capital expenditure when planning a new installation or upgrading processes is considerable, ongoing servicing and maintenance costs should be the major concern. Since sealless pumps were first introduced more than 70 years ago, they have evolved considerably, constantly changing, both to conform to emerging safety regulations and to extend their application and use. The result is a proliferation of choices and the existence of different pump types within

VapourView.

1. CSA Wetted Parts; 2. ZeroLoss Shell Family; 3. Sectioned Sealless Pump.

processing operations which can add to the cost of maintenance and problems with compatibility including when replacing ageing plant. Responding to user concerns, the latest magnetic drive pumps are modular in design, allowing easier and quicker specification and supply, with lead times considerably reduced.

Choosing the right pump is essential in future proofing and protecting plants against potentially dangerous leaks and avoiding unexpected downtime in processing. Having left early teething problems behind and revisited design principles to meet changing needs, perfected magnetic drive sealless pumps now offer an attractive option for the future.

About the Author

Darren Martin is the Global Product Line Manager at HMD Kontro. Working closely with the Sundyne global sales team, Darren is responsible for the identification of new market and product opportunities, based on feedback from territory customers and channels. He is then involved in the development of new and upgraded products right through to their release and ongoing promotion.