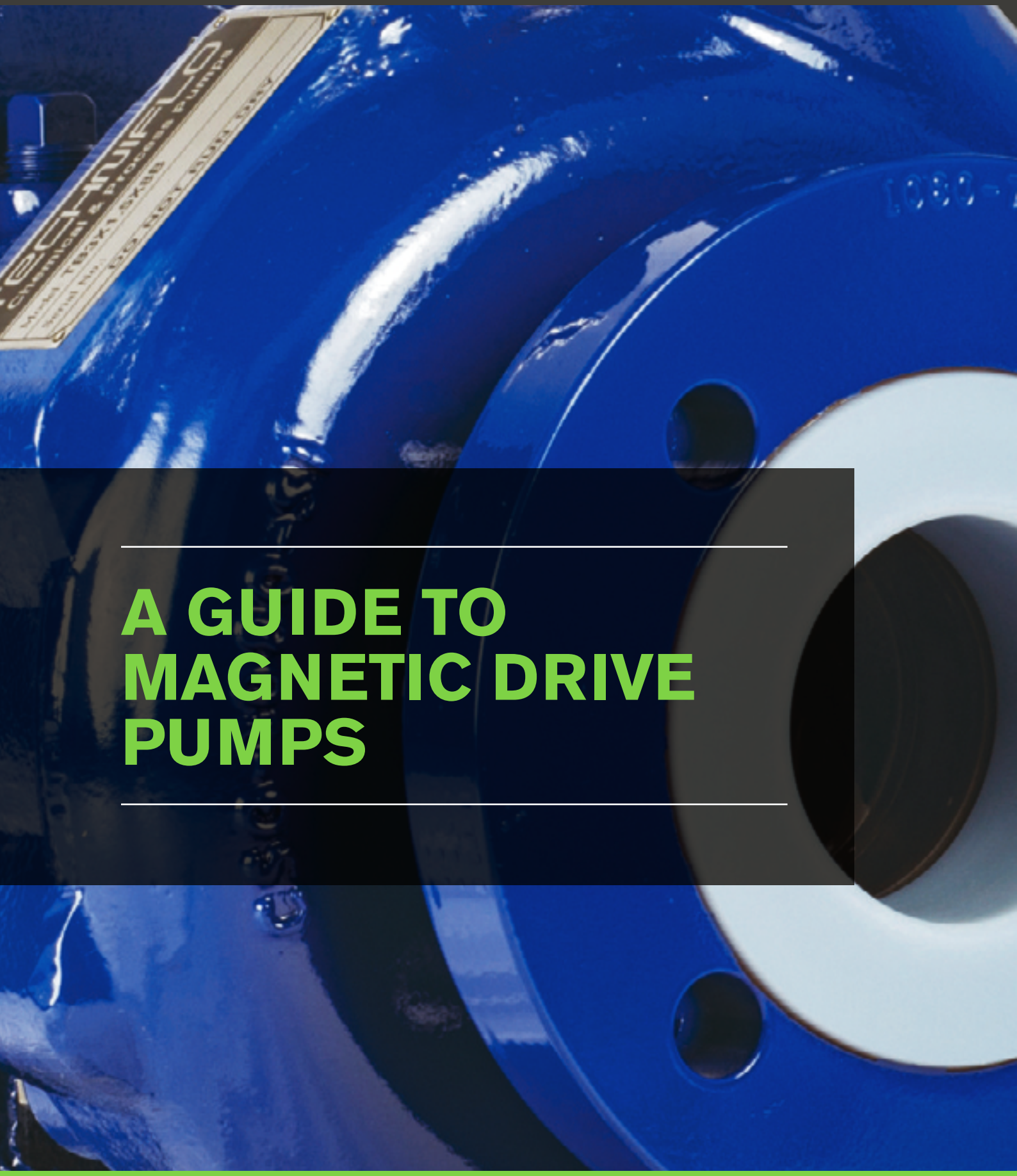
Global Pumps

solving tough challenges



A GUIDE TO MAGNETIC DRIVE PUMPS

INTRODUCTION

WHAT IS A MAGNETIC DRIVE PUMP?

Magnetic drive centrifugal pumps are seal-less pumps that use the attraction of the drive magnet and inner magnet to allow the full torque of the motor to be passed to the impeller. As the shaft of the motor does not reach the interior of the pump, magnetic drive pumps do not have a shaft seal. The magnets are separated by a rear casing or housing, which creates the seal-less containment.

Different to other pumps, the impeller for magnetic drive pumps is not fixed to the motor shaft, as it floats inside the pump housing. Whilst it spins at the same speed as the motor, it is supported by a stationary shaft. This impeller is the only moving part that touches the liquid.

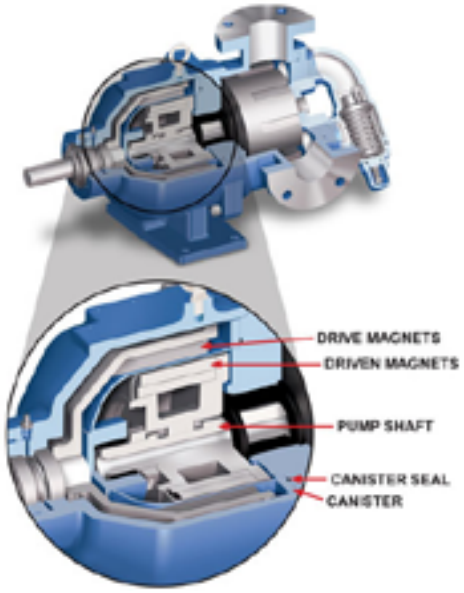
As there is no need for sealing, mag-drive pumps are a leak-proof pump and feature non-metallic wetted parts. Seal-less pumps offer reassurance for those pumping dangerous or corrosive liquids – with a leak-free guarantee. The maintenance costs normally associated with replacing a shaft sleeve are non-existent with magnetic drive pumps due to their unique construction.

There are also magnetic drive positive displacement pumps, vane pumps, internal gear pumps and external gear pumps – with the basic principles being the same. In all variations, the pumped fluid is contained within the sealed housing. This eliminates the risk of a leakage or spill.

TYPES OF MAGNETIC DRIVE PUMPS

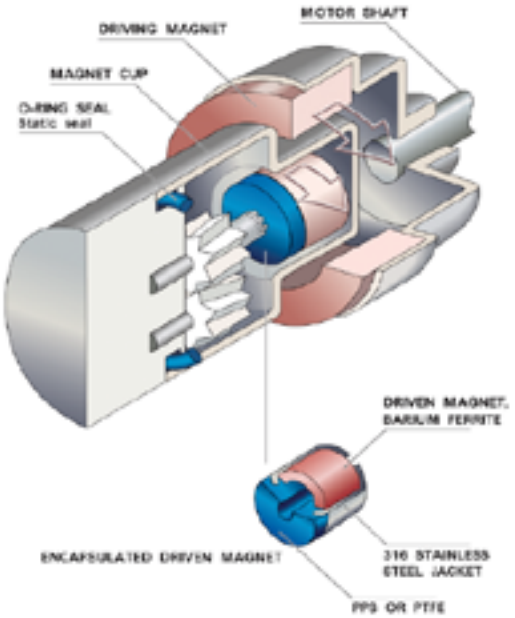
There are two types of magnetic drive pumps available:

ROTATING SHAFT



These are designed for heavy-duty applications and are usually made of metal. They provide the greatest high-strength, temperature, and pressure ratings. The rotating shaft adds complexity to the pump, meaning more parts, greater maintenance requirements and increased costs.

STATIONARY SHAFT



These mag-drive pumps have fixed shafts and are designed for light-to medium-duty applications. These are generally made using non-metallic components (ceramics and plastics), providing good corrosion resistance. The stationary shaft reduces the number of wearing parts, meaning less costs and lower long-term maintenance fees.

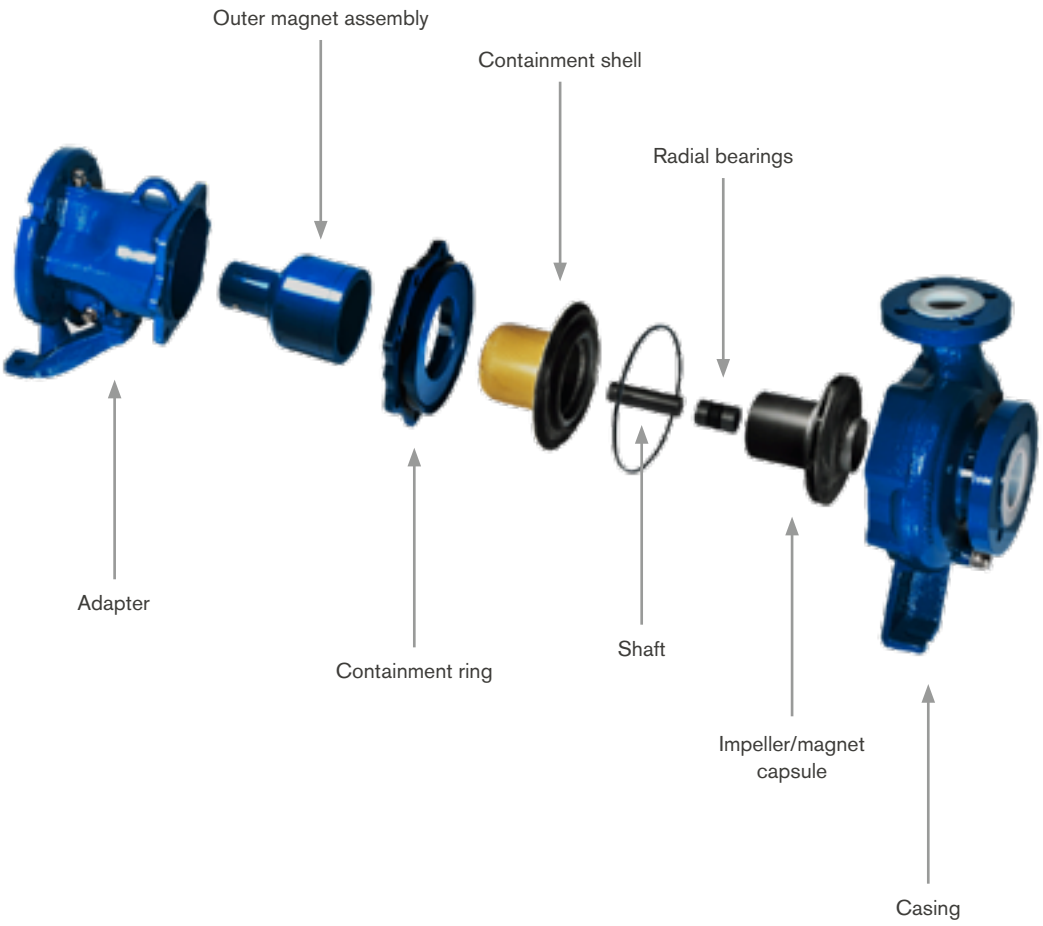
HOW DOES A MAG-DRIVE PUMP DIFFER FROM A SINGLE/DOUBLE MECHANICALLY SEALED PUMP?

The majority of pumps, excluding magnetic drive pumps, have a shaft which runs through the pump casing. This shaft is surrounded by a seal which could cause leakage. Higher quality seals and “seal pots” (seal-fluid pressurisation systems) can minimise leakage, however it is not guaranteed. Seal-fluid pressure minimises the potential for the product to escape past the seal.

As magnetic drive pumps do not have a shaft seal, the hazardous product cannot escape past – and therefore cannot leak.

HOW DOES A MAGNETIC DRIVE PUMP WORK?

The outer magnetic rotor, which is positioned on the drive shaft, transmits the motion to the inner magnetic rotor which is connected to the impeller via the pump shaft. This provides velocity and movement to the liquid through the pump. The sealing within the containment shell creates a static sealing between the inner and outer magnetic rotors. This action provides a 100% leak-free operation.



WHEN WOULD I USE A MAGNETIC DRIVE PUMP?

Magnetic drive pumps are a suitable option when the product being pumped is of a hazardous nature. As they prevent the leakage of any fluid, they are a safe option for highly corrosive, toxic or costly liquids.

Common applications for mag-drive pumps include, but are not limited to:

- petro-chemical industry
- volatile and low flashpoint liquids
- mineral processing
- chemical manufacturing
- chemical processing
- steelmaking industry
- heat transfer liquids
- hot liquors
- bio-diesel plants
- fertiliser plants.

SELECTING A MAGNETIC DRIVE PUMP

When selecting a magnetic drive pump, the following considerations should be made:

PUMP BEARINGS

On a mag-drive pump, bearings on the impeller shaft are lubricated by the pumping action itself. Therefore, low flow, dry running, suspended solids or media with poor lubrication qualities can affect the reliability and longevity of these bearings.

OPERATING TEMPERATURES

If a temperature is reached beyond the magnetics upper limit, they can become demagnetised. In order to avoid failure, users need to avoid dry running and other conditions that cause heat gain within the pump.

VISCOSITY

Vapour pressure and corrosiveness of the pumping fluid may vary due to changes in temperature. Careful attention should be paid to changes in pumping fluid characteristics.

DECOUPLING

Magnetic couplings are rated for maximum torque. Beyond this point, the magnetics will operate at reduced speed - known as decoupling. Continued operation in this state can demagnetise the magnets, making them vulnerable to operating conditions.

ADVANTAGES OF A MAGNETIC DRIVE PUMP

A clear advantage of a magnetic drive pump is the seal-less construction. The elimination of the seal also improves performance, reliability and availability of pumps.

Other advantages of magnetic drive pumps include, but are not limited to:

- no risk of leakage unless pump casing is broken
- no heat transfer from the electric motor power to the pump – the pump chamber is completely separated from the electric motor by an air gap
- wide variety of mag-drive pumps in most materials, metallic and non-metallic.

DISADVANTAGES OF MAGNETIC DRIVE PUMPS

Disadvantages of magnetic drive pumps include, but are not limited to:

- loss of magnetisation when magnets are exposed to temperatures above their limit
- lower efficiency (of typical mag-drive pump) than conventional centrifugal pumps
- risk of overheating or damage; as pumped liquid is used as a lubricant and coolant, if the pump were to run dry, the bearing and other parts could overheat and become damaged. If the application can cause a higher risk of running dry, magnetic drive pumps should not be used or dry run protection devices need to be fitted to pump
- a need to correctly size magnets to avoid breakaway torque being exceeded during start-up
- extreme sensitivity to fluctuating conditions, for example low flows and operation near shutoff head conditions
- limited solids-handling capabilities – solids could become trapped in passages surrounding the magnet and bearings

BEST INSTALLATION PRACTICES

When installing a magnetic drive pump the following considerations should be made:

- install the pump as close to the suction tank as possible
- ensure it is readily accessible for inspection and maintenance
- piping should be supported independently so unnecessary weight and vibration is not transmitted to the pump. Flexible piping is recommended to avoid damage to the pump casing (if it is plastic)
- best piping arrangement for minimum loss is straight runs with few bends and fittings as possible. Suction piping should:
  - be as short as possible with minimum number of bends. Excessive length and sharp change in the direction of flow could lead to flow instability and cavitation
  - never be smaller than the pump inlet
  - flow velocity should not exceed 2 m/s
  - have enough net positive suction head (NPSH) particularly if pumping lower flow rates
- determine the discharge pipe diameter after calculating friction loss head
- install a non-return valve in the following conditions:
  - if the line is extremely long
  - if the total static head exceeds 9 m
  - if two or more pumps are connected in parallel to a common piping

MAGNETIC DRIVE PUMPS IN THE FIELD

Global Pumps received an enquiry regarding a high-quality pump capable of transferring copper electrolyte mixture. The mixture consisted of copper sulphate and sulphuric acid, as well as suspended solids – making it incredibly abrasive and corrosive.

From a wide range of pumps, Global Pumps selected a magnetic drive pump for the application. As these pumps are designed for handling corrosive media, they were the suitable option for the application. Their durable characteristics could withstand the effects of corrosion and wear without any internal damage.

In this instance, the Global Pumps team analysed the application and environment the pump would be operating in and agreed that a mag-drive pump would be suitable. It was crucial that the pump could safely transfer the corrosive material without leakage – a unique characteristic of the mag-drive range.

CONTACT A SPECIALIST

WITH OVER 40 YEARS' EXPERIENCE, YOU'RE IN SAFE HANDS

Global Pumps are the pump experts, with over 40 years' experience in all types of industry and applications.

If you have an enquiry, or are looking to solve a tough challenge, contact our team of experts. We have a wide range of quality, reliable magnetic drive pump suitable for a variety of applications.

1300 1 GLOBAL

sales@globalpumps.com.au

globalpumps.com.au

Global Pump Group Pty Ltd

For more information
or to request a quote

1300 1 GLOBAL
+61 8 8275 8000

sales@globalpumps.com.au
globalpumps.com.au

12 Selgar Avenue
Tonsley SA 5042

20-128