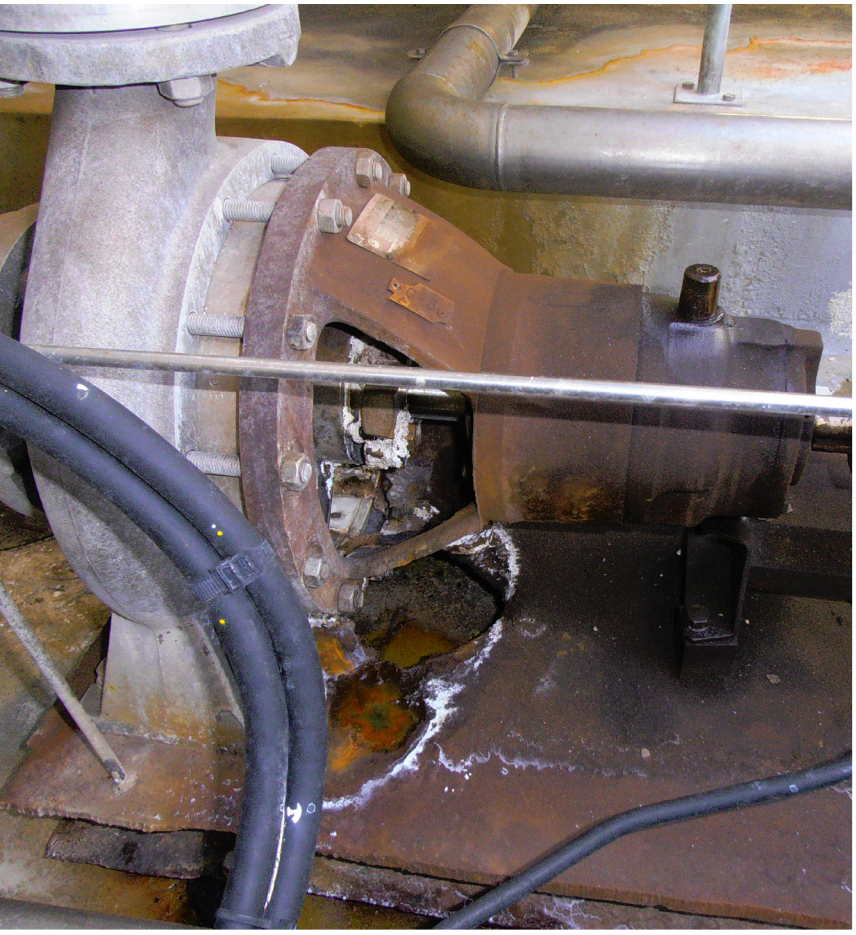
CASE STUDY
MAGNETIC COUPLING UPGRADE



ND pump - magnetic coupling upgrade

Industry:	Oil + Gas - petrochemical
Region:	Europe
Territory:	France
Category:	Mechanical design upgrade
API Type:	OH1

ClydeUnion Pumps Aftermarket Technical Services team has experience across a range of services on critical rotating and reciprocating equipment to improve operational safety, reliability and efficiency. The design upgrade of the CUP-OH1 pump for the oil and gas market is one of our success stories documented in our library of case studies. These case studies highlight the requirement from the customer, how we achieved the goal and the process we followed to deliver the improvements.

Image left: As found CUP-OH1 pump

Situation

The leakage of a highly corrosive liquid through the mechanical seal of CUP-OH1 size 5x3x16 pump required numerous interventions to clean, repair, or change the damaged parts.

After investigation, it was established that either the mechanical seal or braid technologies were not suited to this process. In addition to being highly corrosive, the pumped liquid easily crystallised and led to quick deterioration of dynamic seals. The leaks required monthly cleaning of baseplate and surroundings of the pump by a specialised sub-supplier to comply with environmental standards.

Challenge

The main requirement from the customer was to reduce the frequency and cost of maintenance by suppressing all leak issues. The design requirements were to keep the same hydraulic performances and have no modifications of the current interfaces (baseplate general arrangement, suction and discharge flanges position).

Solution

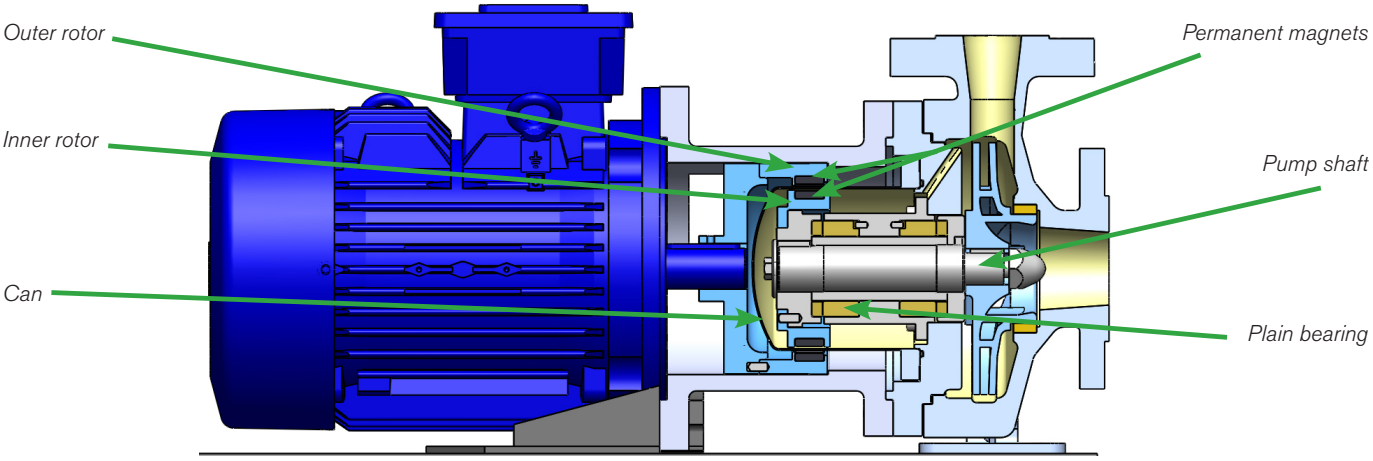
ClydeUnion Pumps proposed to replace the mechanical seal with a magnetic coupling assembled on the current pump casing. The advantage of magnetic coupling technology compared to mechanical seal is to contain the pumped liquid in a hermetic can with no need for a dynamic seal.

Operating principle - an outer rotor containing strong permanent magnets is driven directly by the motor. The torque is then transmitted through the can to an inner rotor (pump rotor and impeller) by magnetic forces.

Axial and radial forces applied to the pump shaft are absorbed by a plain bearing assembled on the pump shaft and lubricated by the pumped liquid.

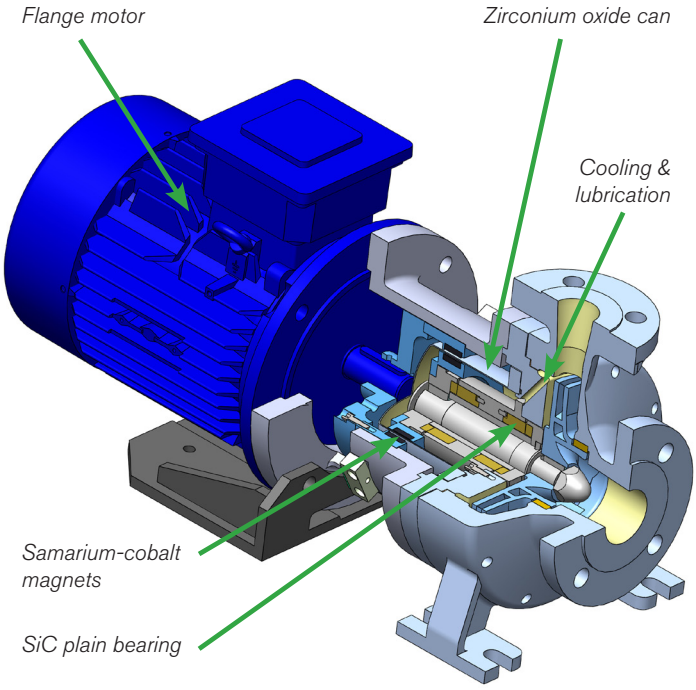
Heat transfers created by magnetic fields inside the can are dissipated by the internal circulation of the pumped liquid. If the magnet's maximum allowable torque is exceeded, the magnetic force between inner and outer rotor breaks.

ClydeUnion Pumps



The following work was undertaken and completed by ClydeUnion Pumps:

- Integration of the magnetic coupling on the pump casing and selection of a size in accordance with the power to be transmitted
- Choice of materials compatible with the pumped liquid
- Removal of the oil bearing housing
- Upgrade of the motor from a foot design to flange design
- Selection of samarium-cobalt magnets to transmit heavy torques and to resist high temperatures
- Selection of zirconium oxide can to suppress eddy current losses generated by magnetic fields
- Design of a new lantern and casing cover



Financial illustration

- **Investment**

  New motor, magnetic coupling, shaft, casing cover and lantern 25,000 Euros

- **Savings**
  - Cost of two new mechanical seals and multiple overhauls on one pump by year
  - Cost of damaged parts to replace
  - Costs linked to specific procedures for cleaning
  - Savings due to increased availability of the process

Operational improvements

- Increase of availability of the pumping package
- High increase of MTBO
- Compact arrangement with no need to change the current interfaces

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