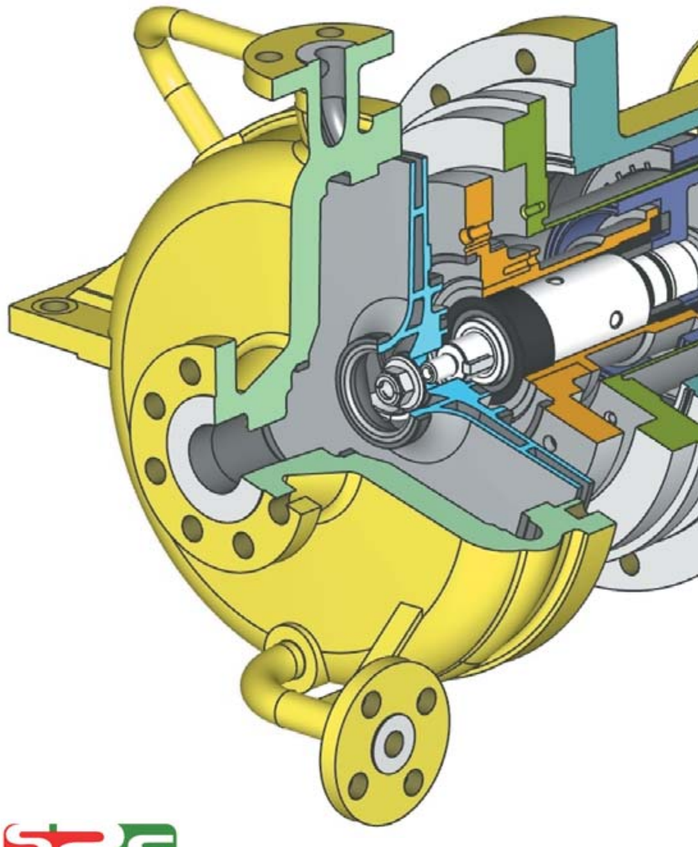
HMD Kontro

Directory of Sealless Pump Terminology



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What are the advantages of magnetic drive over mechanically sealed pumps?

The mean time between failure (MTBF) for sealless magnetic drive pumps is typically three times that of mechanically sealed pumps.

Double mechanical seals require support systems and barrier fluid. These require constant monitoring and maintenance to work properly. Sealless pumps are simpler and no complex support is needed.

Mechanical seals leak across their faces (that is how they work). Magnetic drive pumps are a true zero leakage design. This eliminates potentially harmful emissions and odours associated with sealed pumps.

Sealless pumps are easier to maintain, have fewer working parts, no potential leak paths and no support systems to worry about.

There is less cost involved in system design and procurement, and no concerns regarding material compatibility or appropriate buffer liquids.

- No Seals
- No Seal Support Systems
- No Risk of Seal Failure
- No Leaks (At All!)
- No Emissions
- No Environmental Hazards
- No Health Issues
- No Safety Concerns
- No Maintenance (Almost!)
- No Buffer or Flush Fluid Costs
- No Need to Decontaminate
- No Bearing Changes
- No Loss of Product
- No Loss of Production Output
- No Unexpected Expenses
- No Problems!

What Makes HMD Kontro pumps so special?

HMD pioneered magnetic drive technology for pumps and have manufactured only sealless pumps in Eastbourne since 1947 and so the design is specific, and not a modified mechanically sealed pump. We make them differently and engineer them to last.

The containment shell is a welded construction to ASME VIII pressure vessel standards and typically of 1.2mm thickness. Our competitors usually have hydro formed shells, much thinner and weaker than the HMD design. Rotating parts are dynamically balanced ensuring smooth, quiet operation and longevity.

HMD pumps are a modular cartridge design. This can reduce maintenance time considerably. This method of construction means that there are many common components for each of the three frame sizes throughout the range, reducing the need for a large stock of spare parts in a multiple pump installation.

The outer magnet ring is fully encapsulated. This means that the magnets are protected from being chipped on assembly and against corrosion from the pumped liquid in the event of containment shell breach. It also means that the component can be easily cleaned in workshop conditions.

Each and every HMD Kontro pump is hydrostatically tested and performance tested before being dispatched to guarantee optimum reliability.

Because of their inherent durability and low cost operation, HMD Kontro sealless pumps can give a much-reduced lifetime cost benefit for the majority of applications. Please enquire today for further information.

Pump Parameters

At HMD Kontro, since developing the first sealless, magnetic drive pump over sixty years ago, we have continued to push the parameters at which our latest pumps can now operate.

As a summary, please find these details below:

- Temperature – Down to minus 100°C
- Up to 450°C / 840°F Torque Ring Design
- Up to 315°C / 600°F Synchronous Design
- Flow Rates – Up to 2000m^3/hour / 8800 USGPM
- Heads – Up to 350m / 1140' differential
- Viscosity – Maximum 200cps
- Pressure – Up to 250 bar / 2600 PSI
- Solids – Up to 5%, with a particle size of 150 microns
- Up to 8% and 250 microns with filtration
- Power – 315kW 50hz / 400kW 60hz
- Full compliance with API685 / API610

If your operating parameters are higher than those shown or you have a particular requirement, we may well be able to engineer a bespoke solution for your application. Please contact us to discuss your requirements and we will do our very best to accommodate them.

Introduction

Directory of Sealless Pump Terminology

As the company that devised the very first magnetic drive pump, no one is better placed to develop and provide a glossary of the various terms that surround sealless pump applications. This guide has been prepared to help improve the general understanding of the sealless pump process.

We have also taken the opportunity to list the parameters that our sealless pumps can now attain. For further information, please ask for a copy of our Sealless Pump Know How guide, which provides details about the benefits and significant cost savings that can be achieved by using a magnetic drive pump.

HMD Kontro offer a comprehensive standard range of pumps that are suitable for the hazardous and arduous applications that you would expect from a magnet drive pump. However, because of their efficiencies and economies, they are often now a very viable alternative to a mechanical sealed pump.

For further details and information on sealless pumps, please do not hesitate to contact HMD Kontro directly or our distributor in your country, as shown on the back of this directory. Further details can also be found at our comprehensive website: **www.hmdkontro.com.**

Sealless
Pumps

Air Gap: The radial distance between the outer magnet ring and the containment shell.

ANSI B73.1M Standard – Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process: This standard applies to horizontal, end-suction, overhung, radially split, single-stage, mechanically sealed pumps. It defines both dimensional and best-efficiency head and capacity parameters. The intent is to ensure users can utilise and exchange pumps within the same grouping from any manufacturer without piping or foundation dimension changes.

ANSI B73.3M Standard – Specification for Sealless Horizontal End Suction Centrifugal Pumps for Chemical Process: This standard applies to horizontal, end-suction, overhung, radially split, single-stage, sealless pumps. It defines both dimensional and best-efficiency head and capacity parameters. The intent is to ensure users can use and exchange pumps within the same grouping from any manufacturer without piping or foundation dimension changes.

ASME B16.5 Standard – Specification for Pipe Flanges and Flanged Fittings: The scope of this standard is to define and standardise pressure & temperature ranges for flange ratings within various material groups, to define flange dimensions for various ratings and fitting designs, and also for the flange bolts, to establish tolerances covering the major flange dimensions and to give rules covering hydrostatic testing and the application of various raised face designs.

HMD Kontro
Options

To enhance the performance of our sealless pumps still further, we offer a range of standard options to ensure that our pumps can meet your requirements.

Examples of these are as follows:

- Close Coupled – Flange Mounted on Sub-Base Design
- Separate Mounted – Foot Mounted on Baseplate Design
- Casing Heating Jackets
- Coupling Housing Heating Jackets
- Secondary Control – Via Magnetic Seal and Flanged Drain
- Secondary Containment – Via Gas Seal
- Solids Handling – In-line filter or Mono & Duplex Filters, Magnetic Filter

If there are other facilities or options that you require, that are not listed here, then please do not hesitate to contact us to discuss your requirements.

Torque Ring Drive: Also know as an Eddy Current Drive. A magnetic coupling consisting of a permanent outer magnet ring and an inner torque ring containing a network of copper rods supported on a mild steel core. The rotating outer magnet ring generates eddy currents in the copper rods, which converts the core to an electromagnet. The electromagnet follows the rotating outer magnet ring, but at a slightly slower speed due to slip, i.e. asynchronous drive.

Total Indicated Runout (TIR), Also Known as Total Indicator Reading: The runout of a diameter or face determined by measurement with a dial indicator. The indicator implies an eccentricity equal to half the reading or an out-of-squareness equal to the reading.

Trip Speed (In Revolutions Per Minute): The speed at which the independent emergency overspeed device operates to shut down a prime mover.

Unit Responsibility: Refers to the responsibility for coordinating the technical aspects of the equipment and all auxiliary systems included in the scope of order. Factors such as the power requirements, speed, direction of rotation, general arrangement, couplings, dynamics, lubrication, material test reports, instrumentation, piping, and testing of components, and so forth, shall be included.

Vertical In-Line Pump: A pump whose suction and discharge connections have a common centerline that intersects the shaft axis. The pump's driver is generally mounted directly on the pump.

API 610 Standard – Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services: The scope of this standard covers the minimum design, testing, dynamics, and metallurgical requirements for mechanically sealed centrifugal pumps and hydraulic power recovery turbines. Single stage overhung pumps, and both single and multistage between bearing pump designs are covered, in both horizontal and vertical configurations.

API 685 Standard – Sealless Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services: The scope of this standard covers the minimum design, testing, dynamics, and metallurgical requirements for sealless centrifugal pumps, including single stage pump designs for Magnetic Drive Pumps (MDP) of both synchronous and eddy-current / torque ring drives, and also for canned motor pumps, both horizontal and vertical configurations.

ATEX – ATmosphere EXplosibles (French for Explosive Atmospheres: The name commonly given to the legal requirements for controlling explosive atmospheres and the suitability of equipment and protective systems used in them.

Axial Thrust: The net axial load on the pump shaft caused by hydraulic forces acting on the impeller shrouds and rotor or inner magnet ring.

Axially Split: Casing or housing joint that is parallel to the shaft centreline.

BEP – Best Efficiency Point: The point or capacity at which a pump achieves its highest efficiency.

Containment Shell: Also known as the Shroud. The pressure containing boundary located within the drive end that separates the inner and outer magnet rings of a magnetic drive pump.

Coupling (Magnetic): The attraction of the magnets of the Inner Magnet Ring and Outer Magnet Ring allowing both to rotate synchronously or asynchronously in the case of a torque ring drive.

Critical Speed: Rotative speed corresponding to a lateral natural frequency of a rotor.

Critical Speed, Dry: A rotor natural frequency calculated assuming that the rotor is supported only at its bearings and that the bearings are of infinite stiffness. No account is taken of the damping effects that result when pumping liquid. This damping effect is called the 'Lomakin effect'. The dry critical speed is invariably lower than the wet critical speed, for this very reason.

Decouple: Also known as 'Pulling-out-of-step'. To break the magnetic linkage between the inner and outer magnet rings of a synchronous coupling resulting in a failure of the magnet assemblies to rotate synchronously.

Demagnetization: The loss of magnetic attraction due to such causes as elevated temperature.

Drive Train Components: Items of equipment, such as motor, gear, turbine, engine, fluid drive, and clutch used in series to drive the pump.

Drive Shaft: The shaft attached to the electric motor supported by the power frame bearings.

Suction Pressure: The liquid pressure at the suction flange of the pump.

Synchronous Drive: A drive consisting of an inner and outer magnet ring, whereby the rpm (revolutions per minute) of both components is identical.

Throat Bushing: A device that forms a restrictive close clearance around the sleeve (or shaft) between the rotor chamber and the impeller.

Throttle Bushing: A secondary control device on a magnetic drive pump that forms a restrictive close clearance around the shaft (or sleeve) of the outer magnet ring.

Through Life Cost (Life Cycle Cost): The total cost of ownership including maintenance and operating costs, plus energy consumed.

Tolerance Ring: A component, which acts as an elastic shim to frictionally position mating cylindrical parts.

Secondary Containment System: A combination of devices that, in the event of leakage from the primary containment shell, confines the pumped liquid within a secondary pressure casing that includes provisions to indicate a failure of the primary containment shell.

Secondary Control: The minimisation of release of pumped liquid in the event of failure of the containment shell.

Secondary Control System: The combination of devices (including a secondary pressure casing) that, in the event of leakage from the containment shell, minimises and safely directs the release of pumped liquid. It includes provision(s) to indicate a failure of the containment shell.

Secondary Pressure Casing: The composite of all pressure containing parts of the unit, which are exposed to pressure resulting from failure of a containment shell.

Self-Priming: The ability of a pump to generate sufficient vacuum to draw process liquid into the impeller, prior to achieving the usual operation of the pump.

Sleeve Bearing: A bearing consisting of a rotating member (journal) and a stationary member (bearing bushing).

Slip: The speed differential between the torque ring and outer magnet ring in a torque ring drive pump.

Specific Gravity (SG): Property of a liquid; ratio of the liquid's density to that of water at 4°C (39.2°F).

Eddy Current Drive: Also know as a Torque Ring drive. A magnetic coupling consisting of a permanent outer magnet ring and an inner torque ring containing a network of copper rods supported on a mild steel core. The rotating outer magnet ring generates eddy currents in the copper rods, which converts the core to an electromagnet. The electromagnet follows the rotating outer magnet ring, but at a slightly slower speed due to slip, i.e. asynchronous.

Eddy Current Losses: Losses from random electrical currents generated in a conductive material when a magnetic field is rotated around it. These losses are normally dissipated as heat, due to the electrical resistance of the material.

Fluid Cooling: A design of pump whereby a proportion of the pump liquid is used to cool the drive assembly.

Glandless: A sealless pump design, which does not utilise gland packing or mechanical seals.

Heat Balance Calculation: A calculation carried out to check that the pumped liquid used for lubrication and cooling does not change state from liquid to gas during operation across a range of conditions.

Hermetically Sealed: A sealless pump that has a stationary containment device to prevent any leak paths to the atmosphere.

Hydraulic Thrust Balance: Axial thrust equalisation achieved by means of an impeller design, by impeller balance holes or by thrust balancing through variable orifices in the drive end.

Hydrodynamic Bearings: Bearings that use the principles of hydrodynamic lubrication. Their surfaces are oriented so that relative motion forms a lubricant wedge to support the load without journal-to-bearing contact.

Inner Magnet Ring (IMR): The cylindrical band of magnets operating within the containment shell of a magnetic drive pump, driven by the outer magnet ring. The inner magnet ring contains the same number of magnet lengths as the outer magnet ring, and is mounted on the same shaft as the pump impeller. The IMR transmits torque to the impeller shaft.

Inner Magnet Sheathing: The protective covering of the inner magnet ring in a magnetic drive pump.

ISO 2858 Standard – Specification for end-suction centrifugal pumps: This international standard specifies the principal dimensions and nominal duty point of end-suction centrifugal pumps having a maximum operating rating of up to 16 bar.

Journal Bearing: A radial, fluid lubricated bearing comprising of two parallel cylindrical components, one of which is rotating and one of which is stationary. The relative motion of the two surfaces generates a fluid force separating the two surfaces.

Journal Bush: The stationary component of the journal bearing.

Journal Sleeve: The rotating component of the journal bearing.

Radially Split: Casing or housing joint that is perpendicular to the shaft centerline.

Rated Operating Point: The point at which the pump performance is within the tolerances stated.

Relative Density: Property of a liquid; ratio of the liquid's density to that of water at 4°C (39.2°F).

Rotor: The assembly of all the rotating parts of a centrifugal pump.

Rotor Chamber: The liquid filled cavity bounded by the inside diameter of the liquid filled cavity in a magnetic drive pump internal to the containment shell which contains the inner magnet ring, shaft, and bearings.

Rotor Chamber Temperature Rise: The temperature increase of the fluid circulated through the rotor chamber. It is the difference between the temperature of the fluid leaving and that entering the rotor chamber.

Sealless Pump: A design that does not require an external dynamic shaft seal. Static seals are the primary method of containing the fluid.

Secondary Containment: The confinement of the pumped liquid within a secondary pressure casing in the event of failure of the primary containment shell.

Operating Region: Portion of a pump's hydraulic coverage over which the pump operates.

Allowable Operating Region: Region over which the pump is allowed to operate, based on vibration within the upper limit or temperature rise or other limitation; specified by the manufacturer.

Outer Magnet Ring: The band of permanent magnets securely fixed to and encapsulated in a cylindrical frame and evenly spaced to provide a uniform magnetic field. The outer magnet ring rotates about the containment shell, driving the inner magnet ring or torque ring.

Overhung Pump: A pump whose impeller is cantilevered from its bearing assembly. Overhung pumps may be horizontal or vertical.

Pole: The region of a magnet where flux density is concentrated.

Power End: The end of the pump that provides the mechanical energy necessary for the operation of the liquid end.

Primary Pressure Casing: The composite of all stationary pressure-containing parts of the unit, including the containment shell.

Product Lubricated Bearings: Bearings and journals that operate in a pumped liquid lubricated environment to support the drive shaft, inner magnet ring and impeller.

Radial Loading: The side load perpendicular to the pump shaft and drive shaft due to unbalanced hydraulic loading on the impeller, mechanical and magnetic rotor unbalance, rotor assembly weight, and forces of the fluid circulating through the rotor chamber.

Liquid End: The end of the pump, which converts mechanical energy to kinetic energy in the pumped fluid.

Liquid Gap: The radial distance between the containment shell inside surface and the outside surface of the inner magnet sheathing.

Locked Rotor Torque: The maximum torque which a motor will develop at rest for all angular positions of the rotor, with rated voltage applied at rated frequency.

Magnetic Drive (Magdrive) Pump: A type of sealless pump, which utilises magnets to drive an internal rotating assembly, consisting of an impeller, shaft and inner drive member (torque ring or inner magnet ring) through a corrosion resistant containment shell.

Maximum Allowable Speed (rpm): The highest speed at which the manufacturers design will permit continuous operation.

Maximum Allowable Temperature: The maximum continuous temperature for which the manufacturer had design the equipment when handling the specified liquid at the specified pressure.

Maximum Allowable Working Pressure (MAWP): The maximum continuous pressure for which the manufacturer has designed the equipment when operating at the maximum allowable temperature.

Maximum Continuous Speed (rpm): The maximum continuous operating speed allowed by the equipment manufacturer, taking into account the effects of higher powers, material stresses and the dynamics of the pump rotor.

Minimum Continuous Stable Flow: The lowest flow at which the pump can operate at, without exceeding dynamic constraints, such as excessive vibration levels.

Minimum Continuous Thermal Flow: The lowest flow that the pump can operate at, without its operation being impaired by the temperature rise of the pumped liquid.

Mean Time Between Failure (MTBF): A measure of reliability. The mean (average) time between failures of a pump or another device. Calculations of MTBF assume that a system is renewed / fixed, after each failure, and then returned to service immediately after failure. The average time between failing and being returned to service is termed mean down time (MDT) or Mean Time to Repair (MTTR). Mean Time Between Failure numbers can be significantly altered by environmental factors such as improper power and cooling. MTBF numbers can also be lowered by excessive vibration or by many forms of misuse. The calculation of the MTBF is a statistical calculation involving the average life of the major pump components.

Net Positive Suction Head (NPSH): The total absolute suction head, in metres (feet) of liquid, determined at the suction nozzle and referred to the datum elevation, minus the vapour pressure of the liquid, in metres (feet) absolute. The datum elevation is the shaft centerline for horizontal pumps, the suction nozzle centerline for vertical in-line pumps, and the top of the foundation for other vertical pumps.

Net Positive Suction Head Available (NPSHA): The NPSH, in meters (feet) of liquid, available from the system providing liquid to the pump, and given for the pumping system with the liquid at the rated flow and normal pumping temperature. Classically the NPSHA = Suction Pressure – Vapour Pressure of the liquid, referenced to the pump suction flange, or to the pump foundation, whichever is stated. The NPSHA is a function of the system design and liquid operating characteristics.

Net Positive Suction Head Required (NPSHR): The NPSH, in meters (feet), determined by testing with water. NPSHR is measured at the suction flange and corrected to the datum elevation. NPSHR is the minimum NPSH required at rated capacity required to prevent a head drop of more than 3 percent due to cavitation within the pump. The NPSHR is a function of the pump design and operating speed.

Normal Operating Point: The point at which the pump is expected to operate under normal process conditions.

Normal Wear Parts: Those parts normally restored or replaced at each pump overhaul, typically wear rings, throat bushing, bearings, and all gaskets.

Oil Mist Lubrication: A lubrication system that employs oil mist produced by atomization in a central supply unit and transported to the bearing housing by compressed air.

Pull Out Torque (Break out Torque): The amount torque required to decouple the magnetic coupling - usually measured under static conditions.

Pure Oil Mist Lubrication (Dry Sump): The mist both lubricates the bearing and purges the housing.

Purge Oil Mist Lubrication (Wet Sump): The mist only purges the bearing housing. Bearing lubrication is by conventional oil bath, finger, or oil ring.