NORTH RIDGE PUMPS

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A GUIDE TO THE:

Parts of a Positive Displacement Pump

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A Guide To:

Parts of a Centrifgual Pump

A pump head contains 4 main parts but relies on up to 30 different parts for its correct function, working motion and longevity.

Air Driven Diaphragm Pumps (AOD)

2. Diaphragms
2. Balls
3. Seats
3. Ball Cage
4. Silencer or Air Muffler
4. Centre Nut
5. Washer
5. Air Valve
6. Manifold

Electric Diaphragm Dosing Pump

7. Piston Cylinder Ring
7. Regulating Rod
8. Piston
8. Suction/Discharge Valve
9. Diaphragm
9. Flexible Impeller

Gear

10. Heating Jacket
10. Rotary Gear
11. Idler Gear
11. Herlical Gear

Peristaltic

12. Hose
12. Roter
13. Shims
13. Shoes
14. Rollers

Piston/Plunger

15. Crankshaft
15. Discharge Manifold
16. Plunger
16. Piston
17. Sleeve
17. Slinger
18. Retainer Seal
18. Wick Long Tab
19. Guided Valve
19. Shafter Protector
20. Mounting Angle Rail Kit
20 V Packing

Progressing Cavity

21. Rotor
21. Stator
22. Tie Rods
22. Coupling Pin
23. Joint Cover

Lobe

24. Lobes
24. Gear
25. Drive Shaft
25. Driven Shaft
26. Wear Plates
26. Cover Plate

Rotary Piston

27. Rotor
27. Piston

Double/Triple Screw Pump

28. Twin Screw
28. Driving Screw
29. Idler Screws

Vane Pump

30. Rotor
30. Rods
31. Vanes

Common Parts

32. Bearings
32. CIP/SIP Port
33. Circlip, Snap Ring, Retaining Rings, Seeger
33. Gearbox
34. Mechanical Seal
34. O Ring
35. Packing
35. Relief Valve
36. Rubber/Steel Gaskets
36. Spring

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Air Driven Diaphragm Pump

Diaphragms

Diaphragms are housed within the chambers of air operated diaphragm pumps which have two sides – an air and fluid side.

The air side is the side of the diaphragm which expands and contracts being closest to the central air valve. The fluid side meets the fluid, filling and contracting with fluid as the pump cycles.

Diaphragms

Balls

These are manufactured in a variety of plastics and metals depending on the fluid being pumped. They act as valves above and below each side of the diaphragms, below the top manifold and above the bottom manifold. They are responsible for maintaining pump efficiency and ensuring the pump can operate.

Balls

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Air Driven Diaphragm Pump

Seats

Diaphragm pump balls push against seats to form a seal isolating each chamber within an AOD pump.

Seats

Ball Cage

The balls located above and below the pump diaphragms are housed in cages. This to prevent the balls from damaging the tops of the manifolds and to stop them sticking to the top of the pump.

Ball Cage

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Air Driven Diaphragm Pump

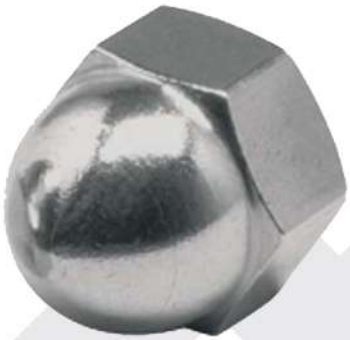
Silencer or Air Muffler

Quietens the sound of air discharge from the pump.

Silencer

Centre Nut

This holds parts of the pump together e.g., manifolds, diaphragms etc.



Centre Nut

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Air Driven Diaphragm Pump

Washer

Used in conjunction with the nut to prevent the nut from moving or corroding.

Washer

Air Valve

The air valve is located in the central manifold of the pump. Its purpose is to convert air flow and pressure into reciprocating movement. This drives a piston to compress one diaphragm then another.

Air Valve

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Air Driven Diaphragm Pump

Manifold

Manifolds are located at the top and bottom of AOD Pumps. The suction manifold is designed to keep the pump diaphragms flooded with fluid. They act as a single delivery pipe on the pump discharge.

Manifold

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Electric Dosing Pump

Piston Cylinder Ring

Maintains Seal around the outside of the cylinder.

Piston Cylinder Ring

Regulating Rod

This regulates how far the piston compresses the diaphragm via a dial at the rear of the pump. This is usually a setting between 0 – 100% of displacement.

Regulating Rod

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Electric Dosing Pump

Piston

This is driven via a gearbox and moves in a reciprocating motion compressing the diaphragm. When the diaphragm is compressed, fluid exits the pump head via the discharge valve. When the piston draws back the diaphragm expands drawing fluid into the pump head via the suction valve.

Piston

Suction/Discharge Valve

Responsible for sealing the pump head, ensuring that fluid drawn into the pump head and does not leak out. Also, that displacement is always via the discharge valves.

Suction/Discharge Valve

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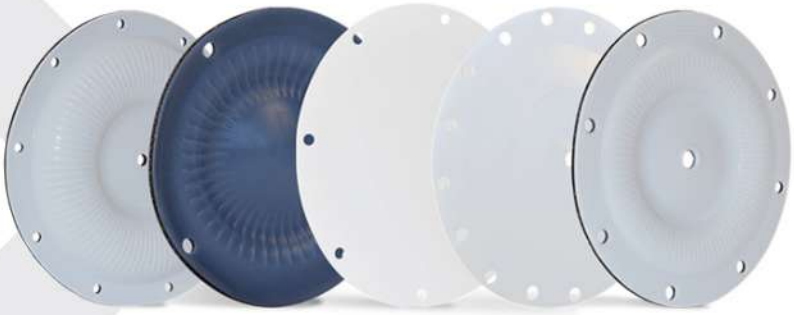
Electric Dosing Pump

Diaphragm

These fill with fluid and are compressed by the piston. This happens at varying frequency and depth to produce the required flow.



Diaphragm

Flexible Impeller

This is a rubber impeller which sits inside the pump casing. When inside the casing, several of the vanes are bent over forming a tight seal within the casing.

They are made from a variety of rubbers such as EPDM, NBR, Silicone, Viton, and Neoprene.

Flexible Impeller

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Gear Pump

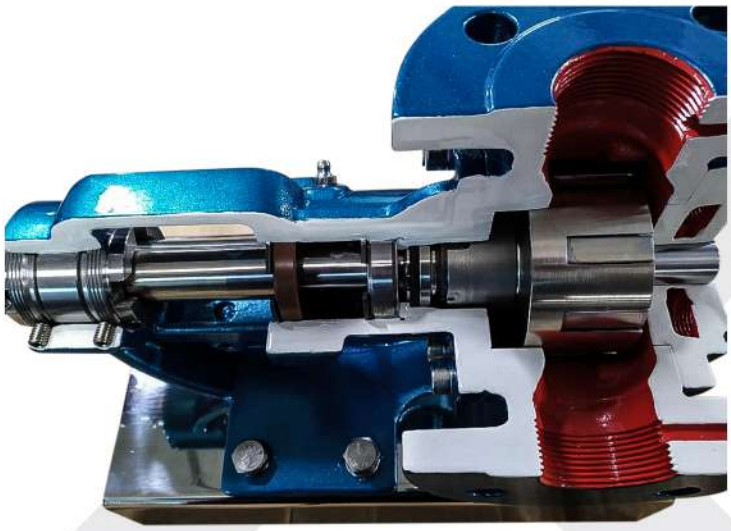
Heating Jacket

These maintain the liquid temperature within the pump head preventing solidification. This ensures the liquids viscosity remains within the handling capabilities of the pump.

Heating Jacket

Rotary Gear

Found within internal gear pumps, this is fixed in place with a smaller idler gear driven by the pump shaft.



Rotary Gear

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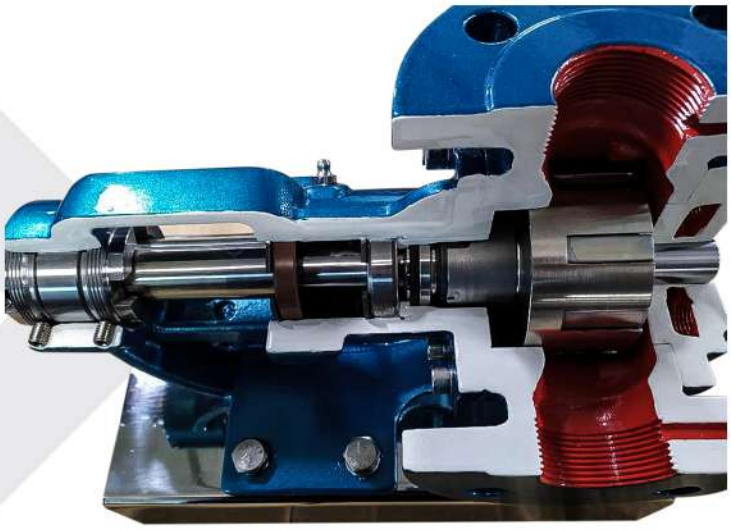
Gear Pump

Idler Gear

The idler gear rotates within the rotary gear, driven by the pump shaft drawing fluid into the pump head. This builds pressure before its discharged via the outlet of the pump.



Idler Gear

Helical Gear

These are two interlocking gears mounted on separate shafts working in unison. They draw fluid around the outside of the pump casing. This fills the pump head before liquid builds in pressure and is discharged via the outlet.

Herlical Gear

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Peristaltic Pump

Hose

The only wearing part of a peristaltic pump. The hose is compressed by rollers or shoes causing the transfer of liquids.

Hose

Rotor

The rotor is driven by the output shaft of the gearbox. This then rotates the shoes or rollers which compress the hose.

Rotor

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Peristaltic Pump

Shims

Shims are placed under shoes and rollers which alters the amount of hose compression and consequently the pressure generated by the pump.

Shims

Shoes

These compress the hose enabling pressures up to 15 bar to be generated by the pump.

Shoes

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Peristaltic Pump

Rollers

The volute is a piece of metal that forms part of the casing surrounding the impeller. It is responsible for ensuring pump efficiency and controls the amount of pressure generated by the impeller.

Rollers

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Piston/Plunger Pump

Crankshaft

This converts rotary movement into reciprocating movement, allowing the driving of plungers or pistons at separate time intervals.

Crankshaft

Discharge Manifold

Pressure and flow generated by the pistons or plungers flows into the discharge manifold and exits the pump via a single port.

Discharge Manifold

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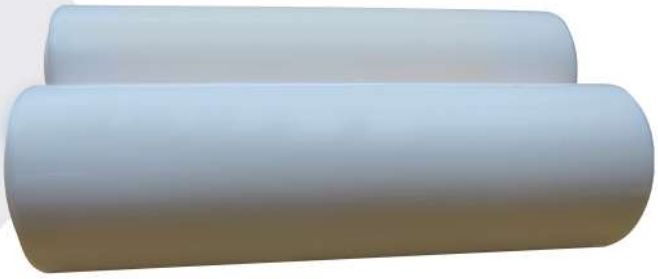
Piston/Plunger Pump

Plunger

A plunger is a solid ceramic polished part that slides back and forth within a stuffing box. It generates flow and pressure in the discharge manifold.

There are often several plungers located within one pump head. In a triplex plunger pump, there are 3 plunger rods present. Flow and pressure are controlled by driving the plungers at different speeds and force.



Plunger

Piston

These slide backwards and forwards within a hollow cylinder producing flow and pressure.

Piston

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Piston/Plunger Pump

Sleeve

This is a sacrificial part which protects the shaft from contact with fluid. Its purpose is preserving the lifespan of the shaft.

Sleeve

Slinger

These sit behind the ceramic plunger. If the low-pressure seal starts to leak, it prevents water jetting inside the crankcase and mixing with the oil. Flow is directed downwards and is reduced in pressure appearing to the operator as a drip.

Slinger

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Piston/Plunger Pump

Retainer Seal

This part is a spacer between the inlet manifold and crankcase. It holds the low-pressure seals and crank case seal. It allows leakage should the low-pressure seal leak, allowing fluid to drip out.

Retainer Seal

Wick Long Tab

Usually each month 3 drips of lubricating oil are placed onto the wick long tab. This lubricates the piston rods with any excess dripping into the pan.

Wick Long Tab

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Piston/Plunger Pump

Guided Valve

All pumps have sets of valves ranging from non-return, to flow valves. Guided valves are used on some models and run within a sleeve during operation.

Guided Valve

Shaft Protector

Some pumps have output shafts. One side connected to the driving motor, and should the other side not be used, it is covered with a shaft protector.

Shaft Protector

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Piston/Plunger Pump

Mounting Angle Rail Kit

The base plate of a piston/plunger pump for mounting the pump to equipment.

Mounting Angle Rail kit

V Packing

Multiple lipped packing with an edge like chevrons used to seal static and reciprocating parts.

V Packing

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Progressing Cavity Pump

Rotor

Driven by the output shaft of the gearbox, this rotates in a rotary manner within the stator pushing fluid that enters the inlet towards the outlet of the pump. They can be made in a variety of metals and hard chrome plated to suit a variety of liquids and applications.

Rotor

Stator

The stator is held in place within the pump housing and made from a variety of rubbers such as EPDM, NBR and Viton. They can be assembled in a single piece with a rotor for pressures up to 24 bar. They can also be doubled up, enabling pumps to reach pressures of up to 48 bar. The stator forms much of the body in a progressing cavity pump.

Stator

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Progressing Cavity Pump

Tie Rods

These are threaded rods which hold the pump outlet flange to the main body.

Tie Rods

Coupling Pin

A coupling pin joins the drive shaft to the rotor.

Coupling Pin

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Progressing Cavity Pump

Joint Cover

A joint cover can cover the cardan shaft or the pin joint. This protects it from damage, wear and tear or contamination in hygienic pumps.

Joint Cover

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Lobe Pump

Lobes

A set of lobes which can be manufactured in a variety of rubbers or metals depending on the fluid pumped.

Lobes rotate with the pump head generating the flow and pressure required. Rubber lobed pumps are usually self-priming, whereas metal lobed pumps need a flooded suction.

Lobes

Gear

Timing gears are located behind the rotating lobes. They ensure the lobes do not touch and rotate at pre-set intervals.

Gear

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Lobe Pump

Drive Shaft

Output from the gearbox rotates the drive shaft,
this in-turn rotates the driven shaft, rotating one lobe.

Drive Shaft

Driven Shaft

This is rotated by the drive shaft and controls the
rotation via the timing gear of one lobe.

Driven Shaft

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Lobe Pump

Wear Plates

Wear plates are located on the inside of the pump casing. These sacrificial parts are to protect the casing from wear.

Wear Plates

Cover Plate

Fitted to the front of the pump casing, these allow for easy access to the internal working mechanisms.

Cover Plate

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Rotary Piston Pump

Rotor

The piston drives back and forth within the rotor. This happens as the rotor rotates causing liquid to be drawn into the pump and expelled via the outlet.

Rotor

Piston

Slides back and forth along a rotors groove drawing liquid into the pump inlet.

Piston

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Double/Triple Screw Pump

Twin Screw

A twin set of screws located side-by-side. These screws rotate within the pump casing causing fluid to be drawn towards the inlet. The fluid increases in pressure and is directed towards the outlet of the pump casing.

The screws are driven separately, with one screw driven via the motor, whilst the other is rotated by external timing gear located at the opposite end of the unit.

It is possible for screws to be mounted in pairs meaning up to 4 screws are in one pump. All screws mesh, ensuring fluid is directed from the inlet towards the outlet.

Twin Screw

Driving Screw

A driving screw is the main part responsible for producing flow and pressure within a triple screw pump. It intermeshes with two idler screws to increase fluid pressure with fluid then discharged from the casing. It's driven either by the motor at full speed, or the output shaft of a gearbox at reduced speed for higher viscosity liquids or lower flow rates.

Flow is also controlled by the pitch and depth of chambers along the screw, as well as the diameter of the screws.

Driving Screw

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Double/Triple Screw Pump

Idler Screws

A set of two idler screws intermesh either side of the driving screw. They are driven by the driving screws, helping to produce the flow and pressure required.

Idler Screws

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Vane Pump

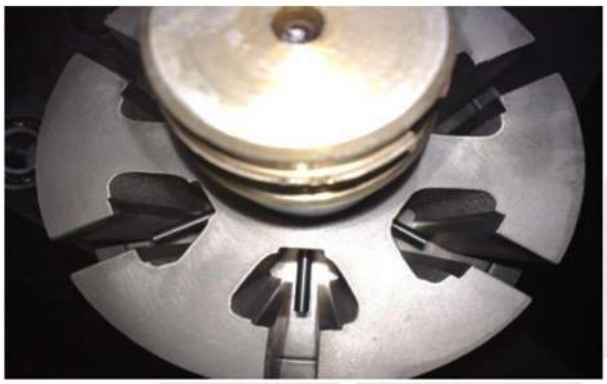
Rotor

The rotor houses the various vanes within the pump. Vanes are slotted within rotor slots, and as it spins, vanes are pushed outwards against the pump casing.

Rotor

Rods

Rods sit between the rotor and edge of the vanes. They support them within rotor slots and help to push vanes outwards.



Rods

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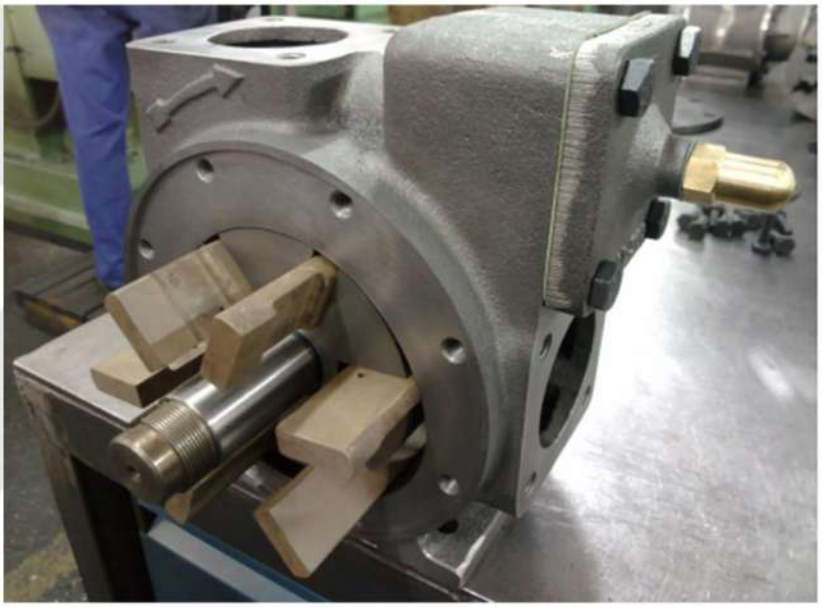
Vane Pump

Vanes

Vanes sit within rotor slots. They are responsible for producing the flow and pressure within the pump head. Their material is changed depending on the fluid being pumped.



Vanes

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Common Parts

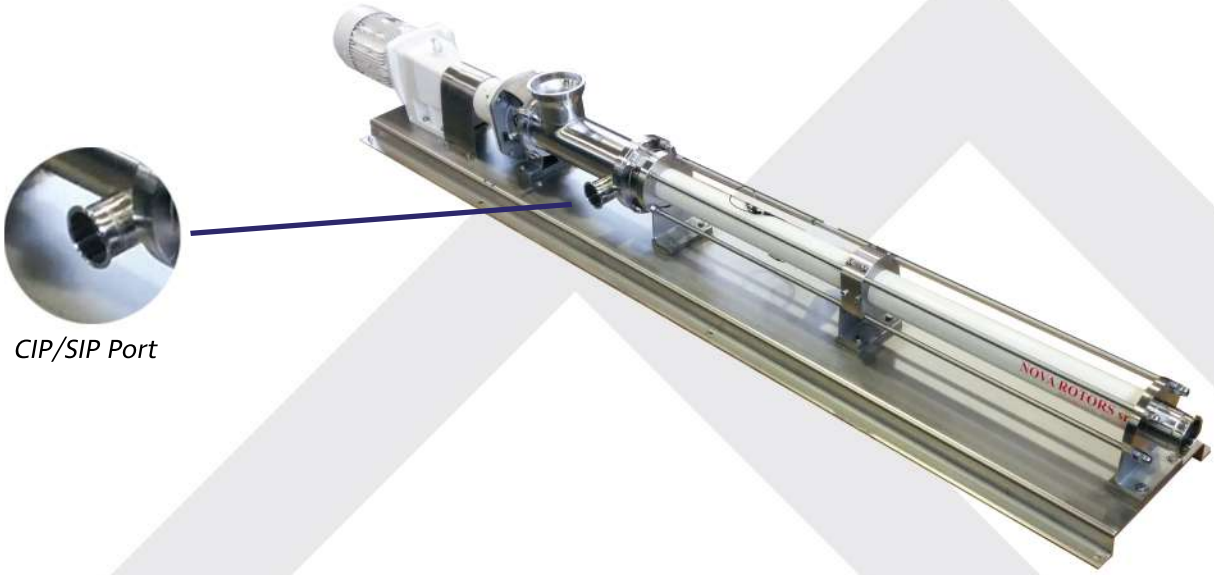
Bearings

Bearings reduce friction between moving parts. They also ensure rotation remains as per the required motion.

Bearings

CIP/SIP Port

These are ports located on the pump to allow easy cleaning without disassembly of the pump. There is usually an inlet and outlet port that is used to automatically clean pumps. A mixture of chemicals and hot water are used for thorough cleaning between batches or between mixture changes.



CIP/SIP Port

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Common Parts

Circlip, Snap Ring, Seeger

A fastener with open ends containing 2 holes which can be internal or external. They are placed in a machined groove to allow rotation but prevent axial movement. They are also used on a shaft for holding elements in place such as a motor fan blade, a bearing, or a seal.

Circlip, Snap Ring, Retaining Rings or Seeger

Gearbox

Depending on the required fluid to be pumped, gearboxes are used to reduce the motor speed, usually operating at 2800rpm or 1400rpm at 50Hz to much lower speeds.

High viscosity fluids or pumps operating 24/7 usually need a low pump operating speed for pump longevity. This is to allow enough time for viscous fluids to flow into the pump head, or to reduce abrasion within the pump by reducing fluid velocity.

Designs can be horizontal meaning the pump head is in line with the motor, or of herringbone design where the motor is at 90° to the pump head.

This enables the motor to be in the shape of an L for compact/space saving installation. A final part of a gearbox is the oil sight level gauge, which shows the amount of oil within a gearbox.

Gearbox

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Common Parts

Mechanical Seal

Pump heads are sealed using a mechanical seal or packed gland. A mechanical seal, seals around the shaft and pump casing. This seal consists of two faces and a spring. The faces and spring press against each other forming a seal that's cooled by the pumped fluid. Dangerous or volatile chemicals may require a dual mechanical seal, or cartridge seal design.

Mechanical Seal

O Ring

O rings are used to seal around metal parts, such as within the pump casing, or around drainage ports. Metal itself is unable to create a seal without an elastomer, silicone, or plastic, acting as a barrier. O rings are placed into grooves where they are compressed between mating surfaces sealing the leak path.

O Ring

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Common Parts

Packing

Packed glands are a set of segmented rings. They are wound around the shaft and need the pumped liquid to lubricate the packing and keep it cool. If there is insufficient cooling the packing will burn. It is reliant on liquid leaking from the pump head for its correct function. The packing is tightened against the shaft using the packing press.

Packing

Relief Valve

PD pumps continue to build pressure within the pump head and any connected pipework. If the pressure is not relieved in anyway, it will continue to build. If not addressed, it can lead to damage to the pump head and internal parts or failure in connected pipework.

Relief Valve

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Common Parts

Rubber/Steel Gaskets

Metal reinforced rubber gaskets are used for the sealing of flanged pipework in hazardous conditions. These conditions can be, high pressures and temperature, or handling of hazardous chemicals.

Rubber/Steel Gaskets

Spring

Used within relief valves and adjusted by rotating clockwise or anti clockwise to adjust relieving pressure.

They are also used in miniature designs of diaphragm pumps to ensure balls return to their original position. Mechanical seals need a spring to supply the pressure required to keep the stationary and rotating seal faces together.

Spring