SUNRISE
ENGINEERS

‘SUN’ ROTARY GEAR PUMPS

INSTALLATION, START-UP & MAINTENANCE MANNUAL

REVERSIBLE PUMP

ROTARY GEAR PUMP

MULTI STAGE PUMP

WORKS : 176, G.I.D.C., MAKARPURA, BARODA - 10

The information contained here in, covers all aspects, from installation to operation of 'Sun' Rotary Gear Pumps.

CHECKING EQUIPMENT : -

Inspect & check the consignment immediately on receipt and report any damage or shortage.

'Sun' Rotary Gear Pumps can be installed horizontally, vertically, or rotated about their shaft axis. However the specifications in the relevant drawings, instructions or product specific descriptions must be observed in each case.

The suction and discharge port bores of every pump are sealed with plastic caps. The wheel chambers contains some residual test oil to protect them against corrosion.

Before being started up for the first time, the pumps must be scavenged, using either the medium to be pumped or a neutral medium. Water or liquids containing water may not be use, due to the risk of corrosion.

The pump should be installed in light, clean, dry location and so placed that it is easily accessible for inspection. Suction of piping should be of full size, short and direct. Motor driven units should not be located in damp or moist place unless provision has been made for this condition.

FOUNDATION : -

The foundation should afford permanent rigid support for the entire unit. Concrete foundations built-up from solid ground will provide the most satisfactory. Ample allowance should be provided for grout in building the foundations.

When an unit is mounted on steel work or other structure, it should be set directly over, or as close as possible to the supporting beams or walls and should be supported so that the base plate cannot be distorted by yielding or springing of the structure.

ERECTION ALIGNMENT: -

Correct alignment is absolutely essential for successful operation. A flexible coupling will not compensate alignment. 'Sun' Rotary Gear Pump unit should be aligned as accurately as if the coupling were solid. The couplings will than serve its purpose. i.e. to prevent the thrust from one machine to the other and to compensate for slight changes in alignment which may occur during normal operation.

FACTORY ALIGNMENT : -

Every unit assembled at our works is accurately aligned. However, all base plates are elastic and for this reason we cannot assure responsibility for the proper mechanical operation of a unit unless the shop alignment is reproduced when the unit is erected on its foundation.

The alignment of the pump set can be checked up at the flexible coupling jaw-end-clearance and level of the coupling. After the erection of the foundation, check up the clearance and at each jaw end of both the couplings, the clearance at the each jaw end should be same at different positions of the coupling i.e. at 90, 180, 270, and 360 deg. Rotation of the shaft by hand.

The outside level of both the couplings should also be the same at different positions which can be checked by putting a scale or lever on the coupling.

The alignment must be checked after the pump has been completely piped up. The springing up at the pump while piping is not allowed, particular care must be taken the suction and discharge piping are properly supported to prevent a strain or pull on the pump. Pipe strain is a common cause of misalignment, hot bearings wear and vibrations.

This misalignment of pump is likely to damage the oil seal and may result in the leakage at the shaft end and will also cause bearings failure of pump.

SUCTION PIPING : -

Suction and delivery piping should be correctly connected as marked on the pump. Experience has provided that a faulty suction line is responsible for trouble with rotary gear pumps. Suction piping should never be less in diameter than full size of the pump suction opening.

It should be uniformly graded up from source of supply to the pump. When lifting liquids from long distances or when handling thick viscous liquids, the diameter of the suction pipe should be greater than the opening in the pump to convey the liquid with minimum friction loss.

'Sun' Rotary Gear Pumps have excellent suction qualities but cannot expected to do the impossible. Remember that the atmospheric pressure is all that forces liquid in the pump. If the static suction lift plus suction pipe friction is equal to or greater than the equivalent of atmospheric pressure the pump will not fill, resulting in reduced or entire loss of capacity.

When pumping highly volatile liquids such as butane, propane, hot oils etc. there must be sufficient static head on the suction in addition to the vapour pressure to prevent vaporization of the liquid within the pump. Rapid wear or seizing will result if these pumps are allowed to run dry. The suction line should be perfectly airtight. A leak will result in reduced or entire loss of capacity.

A strainer is recommended if the liquid contains foreign material. Abrasive in the liquid will cause rapid wear. The strainer should have an area of three to four times the suction pipe area and should permit easy cleaning. Suction pipe must be on downwards as shown in figure-2.

DISCHARGE PIPING : -

Carrying the discharge piping up through a riser approximately five times the diameter is recommended where the discharge is not open to atmosphere such as closed discharge in hydraulic circuits. This prevents gas or air pockets in the pump and will act as a seal in high vacuum service. A valve on the top of the riser may be used as a vent when starting the pump.

STUFFING BOX : -

Unless otherwise specified, the pumps are supplied with neo-prine oil seals. When the pump is supplied with the specified asbestos graphite packing arrangement, do not tighten the glands too tightly, as a slight leakage will help to lubricate the packing.

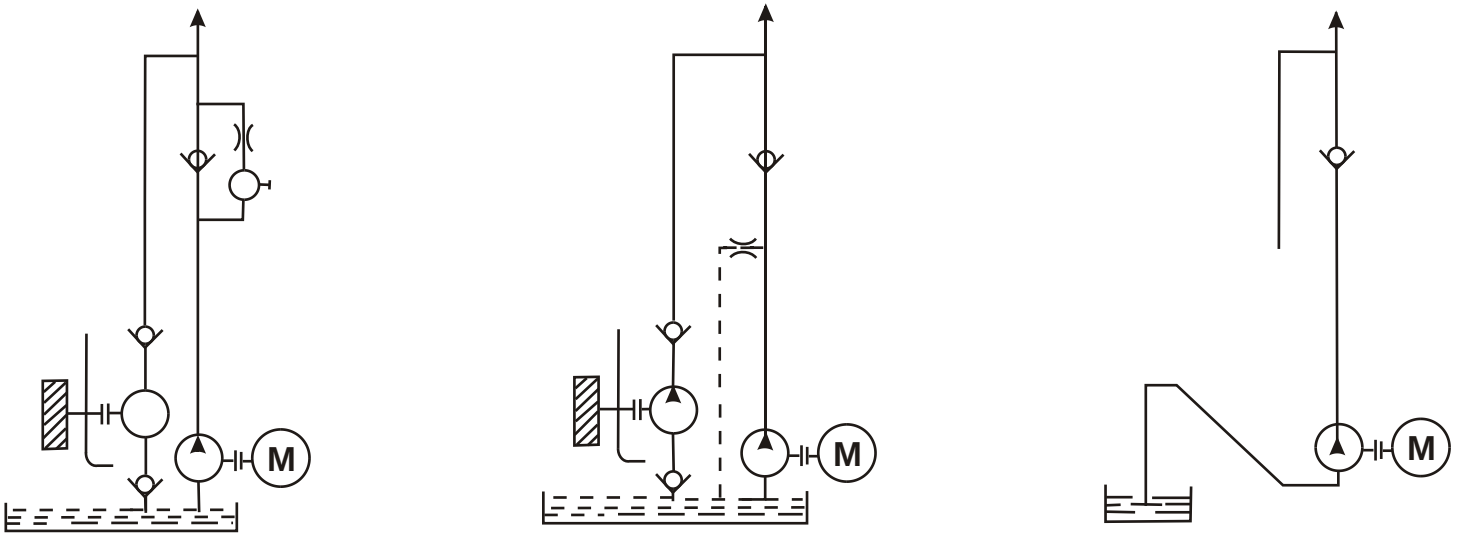
RELIEF VALVE : -

The relief valve protects the pump from excessive pressure. The relief valve is built in the back cover of the pump looking from the shaft end. The valve is set at the required pressure. It can be reset at a lower or higher pressure if required. To reset it, open the cap nut of screw, loosen the check nut and than tighten or loosen the adjusting screw.

PRIMING : -

Before starting for the first time, prime the discharge side of the pump thoroughly. This pumps are run and tested on oil unless specified in the order. Little oil is left in the pump to protect the internal mechanism against corrosion. If this oil will be detrimental to the system, it will be necessary to clean the pump with kerosene thoroughly and than fill the pump with the liquid to be pumped. Never start the pump dry. This will inevitably cause galling, seizing or destruction wear between the rotors end plates, casing & cause damage to white metal bearings, method of self priming as per Figure -2.

Figure -2.



STARTING OPERATION : -

Before starting, prime the pump than check the direction of the drive motor so that when it is started, it rotates the pump shaft in the correct direction. It is absolutely necessary to check the correct direction of rotation before starting the pump with the liquid, as if the pump is run in the wrong direction, it may cause leakage in the oil seal or the oil seal may come out or burst. Check the vacuum pressure on the inlet and outlet side to the ensure that they confirm to the specification and that the pump will deliver full capacity without over loading the motor. It is advisable to start operation at reduced load, gradually increasing the maximum service condition.

The standard 'Sun' rotary gear pumps are having internal bearings, if the liquid to be handled contains lubricating properties, than no attention of lubrication is necessary.

External bearing pumps, require occasional lubrication of soft grease in the bearings. No special maintenance of the pump is necessary.

DIRECTION OF ROTATION : -

Standard direction of rotation is clockwise looking from pump's shaft end. This is indicated by an arrow fixed on the pump body. Before starting the pump with the liquid, the direction of rotation should be checked. If the pump is run with the liquid in the wrong direction, it will cause a leakage form the oil seal or the oil seal may come out or burst. Secondly relief valve will also not work. Therefore, it is absolutely necessary to check the correct rotation of direction.

CHANGING THE DIRECTION OF ROTATION : -

The direction of rotation of the pump can be reversed by to simple manual operations viz. (a)changing the relief valve assembly to the opposite and (b) transferring a small grub screw fitted inside the body casting from delivery side to the suction side.

CHANGING RELIEF VALVE ASSEMBLY : -

The relief valve is comprised of a ball, adjusting screw plug, a spring seat with adjusting screw, a lock nut, a cap nut & dummy plug assembled and fitted on one side of the relief valve. A blind plug is fitted on the other end. Take out this whole assembly by opening adjusting screw plug and refit it in the same order on the opposite side after taking out the blind plug from the other side.

TRANSFERRING A GRUB SCREWS : -

There are two plugs in middle portion of the front cover looking from the shaft end. Take out these two plugs. A small grub screw fitted on the body casting can be seen through the hole on the delivery side. This grub screw is threaded to M6 BSW. Take it out with the help of an 3mm Allen key and refit it on the body casing through other hole. Than refit the two plug (bolts). Now the direction of rotation of the pump is reversed i.e. the suction side becomes delivery and vice versa. Remember that the grub screw must always be on delivery side of pump. The direction of rotation cannot be changed in the pump where these two plugs on the front cover are not provided. In this case open the front cover of the pump and change the grub screw.

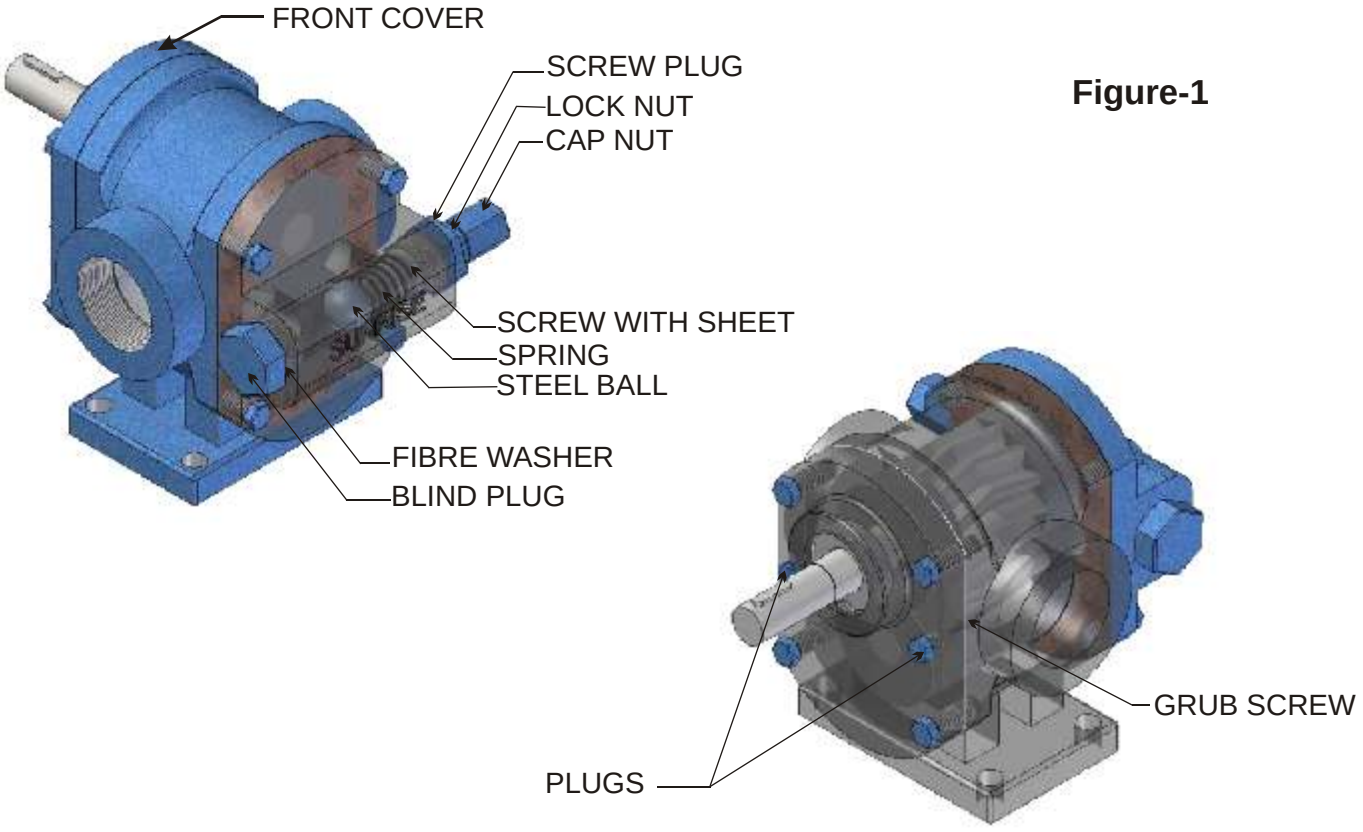


Figure-1

OPERATING FAULTS : -

Gear pumps, which have been correctly designed for the specified operating conditions and carefully installed, will operate faultlessly for a considerable period. However, should trouble occur, the cause must be found and eliminated as quickly as possible. The availability of a system circuit diagram considerably facilitates the location elimination of faults.

The following summary lists some possible faults ; -

(1) INCREASE NOISE GENERATION

Cavitation in the pump :

*Suction filter clogged or too small
*Suction line inner diameter too small
*Too many bends in the suction line
*Too many local constrictions in the suction line
*Suction line clogged or leaky
*Viscosity too high
*Temperature too low
*Oil seal or seals on the inlet side defective
*Pump volumetric efficiency too low.
*Liquid level in supply tank too low.

Foaming or air trapped in the medium :

*Suction line leaky
* Liquid in supply tank too low
*incorrect tank design
*oil seal or seals on the inlet side defective
*return line ends above liquid level in oil tank
*inadequate venting

Mechanical vibration :

*Coupling incorrectly aligned or loose
*Line incorrectly or inadequately secured
*Pressure limiting valve chatters
*Not designed for optimum noise reduction (rubber/metal)
*unfavorable installation site.

(2) INADEQUATE DELIVERY VOLUME :

*Throttled shut-off element in suction line
*Liquid level in supply tank too low
*Suction filter clogged or too small
*Viscosity too high
*Speed too low
*Pressure too high
*Pressure limiting valve setting too low
*Pump takes in air
*Pump is worn

(3) INADEQUATE PRESSURE :

*Viscosity too low
*Pressure limiting setting too low or valve fails to close
*Speed too low
*Pump is worn

(4) POWER CONSUMPTION TOO HIGH :

*Pressure too high
*Viscosity too high
*Drive output too low
*Motor winding defective

(5) OPERATING TEMPERATURE TOO HIGH :

*Pressure limiting valves setting valves setting to high
*Speed too high
*Inadequate cooling & heat dissipation
*Liquid supply too low
*Liquid pumped under pressure via pressure - limiting valve and back into supply tank
*Liquid friction too high

(6) SHAFT SEAL LEAKAGE :

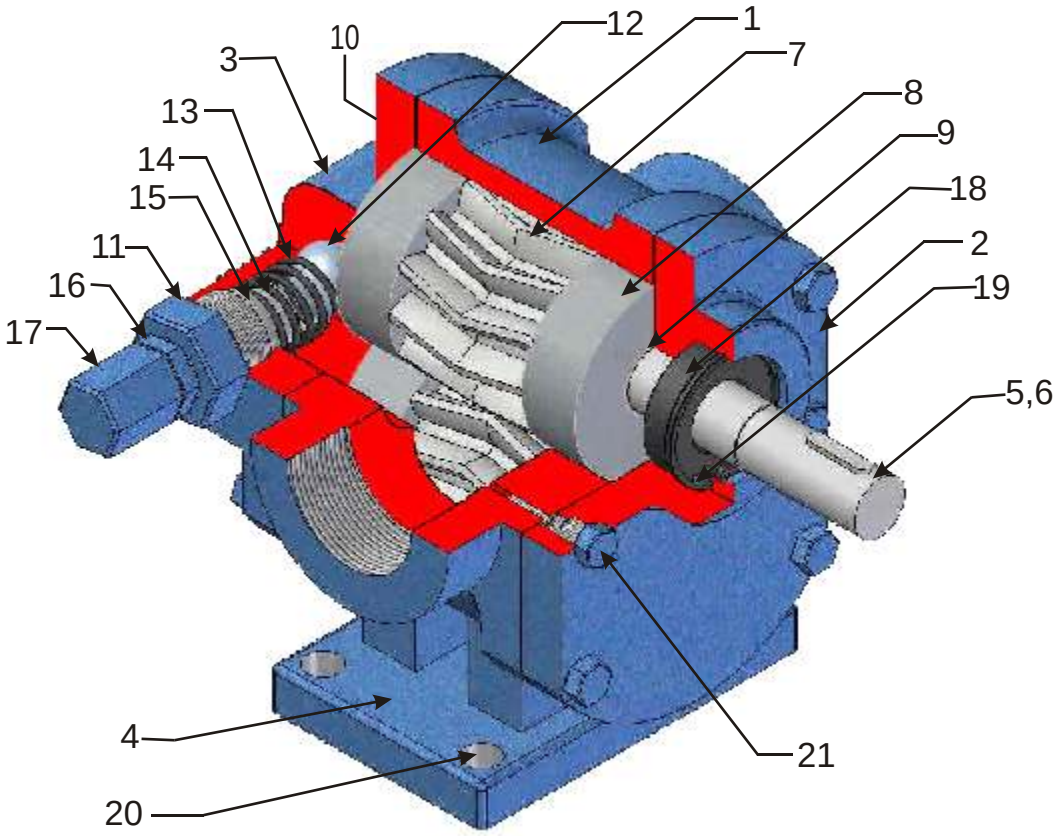
*While changing direction of rotation grub screw position had not been change as given on figure-1
*Abnormal pressure
*Admission pressure unacceptably high
*Incorrect sense of rotation
*Excessive radial load on shaft
*Seal wear due to contamination
*Temperature at seal too high
*Incorrect seal material
*Alignment improper

(7) UNACCEPTABLE PUMP HEATING :

*Directly fitted pressure-limiting valve setting Too low
*Pressure too high
*Viscosity too low
*Stuffing box packing too tight
*Pump worn
*Alignment in proper

(8) COUPLING WEAR :

*Coupling incorrectly aligned or loose
*Inadequate axial coupling play
*Coupling overloaded



GENERAL CONSTRUCTION OF 'SUN' ROTARY GEAR PUMPS.

PART NO.	NAME OF PART	MATERIAL	QTY.
1)	BODY	C.I, M.S., S.S.	1
2)	FRONT COVER	-DO-	1
3)	BACK COVER	-DO-	1
4)	BASE	-DO-	1
5)	DRIVING SHAFT	-DO-	1
6)	DRIVEN SHAFT	-DO-	1
7)	GEARS	EN24, EN36, SS315, SS304, SS410	4
8)	BEARING COVER	C.I.	4
9)	BEARINGS	D.U. BUSH, WHITE METAL, BALL BEARING BRONZE BUSHES, NEEDLE ROLLER	4
10)	BLIND PLUG	M.S.	1
11)	SCREW PLUG	M.S.	1
12)	BALL	STEEL	1
13)	SPRING	STEEL	1
14)	SPRING SEAT	M.S.	1
15	ADJUSTING SCREW	M.S.	1
16)	LOCK NUT	M.S.	1
17)	CAP NUT	M.S.	1
18)	OIL SEAL	NEO-PRINE*	1
19)	CIRCLIP	S.S.	8
20)	HOLES OF BASE	----	4
21)	PLUGS	M.S.	2

GEARS : HARD, NITRATED, PROFILE GROUND OR SHAVED,
SHAFTS : HARD, NITRATED & GROUND
*NEO-PRINE UPTO 65°C, GLAND PACKING ABOVE 65°C, MECHANICAL SEAL

OVER ALL VIEW OF ‘SUN’ ROTARY GEAR PUMPS WITH INTERNAL