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ROTO-JET®

High Pressure Pitot Tube Pumps

Installation, Operation & Maintenance Manual

Model RO, RG, R11, RD11, 2100, 2200

ROTO-JET PUMP
INSTALLATION, OPERATION & MAINTENANCE MANUAL
Models RO, RG, R11, RD11, 2100, 2200

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ROTO-JET PUMP

MODELS RO, RG, R11, RD11, 2100 AND 2200

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

WARNING

PLEASE STUDY THESE INSTRUCTIONS CAREFULLY BEFORE PUTTING THE PUMP INTO SERVICE. ADHERENCE TO THESE INSTRUCTIONS IS NECESSARY FOR SATISFACTORY START-UP OF YOUR ROTO-JET PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATION PARAGRAPHS.

I. GENERAL

A. INTRODUCTION

This manual has been prepared to assist you in understanding the construction and the correct methods of installing, operating and maintaining your new Roto-Jet Pump.

The design, material, and workmanship incorporated in the construction of the Roto-Jet Pump makes it capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is dependent upon correct application, proper installation, periodic inspection and careful maintenance. For this reason, you are urged to read and follow the directions in this manual.

The exclusive patented Roto-Jet Pump has only two basic working parts...a rotating case and a stationary pick-up tube collector arm within the rotating case. The Roto-Jet design completely eliminates the need for packing glands, wear rings or multiple stages as used in conventional centrifugal pumps, and also eliminates the complex pistons, rods, valves and springs required in reciprocating pumps.

The Roto-Jet Pump operates in the following manner: liquid enters the intake manifold and passes into the rotating case where centrifugal force increases the velocity and pressure of the liquid. The velocity of the liquid in the rotor is converted into additional pressure as it jets into the pick-up tube.

B. PUMP IDENTIFICATION

Roto-Jet Pumps are described by a series of letters and numbers, such as RGB-S484 or 2100. The first group is the model and indicates the basic mechanical configuration, and the second group, S484, indicates the pick-up tube size. Each pump nameplate will show the pump, model, size, and serial number.

When ordering parts, or inquiring about service, this information must be supplied. This will insure that the proper size and material of parts are supplied.

C. RECEIVING INSPECTION

Prior to signing any shipping documents, inspect the shipment for shortages or damages and promptly report any to the carrier, noting damage on the freight bill, receipt, and bill of lading. **MAKE ANY CLAIMS TO THE TRANSPORTATION COMPANY PROMPTLY.**

Do not remove any tags or shaft protector. Instruction sheets on various components as well as the Operation and Maintenance Manual for the pump are included in the shipment. **DO NOT DISCARD!**

D. UNLOADING

Care must be taken when unloading pumps.

WARNING

EQUIPMENT LIFTING DEVICES SUCH AS CHAIN, LIFTING EYES, HOOKS, ETC. MUST BE APPROVED BY LOCAL, STATE OR FEDERAL SAFETY CODES.

HOISTS AND CRANES MUST BE ADEQUATELY SIZED TO LIFT RATED LOADS.

FAILURE TO USE APPROVED LIFTING DEVICES MAY RESULT IN INJURY.

WHEN LIFTING THE PUMP, IT IS IMPORTANT TO MAKE SURE THAT THE CHAIN AND CABLES ARE FASTENED RELIABLY TO THEIR RETAINING HOOKS.

The unit should be carefully supported when unloaded. Under no circumstances should it be dropped or receive rough handling. Exercise the same care with this pump as you would with other pieces of engineered equipment. Lifting devices must be securely attached to the lifting lugs on the base.

WARNING

THE EYEBOLT HOLE LOCATED ON THE TOP OF THE PUMP HOUSING IS INTENDED FOR LIFTING THE PUMP ONLY, AND NOT THE COMPLETE PUMP AND BASE PACKAGE.

E. STORAGE INSTRUCTIONS

If the pump is not to be installed and operated immediately, store in a clean, dry place. ROTO-JET Pump assumes the units will be placed in operation a few weeks after shipment, so no special protection is given the pump, drive or motor.

Do not remove the shaft protector until the pump has been mounted. Do not remove the inlet and discharge connection plugs until the unit is to be piped. Store in an area where temperature is reasonably constant.

Parts subject to attack by moisture, such as bearings, shaft, suction and discharge threaded openings, and other finished parts should be inspected periodically and coated with lubricant or rust preventative.

IF THE PUMP IS TO BE STORED OR NOT PLACED IN OPERATION MORE THAN TWO WEEKS AFTER RECEIPT:

1. Store pump in a clean, dry place free from vibration and extremes in temperature.
2. Protect all exposed, unpainted surfaces from rust.
3. On RO, ROH, R11 and 2200 pumps every two weeks remove the Pedestal Cover and spray the bearings with a light coat of oil (MOBIL DELVAC 1 ESP 5W-40). No additional lubrication is needed on RG pumps. ROTATE THE PUMP SHAFT 2 OR 3 REVOLUTIONS BY HAND EVERY TWO WEEKS. After prolonged storage, the bearing lubrication instructions in this Operation and Maintenance Manual must be followed.
4. Accessories such as drives, etc. should be protected in accordance with the accessory manufacturer's instructions.

Following these recommendations will help ensure that the pumps will operate without problems and give long, trouble free service.

II. INSTALLATION

A. LOCATION OF PUMP

Leave sufficient room in front of the pump to remove the manifold for seal replacement.

The pump should be located where there is sufficient accessibility for inspection and maintenance. A clear space with ample headroom should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.

Select a dry place above the floor level whenever possible. Take care to prevent the pump from freezing during cold weather. Refer to Section III, F., "Shutdown".

The pump must be located relative to the system so as to insure that sufficient NPSH (Net Positive Suction Head) is provided at the pump inlet. Available NPSH must always equal or exceed the required NPSH as shown on the pump performance curves.

Whenever possible, the pump should be located below reservoir fluid level to facilitate priming.

B. INSTALLATION ON FOUNDATION

A properly mounted base on a rigid foundation is essential for a smooth running pump. The foundation should minimally be a 4" (100 mm) thick concrete slab floor or an 8" (200 mm) thick concrete pad, extending two inches larger in width and length than the pump or unit, and should be steel reinforced according to local building codes.

The pump and drive assembly should be placed on the foundation with the coupling halves disconnected. On belt driven units, the belts may remain on the sheaves. The alignment operation must be completed before the coupling is reassembled**. (See Section VII.) The baseplate should be supported on metal wedges or metal blocks as illustrated in figures 1 and 2. The support wedges, or blocks, should be placed close to the anchor bolts.

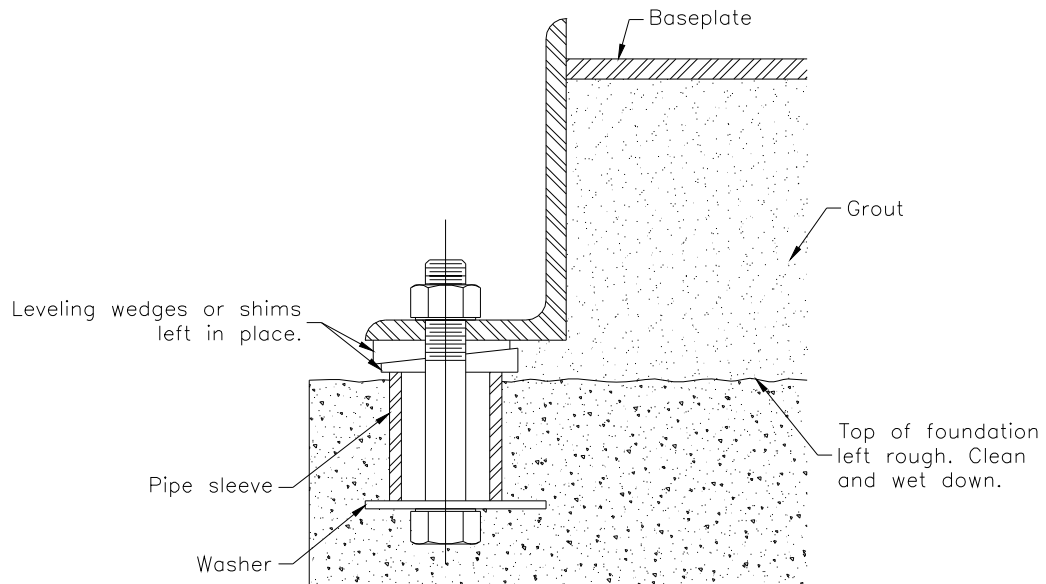


Figure 1 – Typical Foundation Bolt Design

Adjust the metal wedges, or blocks, around base edge until the base is level. Then suction flanges, discharged flanges and coupling faces should be checked by means of a level. Corrections may be made for flange or coupling level or plumb by shims under the pump or motor.

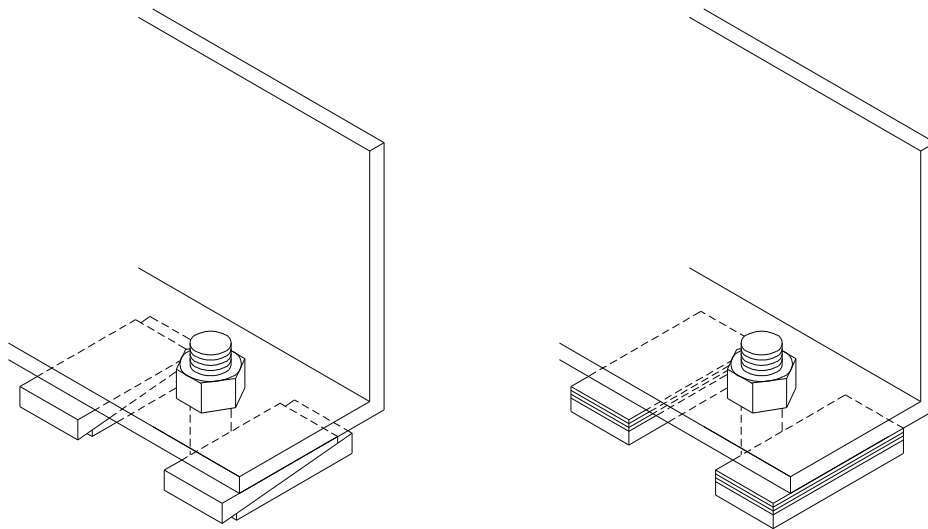


Figure 2 – Method of Leveling

C. GROUTING

Evenly adjust all anchor bolts, but not too firmly, after first alignment is complete. The baseplate can be grouted to the foundation. On open type baseplates fill the internal spaces with non-shrink grout to the top of the baseplate. For closed type baseplates all the voids under the baseplate must be filled with non-shrink grout. Grouting holes are provided in the baseplate.

It is desirable to grout all wedges and blocks in place. Anchor bolts should not be fully tightened until the grout has hardened, approximately 48 hours after pouring.

D. PIPING

1. GENERAL

The pump should be installed as close to the reservoir or fluid supply as possible, with the inlet piping as short and as direct as practical. The minimum recommended pipe size is 2" (50 mm) for 2x2 manifolds and 3" (80 mm) for 3x2 manifolds. When open supply tanks are used, 3" (80 mm) pipe or larger may be required for suction piping. This will depend on flow, fluid temperature, fluid vapor pressure, and losses in elbows, valves and strainers.

Both inlet and discharge piping must be independently supported near the pump and properly aligned so that no pipe strain is transmitted to the pump manifold.

WARNING

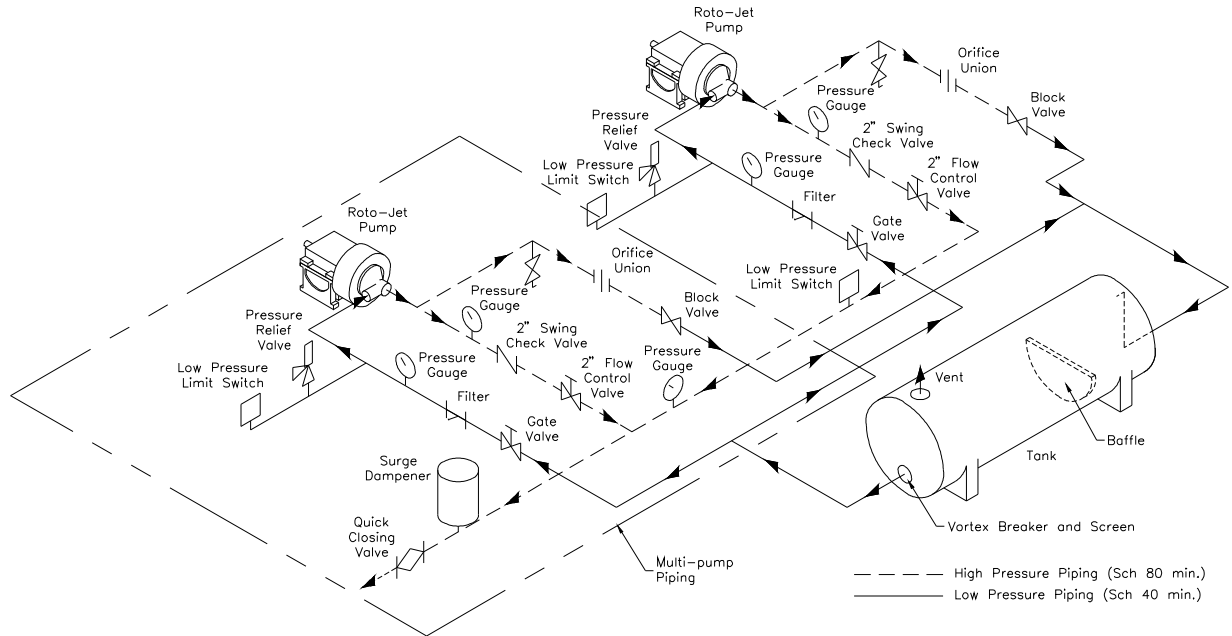
SUCH PIPE STRAINS COULD RESULT IN STRUCTURAL FAILURE LEADING TO INJURY.

The inlet piping should slope upward to the pump. A horizontal suction line must have a gradual rise to the pump. Any high point in the piping will become filled with air and thus prevent proper operation of the pump. When reducing the piping to the inlet opening diameter, use an eccentric reducer with the eccentric side down (flat side up). Never use a straight taper (concentric) reducer in a horizontal suction line, as it tends to form an air pocket in the top of the reducer and the pipe.

WARNING

THE PUMP AND PIPING SYSTEM MUST BE PROTECTED FROM THE EFFECTS OF WATER HAMMER (PRESSURE SURGE) WHEN USING A QUICK-CLOSING VALVE OR ANY DEVICE CAPABLE OF RAPIDLY SHUTTING OFF SYSTEM FLOW.

PIPING DIAGRAM



Properly sized pressure gauges should be installed in both the inlet and discharge lines. The gauges will allow the operator to easily observe the inlet and discharge pressures of the pump and thereby determine if the pump is operating according to the performance curve. If cavitation, vapor binding or other unstable operation should occur, a widely fluctuating discharge pressure will be noted.

If there is any possibility of high pressure remaining on the outlet of the pump after the pump has been shut down (as with two or more pumps operating in parallel or when pumping to a high pressure reservoir), a check valve must be added to the discharge side of the pump and a pressure relief valve, set at 225 psi (15.5 bar) or less, must be installed in the inlet piping between the pump and the intake shut-off valve. This will prevent damage to the mechanical seal and the inlet piping.

2. BYPASS

Like other centrifugal type pumps, the Roto-Jet Pump loses a certain amount of power in churning the fluid within the pump. This lost power is converted to heat. If the pump is operated at or near shut-off (no flow), the temperature of the fluid within the pump will rise to unacceptable levels, and could cause seal failure or various other problems.

It is therefore necessary to have a fluid bypass to remove this heat and insure adequate seal lubrication.

The minimum recommended bypass flow should be approximately 10% of the peak efficiency flow of the pump. Listed below are applicable bypass orifice sizes which will meet the bypass flow requirement of the Roto-Jet Pump selected:

| MODEL | ORIFICE SIZE |
|-------------------------|------------------|
| R11, RD11-S252 | 3/32" (2.387 mm) |
| R11, RD11-S338 | 3/32" (2.387 mm) |
| R11, RD11-S433 | 1/8" (3.175 mm) |
| R11, RD11-D433 | 5/32" (3.962 mm) |
| RG, RO, 2100, 2200-S266 | 3/32" (2.387 mm) |
| RG, RO, 2100, 2200-S375 | 3/32" (2.387 mm) |
| RG, RO, 2100, 2200-S484 | 1/8" (3.175 mm) |
| RG, RO, 2100, 2200-D484 | 1/8" (3.175 mm) |
| RG, RO, 2100, 2200-S600 | 1/8" (3.175 mm) |
| RG, RO, 2100, 2200-D600 | 5/32" (3.962 mm) |
| RO-D850 | 5/16" (7.930 mm) |

We recommend that 1/2" (13 mm) bypass line be installed (tee-in) in the discharge line of the pump, between the pump and the discharge valve. The bypass line should be piped back to the suction reservoir, or to a drain.

WARNING

NEVER PIPE THE BYPASS LINE DIRECTLY INTO THE INTAKE OR SUCTION LINE OF THE PUMP.

Roto-Jet optionally furnishes a valve and gauge package which includes an outlet throttle valve, a pressure gauge, a tee, and bypass orifice, ready to connect to the pump discharge line and a bypass line.

WARNING

A VORTEX BREAKER, SCREEN, AND/OR BAFFLE MAY BE REQUIRED IF THE TANK IS SMALL OR THE BYPASS RETURN LINE IS TOO CLOSE TO THE PUMP SUCTION LINE.

Block valves are required in the bypass line if the line enters the reservoir below the fluid surface.

3. FILTRATION

As a minimum recommendation, install a 100 Mesh (149 Micron) strainer or equivalent filtration device in the suction piping adjacent to the pump to prevent mill scale, rust and other foreign material from damaging the pump.

WARNING

THE ROTO-JET PUMP IS NOT DESIGNED TO PUMP ABRASIVES AND IS NOT WARRANTED AGAINST ABRASIVE DAMAGE OR WEAR. IT WILL NORMALLY OPERATE SATISFACTORILY WITH UP TO 100 PPM SUSPENDED SOLIDS, BUT WEAR WILL DEPEND ON THE PARTICLE SIZE AND HARDNESS. CONSULT FACTORY FOR FILTRATION AND SPECIAL PARTS RECOMMENDATIONS IF THIS LEVEL IS EXCEEDED.

4. SEAL DRAIN

In the event of seal failure, the leakage will exit from the seal drain. Piping may be connected to the seal drain (except the RG 2x2) and piped away from the unit, but it should never be plugged. If pumping other than water, please consult the factory. Leakage should be monitored for identification of seal failure.

5. SEAL FLUSH

Unless the pump was equipped for seal flush, the seal flush inlet should remain plugged. If seal flush is necessary, the tubing or piping should be connected to the seal flush inlet. It is recommended that the flush fluid be supplied at 2-3 gpm (.5-.7 m³/hr) flow rate and 15-20 psig (1-1.4 bar) pressure above the inlet pressure. Flush fluid temperature is dependent on pump duty and temperature of pumped fluid. Please consult factory.

E. ALIGNMENT

The pump and driver, if supplied, were not aligned at the factory since the unit can shift during shipment. Couplings are disconnected for shipment and belts untensioned. The pump and driver shafts must be checked for angular and parallel alignment. (Realignment is also necessary after the grout has hardened and anchor bolts have been tightened.) The alignment must be finally checked after the piping has been completed and rechecked periodically. In accurate alignment results in vibration and excessive wear on bearings, shaft sleeves or mechanical seals.

WARNING

WHEN CHECKING ALIGNMENT OR PERFORMING ANY WORK ON THE UNITS, ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

The model suffix A (i.e., ROA) has been designed to be driven through a flexible coupling and the model suffix B pump has been designed for belt drives. The bearing system in each model is designed to optimize bearing life with their respective type drive. Warranty will not be extended to any problems or damage due to misapplication.

If necessary, the bearing system can be converted to suit the drive system selected. See Disassembly/Assembly manual.

Flexible Coupling Drive (Model Suffix A)

Flexible couplings are not intended to permit permanent misalignment. Even slight misalignment will reduce bearing life and cause other problems. Flexible couplings do permit some temporary slight change in alignment or end play to allow for unusual momentary loads or thermal expansion during start-up.

The coupling should be installed and aligned according to the manufacturer's recommendations. The dimensions and tolerances listed below apply only to the couplings furnished by Roto-Jet Pump.

Motor to Gear Box Coupling Make: Falk Type: T20, Size: 1070 T
Gear Box Shaft: Refer to gear manufacturer's information, Motor Shaft: Refer to NEMA Motor Size.

Gap between coupling faces: Minimum 1/16", Normal 1/8", Maximum 3/16"

Concentricity between faces: .004" total indicator reading .002" max. center-line displacement

Face parallelism: .002" max. gap variation at edge of coupling

For coupling parts list and additional installation and maintenance instruction, refer to the Falk Steelflex Coupling Service Manual 428-110, 428-010 or 428-012.

Gear Box to Pump Coupling Make: Thomas Type: DBZ-C, size: 226
Pump Shaft: 2-1/4", Gear Box Shaft: Refer to gear manufacturer's information.

Gap between coupling hub faces to be set at 5" + 1/64"

Concentricity between hub flange O.D. .005: total indicator reading

Face parallelism - .005" maximum gap variation at edge of hub flange.

Start and run unit until normal operating temperature is reached (approximately 1 hour). Shut unit down and check alignments on components at operating temperature, realign as required.

For Belt-Drive Units (Model Suffix B)

Shaft alignment can be checked by measuring the distance between the shafts at three or more locations. If the distances are equal, then the shafts will be parallel.

To check the alignment of the sheaves on the shafts, a straightedge or a piece of string can be used. If the sheaves are properly lined up, the straightedge or string will touch each sheave at two points and both sheaves at four points simultaneously. Rotating each sheave a half revolution will determine whether the sheave is wobbly, or the drive shaft is bent. Correct any misalignment.

The sheaves should be mounted as close as possible to the pump and motor bearings. With sheaves aligned, tighten cap screws evenly and progressively. Apply the recommended torque to cap screws as listed below.

Before reinstalling the guards, check the sheaves to be sure there is no grease, oil, dirt, or rust in the grooves. Any that is present must be removed before starting, or the belts could be damaged. When replacing belts, a matched set should be purchased and all belts replaced at the same time. See drive manufacturer instructions for proper belt tension and other information.

F. V-BELT DRIVE

V-Belt Drive systems should be properly installed to ensure maximum belt life and to minimize excessive loads or wear on bearings.

Inspect all drive components for damage. Sheaves should be free of oil, grease rust and burrs.

Sheaves must be aligned so that when a straight edge is held across the face of the driven and driver sheaves there is less than .025" gap between the straight edge and the face of the sheaves. Shafts should be parallel.

Always use a matched set of new belts purchased from manufacturer.

Use only the same section of belt (Example: 3VX) that the sheave was designed for.

Slack off sheaves until belts can be placed in grooves by hand – without forcing. Never use a screwdriver, crowbar or other implement. Do not install on the same sheave some belts with slack side on top and others with slack side below. Have slack in all belts on the same side.

Adjust take-up until belts are snug and then tension the drive properly. The following tensioning information are general guidelines for equipment supplied by the factory. For specific tensioning data, consult the factory or belt manufacturer.

Measure the span (distance between centerlines of sheaves). The deflection at mid-span should be 1/64" per in of span. (i.e., for a span of 24", the deflection is 3/8"). Using a V-belt tension tester, the mid-span force per belt after break-in should be:

| Motor HP/Belt | Force (lb) |
|---------------|------------|
| 3 – 5 | 2 – 3 |
| 6 – 8 | 3 – 4 |
| 9 – 10 | 3-1/2 – 5 |
| 25 | 8 - 12 |

Check belt tension and alignment several times during the first few days of operation with new belts.

Never use a belt dressing.

WARNING

ALL GUARD AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, SHEAVES, OR COUPLINGS COULD RESULT IN INJURY.

G. ELECTRIC MOTOR DRIVE

If the pump driver is an electric motor, a motor starter with overload protection must be provided. The overload resets should be set according to local code. Refer to motor nameplate. Direction of rotation of pump shaft must be counterclockwise when facing pump shaft extension. Make motor electrical connections accordingly. Changing any two leads on a three phase motor will change direction of motor rotation.

Be sure that the power source is correct for the driver.

Determine the power to be used, and provide the appropriate wire size.

When a 10HP (7.5 kw) with R11 pumps or 50HP (37.5 kw) with RG, RO, 2100 or 2200 pumps or smaller motor is used, a slow-trip overload relay is recommended to prevent tripping during start-up. The rotor assembly of a Roto-Jet pump has a relatively high moment of inertia, and requires an extended acceleration period with these motors before operating speed is reached.

WARNING

ALL ELECTRICAL CONNECTIONS AND WIRING ARE TO BE IN COMPLIANCE WITH LOCAL BUILDING AND SAFETY CODES.

DO NOT OPERATE EQUIPMENT WITH OPEN ELECTRICAL BOXES OR FITTINGS. CONTACT WITH INCORRECTLY WIRED EQUIPMENT COULD RESULT IN INJURY.

H. GUARDS

Rotating sheaves and drive belts, must be guarded as required by applicable local safety codes and OSHA regulations to protect personnel from injury. The pump should never be allowed to operate until this protection has been provided. A guard is part of the belt drive package which is optionally furnished by Roto-Jet Pumps.

III. OPERATION

A. Operation Limits and Data (RG, RO, ROH, 2100, 2200) (See page 16 for footnotes)

| OPERATION PARAMETER | RG PUMP | | RO PUMP | | RO HIGH SPEED OPTION | | 2100 | | 2200 | |
|-----------------------------------|---------------------------------------|---|---------------------------------------|---|---------------------------------------|---|---------------------------------------|---|--|---|
| | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM |
| Pump Speed | | | | | | | | | | |
| -Direct Connect | 4380 RPM | --- | 4380 RPM | --- | 6321 RPM | --- | 4709 RPM | --- | 5443 RPM | --- |
| -Belt Drive | | | | | 4380 RPM (12) | | 4380 RPM (12) | | 4380 RPM (13) | |
| Suction Pressure | 200 PSIG (13.8 bar) | NPSHR from Curve | 250 PSIG (17.2 bar) | NPSHR from Curve | 250 PSIG (17.2 bar) | NPSHR From Curve | 200 PSIG (13.8 bar) | NPSHR From Curve | 50 PSIG (3.4 bar) @ 5443 RPM 150 PSIG (10.3 bar) @ 5060 RPM 200 PSIG (13.8 bar) @ 4709 RPM | NPSHR From Curve |
| Differential Pressure (16) | 1125 PSIG (77.6 bar) | 50 PSIG (3.4 bar) | 1125 PSIG (77.6 bar) | 50 PSIG (3.4 bar) | 2400 PSIG (165.5 bar) | 50PSIG (3.4 bar) | 1300 PSIG (89.6 bar) | 650 PSIG (44.8 bar) | 1750 PSIG (120.7 bar) | 50 PSIG (3.4 bar) |
| Flow (16) | 450 GPM (102.2 M ³ /hr) | 2 GPM (.5 M ³ /hr) | 450 GPM (102.2 M ³ /hr) | 2 GPM (.5 M ³ /hr) | 475 GPM (107.9 M ³ /hr) | 2 GPM (.5 M ³ /hr) | 465 GPM (105.6 M ³ /hr) | 9 GPM (2.0 M ³ /hr) | 535 GPM (121.5 M ³ /hr) | 2 GPM (.5 M ³ /hr) |
| Specific Gravity (2) | 1.2 | 0.6 | 1.2 | 0.6 | 1.2 | 0.6 | 1.2 | 0.6 | 1.2 | 0.6 |
| Horsepower | | | | | | | | | | |
| -Direct Connect | 400 HP (290 kw) | | 400 HP (290 kw) | | 400 HP (290 kw) | | 400 HP (290 kw) | | 400 HP (290 kw) | |
| -Belt Drive | 250 HP (186 kw) (3) | (4) | 250 HP (186 kw) (3) | (4) | 400 HP (290 kw) (3) | (4) | 250 HP (186 kw) (3) | (4) | 250 HP (186 kw) (3) | (4) |
| Fluid Temperature | | | | | | | | | | |
| -Water Single Seal | 180° F (82° C) | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) | Higher of 20° F (-7° C) or fluid freezing temperature |
| -Single Seal with cooled flush | 250° F (110° C) (3x2 only) | | 250° F (121° C) | | 250° F (121° C) | | 250° F (110° C) | | 250° F (121° C) | |
| -Double Seal with cooled flush | 250° F (121° C) | | 275° F (135° C) (5) | | 275° F (135° C) (5) | | 250° F (121° C) (5) | | 250° F (121° C) (5) | |
| -Other Fluids: | 250° F (121° C) | | 550° F (288° C) (5) | | 550° F (288° C) (5) | | 250° F (121° C) (5) | | 250° F (121° C) (5) | |
| First Critical Speed | 6500 RPM | ---- | 8500 RPM | ---- | 8500 RPM | ---- | 7750 RPM | ---- | 7750 RPM | ---- |
| Fluid Abrasives | 100 PPM Suspended Solids | ---- | 100 PPM Suspended Solids | ---- | 100 PPM Suspended Solids | ---- | 100 PPM Suspended Solids | ---- | 100 PPM Suspended Solids | ---- |

B. Operation Limits and Data (R11, RD11)

| OPERATION PARAMETER | R11 (2x2) | | R11 (2 x 1-1/2) | | RD11 (2x2) | | RD11 (2x1-1/2) | |
|--|---|---|---|---|---|---|---|---|
| | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM | MAXIMUM | MINIMUM |
| Pump Speed -Direct Connect -Direct Connect w/ D433 -Belt Drive -Belt Drive w/ D433 | 3600 RPM 3600 RPM 4858 RPM 4380 RPM | --- | 4858 RPM 4380 RPM 4858 RPM 4380 RPM | --- | 4858 RPM 4380 RPM --- --- (9) | --- | 4858 RPM 4380 RPM --- --- (9) | --- |
| Suction Pressure | 200 PSIG (14 bar) | NPSHR from Curve | 200 PSIG (14 bar) | NPSHR from Curve | 90 PSIG (6 bar) (10) | NPSHR from Curve | 90 PSIG (6 bar) (10) | NPSHR from Curve |
| Differential Pressure (9) | 640 PSIG | 225 PSIG | 640 PSIG | 225 PSIG | 640 PSIG | 225 PSIG | 640 PSIG | 225 PSIG |
| Flow (9) | 158 GPM | 4 GPM | 158 GPM | 4 GPM | 158 GPM | 4 GPM | 158 GPM | 4 GPM |
| Specific Gravity (2) | 1.2 | 0.6 | 1.2 | 0.6 | 1.2 | 0.6 | 1.2 | 0.6 |
| Horsepower | 75 HP (55 kw) | (7) | 75 HP (55 kw) | (7) | 75 HP (55 kw) | 15 HP (11) | 75 HP (55 kw) | 15 HP (11) |
| Fluid Temperature -Water Single Seal -Single Seal with cooled flush -Double Seal with cooled flush -Other Fluids: | 180° F (82° C) 250° F (121° C) --- --- | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) 250° F (121° C) 275° F (135° C) (5) 350° F (177° C) (5) | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) 250° F (121° C) (with flush) --- --- | Higher of 20° F (-7° C) or fluid freezing temperature | 180° F (82° C) 250° F (121° C) 275° F (135° C) (5) 350° F (177° C) (5) | Higher of 20° F (-7° C) or fluid freezing temperature |
| First Critical Speed | 18,000 RPM | --- | 18,000 RPM | --- | (14) | --- | (14) | --- |
| Fluid Abrasives | 100 PPM Suspended Solids | --- | 100 PPM Suspended Solids | --- | 100 PPM Suspended Solids | --- | 100 PPM Suspended Solids | --- |

Footnotes: (Please see next page.)

FOOTNOTES:

Consult factory for further information on the following:

- (1) Materials and seals for charge pressure over 200 psig (14 bar)
- (2) Specific gravities over 1.2 or below .6.
- (3) Horsepower in excess of 300 (220 kw) for direct connect and 150 (112kw) for belt drive.
- (4) For input horsepower less than 25 (18 kw).
- (5) Material, seals, o-rings, and required periphery equipment for temperatures over 250° F (135° C) and below 20° F (-7° C).
- (6) Materials and pump components for increased abrasion resistance.
- (7) For input horsepower less than 10 (7.5 kw).
- (8) Seal flush and injection requirements: 2-3 GPM at 15-20 (1.03 – 1.4 BAR) psig above suction pressure. Temperature of fluid dependent on required temperature difference. Consult factory.
- (9) Speed limitations by motor size.
- (10) Suction pressure limitations by motor size.
- (11) Minimum motor frame size for the RD11 pump.
- (12) Speed limitations by bearing arrangement and pick-up tube selection.
- (13) Speed limitations by bearing arrangement, pick-up tube selection and suction pressure.
- (14) Critical speed by motor frame size.
- (15) Operation limits are NOT mutually exclusive.
- (16) See performance curves for specific data.

C. BEFORE STARTING

The following procedures should be used when starting a new unit for the first time, or after major maintenance has been performed.

WARNING

WHEN CHECKING ALIGNMENT, OR PERFORMING ANY WORK ON THE UNITS, ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

1. Be sure that all installation requirements have been met and that the system has been designed to keep the pump within its operating limits.
2. Rotate unit by hand to be sure that it turns freely.
3. Be sure pump and drivers are aligned.
4. Check bearing lubrication. The bearings in oil lubricated pumps should be sprayed with small amount of oil before the initial pump start-up. Refer to lubrication instructions in Part IV – Maintenance, Section F. Also verify that the oil rings are in the proper location (refer to Disassembly/Assembly Manual, Section Drawing 2.4).
5. Prime pump. The Roto-Jet pump is not a self-priming pump and may be damaged if run dry. It must always be filled completely with liquid before starting.
 - 5.1 Be sure all valves in the suction line are fully open.
 - 5.2 If the pump is installed with a positive head on the suction, prime by opening the inlet valve while venting air out of discharge line.
 - 5.3 If equipped with charge pump, prime by starting charge pump while venting the discharge line until all air is out of the rotor.
6. Close discharge valve. (This should be done to reduce the load on the driver during start-up and to provide a restriction.)
7. If equipped with seal flush, be sure all flush inlet valves are open so that liquid can get to the seal.
8. Jog driver; check rotation. Counterclockwise when facing pump drive shaft.
9. Be sure all guards are installed on rotating parts.

D. START-UP

WARNING

ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, SHEAVES, OR COUPLINGS COULD RESULT IN INJURY.

DO NOT OPERATE PUMP WITH BOTH SUCTION AND DISCHARGE VALVES CLOSED OR WITH SUCTION OR DISCHARGE CLOSED BY CLOGGING. THIS COULD CAUSE DAMAGE AND IS DANGEROUS. ROTO-JET PUMPS ARE TO BE USED FOR LIQUID SERVICE ONLY. EXCESS PRESSURE CAN CAUSE MALFUNCTION LEADING TO INJURY.

1. Start driver and bring unit up to speed.
2. Slowly open discharge valve until operating point is reached.
3. Check bearings during first hour of operation to be sure that they are operating correctly. (Bearing temperatures should not exceed 180° F (82° C) for ambient pumping temperatures.)

E. OPERATING CHECKS

1. Check the pump and piping to assure that there are no leaks.
2. Check and record inlet and discharge pressure gauge readings for future reference.
3. Check and record voltage, amperage per phase and KW if an indicating wattmeter is available.
4. Note any unusual noise or vibration.

F. OPERATING CAUTIONS

1. Belt and coupling guards must always be in place during operation.
2. In cold weather, the fluid in the pump and piping must be kept from freezing.
3. The pump must always be primed before starting or the mechanical seal may be damaged.
4. Repeated trial starts may overheat the driver; allow sufficient time between starts for heat to dissipate from motor windings.
5. The pump must always be operated within its design limits.

6. All pressure and flow adjustments must be made with the discharge valve; **never use a valve on the suction side of the pump for this purpose.**
7. Do not operate near shutoff (low flow) without a bypass.
8. Do not operate pump with suction valve closed – this will cause damage and is dangerous.

G. SHUTDOWN

1. Close discharge valve. (Prevents reversal or continuation of flow after shutoff.)
2. Stop pump.
3. Close valves to prevent flow through by-pass, if applicable.
4. If pump is to remain out of service more than 2 weeks, follow the storage instructions in section I E. "Storage Instructions".

WARNING

TO PREVENT PUMP FROM FREEZING DURING COLD WEATHER THE LIQUID IN THE ROTOR ASSEMBLY MUST BE DRAINED. FAILURE TO REMOVE THE LIQUID DURING FREEZING TEMPERATURES COULD RESULT IN SEVERE DAMAGE TO THE PUMP.

5. For long-term pump storage in cold temperatures drain the liquid in the rotor assembly by doing the following:
 - 5.1 Remove the 3/4 NPT pipe plug in the endbell.
 - 5.2 Rotate the pump until one of the rotor cover drain plugs lines up with the 3/4 NPT hole in the endbell.
 - 5.3 Remove the rotor cover drain plug and allow the liquid to completely drain out.
 - 5.4 Inspect and replace if necessary the o-ring on the rotor cover drain plug.
 - 5.5 Reinstall the rotor cover drain plug in the rotor cover. Torque to 13 ft. lbs. (18 N.M.).
 - 5.6 Reinstall the 3/4 NPT plug in the endbell.

- 5.7 Prior to starting the pump follow the steps in Section III, B, “Before Starting”.

WARNING

WHEN PERFORMING EQUIPMENT MAINTENANCE OR IF THE PUMP IS TO REMAIN OUT OF SERVICE FOR A PERIOD OF TIME, THE EQUIPMENT ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

IV. MAINTENANCE

A. GENERAL

Operating conditions vary so widely that to recommend one schedule of preventative maintenance for all Roto-Jet Pumps is not possible. Yet some sort of regular inspection must be planned and followed. We suggest a permanent record be kept of the periodic inspection and maintenance performed on the pump. This recognition of maintenance procedure will keep your pump in good working condition, and prevent breakdowns. A suggested form for recording pump maintenance is provided at the end of this manual.

One of the best rules to follow in the proper maintenance of your Roto-Jet Pump is to keep a record of actual operating hours. Then, after a predetermined period of operation has elapsed, the pump should be given a thorough inspection. The length of this operating period will vary with different applications, and can only be determined from experience. New equipment, however, should be examined after a relatively short period of operation. The next inspection can be lengthened somewhat. This system can be followed until a maximum period of operation is reached, which should then be considered the operating schedule between inspections.

The maintenance timetable on the following page may be used as a guide.

B. MAINTENANCE TIMETABLE

| SCHEDULE TIME | MAINTENANCE RG, 2100 & RD11 | MAINTENANCE RO, ROH, R11 & 2200 |
|---|--|---|
| Daily | Operating conditions pressure, Flow, Seal leakage, Vibration | Operating conditions pressure, Flow, Seal leakage, Vibration – Oil level |
| 1500 hours/3 months; whichever occurs first | Lubricate bearings 1.oz. (.03 L). Grease to each fitting | |
| 4000 hours/6 months; whichever occurs first | Check Belts on B suffix models or drive on A suffix models | Change bearing oil.* Check belts on B-suffix models or drive on A-suffix models |
| Annually | Disassemble, clean and inspect pump, replace parts as necessary | Disassemble, clean and inspect pump, replace parts as necessary |
| As Required | Replace seals; maximum allowable leakage is: 1 pint per hour (0.5 l) | Replace seals; maximum allowable leakage is: 1 pint per hour (0.5 l) |
| | Clean strainer | Clean strainer |
| | Adjust or replace drive belts B-suffix models | Adjust or replace drive belts B-suffix models. |

***Oil incompatibility may cause bearing failure.**

C. V-BELT DRIVE

Drive should be checked for tension and alignment during the first few days of operation, and periodically thereafter.

WARNING

WHEN CHECKING ALIGNMENT OR PERFORMING ANY WORK ON THE UNITS, ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, SHEAVES, OR COUPLINGS COULD RESULT IN INJURY.

To replace belts:

1. Lockout electrical to motor.
2. Remove belt guard.
3. Slack off belt tension and remove belts.
4. Inspect sheaves for wear or damage.
5. Install new belts.*
6. Replace belt guard.

***NOTE: When belts are replaced they must be replaced as a set.**

D. STRAINER

The filter or strainer in the suction piping should be inspected and cleaned periodically. Failure to do so could cause a restriction in the inlet flow, resulting pump cavitation or failure of the strainer.

E. MECHANICAL SEAL

The mechanical seal provided in the pump requires no maintenance or operational adjustment. When the seal becomes worn or damaged and leaks excessively, it must be replaced.

The mechanical seal is a precision product; therefore, treat it with care. In handling, do not scratch the face of the seal or mating ring or let it drop, and take particular care not to scratch the lapped face that comes in contact with the seal mating ring. Cleanliness is of great importance, particularly at the seal faces.

The seal faces “wear in” with respect to each other and if disturbed it may be possible to reseal them. It is good practice to maintain a spare seal kit and replace the seal and the seal mating ring as a set.

The seal faces should be inspected for abnormal wear patterns. Seals should never be immersed in solvent of any kind as this could damage this internal o-ring.

F. BEARING LUBRICATION

1. OIL LUBRICATED

- 1.1 Factory Lubrication:
The pedestal is filled with oil and test run at the factory.
- 1.2 Approved Oil:
Mobil Delvac 1 ESP 5W-40 Synthetic Oil.

- 1.3 Capacity:
 RO, ROH – Approximately 6 quarts (5.7 L)
 R11 – Approximately 2 quarts (1.9 L)
 2200 – Approximately 4 quarts (3.8 L)

- 1.4 Oil change schedule:

NOTE: Recommend using a 13/16” 8 point socket to remove the oil drain plugs.

See maintenance timetable in Section IV, B.

The schedule time intervals should be shortened for conditions of dust, dirt and moisture.

CAUTION: Do not mix oils. Oil incompatibility may cause bearing failure.

2. GREASE LUBRICATED (RG)

- 2.1 Factory Lubrication:

The bearings are packed with grease at the factory and ordinarily will require no attention before starting provided the pump has been stored in a clean, dry place prior to its first operation.

- 2.2 Approved Greases

Do not use any grease that is not listed unless it is approved by the factory. Failure to comply may result in voiding the warranty.

- 2.3 Approved Substitute Greases for SRI No. 2.

NOTE: The pump is lubricated at the factory with Chevron SRI No. 2.

| APPROVED GREASE | | BASE MATERIAL | NLGI NO. |
|-----------------|---------------------------------------|------------------|----------|
| Chevron | SRI No. 2 (Preferred Grease) | Polyurea | 2 |
| Chevron | BRB No. 2 | Polyurea | 2 |
| Exxon & Esso | UNIREX No. 2 | Lithium | 2 |
| Texaco | RB | Lithium | 2 |
| Amoco | Rykon Premium 2 | Lithium | 2 |
| Mobil | Mobilith 22 | Lithium | 2 |
| Shell | Albida LC EP2 | Lithium | 2 |
| Royal Purple | Ultra Performance | Aluminum Complex | 2 |

CAUTION: DO NOT MIX GREASES. GREASE INCOMPATIBILITY MAY CAUSE BEARING FAILURE.

G. BEARING SYSTEM

Bearings should be inspected for smooth rotation and signs of pitting, rust or metal bluing. Bearings should be replaced as a complete set.

The bearing spacer set located between the radial and the thrust bearing is designed to effectively transmit the pump loads to the pedestal. Scoring, rust or debris on the spacer surfaces may affect the life of the bearings. It is recommended that the bearing spacer set be replaced when the bearings are replaced.

It is considered good practice to replace the wave spring when replacing the bearings as conditions may have affected the temper of the spring.

The bores inside of the pedestal should be inspected for scoring, pitting, rust or debris.

The purpose of the bearing shims is to insure proper preload of the bearings and adequate seal compression. The correct number of shims are identified and installed at the factory. When major components such as rotor, rotor cover, or drive shaft are replaced, the quantity of shims required may vary.

H. ROTOR AND ROTOR COVER

To alleviate vibration damage, the rotor, rotor cover and drive shaft are assembled and balanced at the factory. Unless otherwise specified, the assembly is balanced for fluid of specific gravity of 1.0. Other applications may require rebalancing of the rotating assembly. Excessive material removal due to erosion, corrosion, or damage may also affect the balance of the pump. The rotor and rotor cover should be inspected for signs of cavitation damage. If damage is evident, the cause should be identified and eliminated. The inner shroud of the rotor cover contains a lip that forms a labyrinth seal. This lip should be inspected for excessive wear. The flow passages in the rotor cover should be inspected for excessive wear. The flow passages in the rotor cover should be inspected for blockage.

I. PICK-UP TUBE

The condition of the pick-up tube will affect the successful operation of the pump. For optimum operation, the pick-up tube must be free of blockage and the inlet must be smooth and free of damage due to erosion or mishandling. When the pick-up tube is replaced, it is recommended that the (8) socket head capscrews (RG, RO) or the lock-nut (R11, RD11, 2100 & 2200) also be replaced.

J. OPERATING MAINTENANCE RECORDS

| ITEM | UNITS | DESIGNED VALUE | ACTUAL VALUE | BY |
|----------------------------|----------------|----------------|--------------|----|
| 1. Pump Speed | RPM | | | |
| 2. Pump Discharge Pressure | PSI (BAR) | | | |
| 3. Flow | GPM (M3/hr) | | | |
| 4. System Pressure | PSI (BAR) | | | |
| 5. Inlet Pressure | PSI (BAR) | | | |
| 6. Fluid Temperature | °F (°C) | | | |

| DATE | MAINTENANCE PERFORMED | BY |
|------|-----------------------|----|
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V. TROUBLESHOOTING

A.

| NO LIQUID DELIVERED AT END DELIVERY POINT OR THROUGH FLOW METER | |
|--|---|
| Possible Causes | Corrective Action |
| 1. Inlet or discharge valves closed | Be sure all valves are fully opened. |
| 2. Lack of prime. | Fill pump and suction completely with liquid. Check for vapor bind. |
| 3. Obstruction in liquid passages. | Dismantle pump and inspect passages of pick-up tube, rotor cover and manifold. Remove obstruction. |
| 4. System head too high. | Total system head greater than head for which pump designed. Check pipe friction losses. Larger piping may correct condition. Are valves wide open? Increase pump speed to develop greater differential pressure. CAUTION – Brake HP of pump varies as the cube of the speed; therefore, any increase in speed means considerable increase in the power demand. |
| 5. Suction Lift Too High | If no obstruction at inlet, check for pipe friction losses. However, static lift may be too great. Measure with mercury column or vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered. |
| 6. Air Leak in Suction Line | Suction line can be tested by shutting off or plugging inlet and putting line under pressure. A gauge will indicate leak with a drop of pressure. |
| 7. Speed Too Low. | Slipping drive belts – check belt tension. Check drive sheave and verify correct size for required speed. Check whether motor is directly across-the-line and receiving full voltage. Frequency may be incorrect, motor may have an open phase. |
| 8. Wrong Rotation. | Check motor rotation with required pump rotation. Pump rotation is clockwise viewed from the manifold end of pump. |
| 9. Suction or Discharge Line Plugged. | Unplug line. |
| 10. Gas or Vapor Pocket in Suction Line. | Provide gas separation chamber on suction line. |

B.

| NOT ENOUGH LIQUID DELIVERED AT END DELIVERY POINT OR THROUGH FLOW METER | |
|--|---|
| Possible Causes | Corrective Action |
| 1. Air Leak in Suction Line. | Suction line can be tested by shutting off or plugging inlet and putting line under pressure. A gauge will indicate a leak with a drop of pressure. |
| 2. Speed Too Low. | Slipping drive belts – check belt tension. Check driver sheave and verify correct size for required speed. Check whether motor is directly across-the-line and receiving full voltage. Frequency may be incorrect, motor may have an open phase. |
| 3. Wrong rotation. | Check motor rotation with required pump rotation. Pump rotation is clockwise viewed from manifold end of pump. |
| 4. Obstruction in Liquid Passages. | Dismantle pump and inspect passages of pick-up tube, rotor cover and manifold. Remove obstruction. |
| 5. Discharge Head Too High. | Total system head greater than head for which pump designed. Check pipe friction losses. Larger piping may correct condition. Are valves wide open? Increase pump speed to develop greater differential pressure. CAUTION – Brake HP of pump varies as the cube of the speed; therefore, any increase in speed means considerable increase in power demand. |
| 6. Suction Lift Too High. | If no obstruction at inlet, check pipe friction losses. However, static lift may be too great. Measure with mercury column or vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered. |
| 7. Suction or Discharge Line Partially Plugged. | Unplug line. |
| 8. Inlet Cavitation. | Insufficient NPSH (Net Positive Suction Head) available. Available NPSH must always equal or exceed the required NPSH of the pump. Depending on installation: A. Increase inlet pressure to pump. B. Reduce inlet pipe friction losses. C. Increase height of suction vessel. D. Pressurize suction vessel. E. Lower the pump. |

C.

| NOT ENOUGH PRESSURE ON PRESSURE GAUGE | |
|--|---|
| Possible Causes | Corrective Action |
| 1. No Restriction on Pump Discharge. | Close valve on discharge side at start up. |
| 2. Speed Too Low. | Slipping drive belts – check belt tension. Check driver sheave and verify correct size for required speed. Check whether motor is directly across-the-line and receiving full voltage. Frequency may be incorrect, motor may have an open phase. |
| 3. Wrong rotation. | Check motor rotation with required pump rotation. Pump rotation is clockwise viewed from manifold end of pump. |
| 4. Obstruction in Liquid Passages. | Dismantle pump and inspect passages of pick-up tube, rotor cover and manifold. Remove obstruction. |
| 5. Air Leak in Suction Line. | Suction line can be tested by shutting off or plugging inlet and putting line under pressure. A gauge will indicate a leak with a drop of pressure. |
| 6. Air or Gases in Liquid. | May be possible to over rate pump to point where it will provide adequate pressure despite condition. Better to provide gas separation chamber on suction line near pump. |
| 7. Head Lower Than Rating, Pumps Too Much Liquid | Pump may be operating at a higher flow rate than suspected. Throttle pump at discharge to reduce flow. |
| 8. Pick-up Tube Damaged. | Dismantle pump and inspect pick-up tube for erosion or damage. |
| 9. Inlet Cavitation. | <p>Insufficient NPSH (Net Positive Suction Head) available. Available NPSH must always equal or exceed the required NPSH of the pump. Depending on installation:</p> <ul style="list-style-type: none"> A. Increase inlet pressure to pump. B. Reduce inlet pipe friction losses. C. Increase height of suction vessel. D. Pressurize suction vessel. E. Lower the pump. |

D.

| PUMP OVERLOADS DRIVER | |
|--|--|
| Possible Causes | Corrective Action |
| 1. Speed too high.. | Check driver and verify correct size for required speed. |
| 2. Specific gravity too high. | Check. This can cause overloading. |
| 3. Head lower than rating, pumps too much liquid.. | Pump may be operating at a higher flow rate than suspected. Throttle pump at discharge to reduce flow. |
| 4. High viscosity. | Check. This can cause high drag on the rotor, rotor cover and pick-up tube. |
| 5. Electrical defects. | The voltage and frequency of the electric motor may be lower than that for which the motor was built. The motor may not be ventilated properly due to a poor location. |

E.

| PUMP WORKS FOR A WHILE THEN QUILTS | |
|---|---|
| Possible Causes | Corrective Action |
| 1. Incomplete priming | Free pump, piping and valves of all air. If high points in suction line prevent this, they need correcting. |
| 2. Suction lift too high. | If no obstruction at inlet, check for pipe friction losses. However, static lift may be too great. Measure with mercury column or vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered. |
| 3. Air leak in suction line. | Suction line can be tested by shutting off or plugging inlet and putting line under pressure. A gauge will indicate a leak with a drop of pressure. |
| 4. Air or gases in liquid. | May be possible to over rate pump to point where it will provide adequate pressure despite condition. Better to provide gas separation chamber on suction line near pump. |
| 5. Mechanical failure of critical pump parts. | Check bearings and pick-up tube for damage. |

F.

| PUMP VIBRATION | |
|---|---|
| Possible Causes | Corrective Action |
| 1. Inlet cavitation. | In sufficient NPSH (Net Positive Suction Head) available. Available NPSH must always equal or exceed the require NPSH of the pump. Depending on installation: A. Increase inlet pressure to pump. B. Reduce inlet pipe friction losses. C. Increase height of suction vessel. D. Pressurize suction vessel. E. Lower the pump. |
| 2. Air or gases in liquid. | May be possible to over rate pump to point where it will provide adequate pressure despite condition. Better to provide gas separation chamber on suction line near pump. |
| 3. Misalignment.. | Check alignment and tension of V-belts. |
| 4. Mechanical failure of critical pump parts. | Check bearings and pick-up tube for damage. |
| 5. Obstruction in liquid passages. | Dismantle pump and inspect passages of pick-up tube, rotor cover and manifold. Remove obstruction. |
| 6. Foundation not rigid. | The foundation must be rigid enough to support the pump, auxiliary equipment, drive and baseplate, and prevent vibration and misalignment during operation. |
| 7. Foreign particles in rotor. | The accumulation of foreign particles in the rotor may create and unbalanced condition. Clean pump rotor. |
| 8. Erosion of rotor. | Check pump rotor for evidence of erosion.. Displacement of metal within rotor could create an unbalanced condition. Rebalance or replace rotor assembly. |

G.

| BEARINGS OVERHEAT OR WEAR RAPIDLY | |
|--|---|
| Possible Causes | Corrective Action |
| 1. Improper lubrication or bearing pre-load. | A. Make sure bearings are installed properly. B. Remove pedestal cover and verify that the oil rings are in the proper location. Reference Disassembly/Assembly Manual, Section Drawing 2.4. |
| 2. Vibration. | See Vibration Troubleshooting Section. |
| 3. Dirt or water in bearings. | Dismantle pump and clean bearing housing. Replace bearings and lubricate. |
| 4. Bearings too tight. | Check V-belt tension. Follow procedure outlined in manufacturer's manual. |
| 5. High suction pressure.. | Inlet pressure appreciably different than specified. |

H.

| LIQUID RUNS FROM DRAIN HOLE | |
|-----------------------------|--|
| Possible Causes | Corrective Action |
| 1. Seal leaking. | Dismantle pump and inspect seal faces. Replace as necessary. |
| 2. Leakage past o-rings. | Dismantle pump, clean and inspect o-ring grooves. Inspect o-rings. Replace parts as necessary. |

I.

| NOISE | |
|------------------------------------|--|
| Possible Causes | Corrective Action |
| 1. Vibration. | See Vibration Troubleshooting section. |
| 2. Inlet cavitation. | In sufficient NPSH (Net Positive Suction Head) available. Available NPSH must always equal or exceed the require NPSH of the pump. Depending on installation: F. Increase inlet pressure to pump. G. Reduce inlet pipe friction losses. H. Increase height of suction vessel. I. Pressurize suction vessel. Lower the pump. |
| 3. Discharge cavitation. | Decrease flow requirements; increase pump discharge pressure. |
| 4. Belts slipping. | Adjust or replace belts. |
| 5. Turbulence in discharge piping. | A. Fully open the discharge valve. B. Increase the pipe diameter. C. Eliminate sharp bends in the piping. |

VI. PARTS

A. SPARE PARTS LIST

| | <u>Quantity</u> |
|---------------------------------------|-----------------|
| 1. Bearing Kit | 1 |
| 2. Seal Kit | 1 |
| 3. Pick-up Tube Replacement Kit | 1 |
| 4. O-ring kit | 1 |
| 5. Pedestal Gasket (RO and 2200 only) | 1 |
| 6. Rotor Cover Drain Plug | 2 |

B. ORDERING PARTS

General – It is Roto-Jet Pump’s policy to continually improve its products. Therefore, specifications are subject to change without notice. Parts should be ordered as far in advance or their use as possible since circumstances beyond our control may reduce existing stock.

Placing Orders – The satisfactory ordering and receiving of parts is dependent upon specific and correct information supplied by the purchaser. A specification sheet for each unit manufactured is on file at the factory, and in case some special part is needed, it can be provided if the correct model and serial number is given. Many unnecessary errors and delays may be eliminated by observing the following instructions.

Your parts order should state:

1. Model and serial number of pump.
2. Part number, description, and quantity required.
3. Your company name, address and zip code clearly.
4. Specific shipping and billing instructions.
5. Date required.

With this assistance, the time required to expedite your order will be greatly reduced.

NOTE: Parts will be furnished in original materials unless specified as a material change. All material substitutions should be discussed with the factory.

C. ASSISTANCE

Should you need any assistance, contact the factory or nearest regional office listed on the back cover.

ROTO-JET®

High Pressure Pitot Tube Pumps

*For optimum service and technical assistance,
please contact our factory for the distributor or representative
nearest to your project:*

**Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101
(P.O. Box 209, 84110-0209)
Tel 801-359-8731
Fax 801-530-7828
info@weirsp.com
www.weirpowerindustrial.com**

Excellent
Engineering
Solutions

The logo for WEIR, consisting of the word "WEIR" in a bold, blue, sans-serif font.