

NG/ND SERIES

Owners Manual

IRRIGATION & UTILITY PUMPS



CAUTION

- **DO NOT OPERATE THIS PUMP DRY!**
- Review instructions before operating.

INSTALLATION

- a) **Application:** These high pressure centrifugal pumps are ideal as irrigation or utility pumps as portable units or for fixed installations.
- b) **Pump Location and Installation:** The location of the pump should be such that a minimum length of suction and discharge line is required. This will enable maximum pressure available and minimize unnecessary hose friction losses. The unit should be well anchored and in a level position to insure satisfactory engine operation and reduce vibration. It should be placed so that it will be easily accessible for inspection or maintenance. Adequate drainage of the area should be provided to protect the unit from flooding.
- c) **Suction Hose:** Use non-collapsible suction hose or pipe. Line size should be at least as large as the suction side tapping of the pump. Do not use concentric fittings or pipe reducer bushings to increase the size of suction pipe. Eccentric fittings should be used and should have an angle no greater than 28°. Valves should not be installed in a suction line unless coupled with a booster pump. Never throttle a pump from the suction side. A straight pipe length at the pump's suction entrance should be at least six times the suction diameter. All threaded pipe joints and connections should be thoroughly tightened. A horizontal suction line must have a gradual upward slope to the pump so that the highest point in the suction line is at the pump. Leaks in the suction line reduce pump performance. See figures 1&2. When the suction pipe is connected to a tank, a baffle should be installed between the incoming liquid and the suction pipe inlet to prevent air from entering the suction pipe. If the liquid being pumped contains solids, a strainer must be used. The strainer should have a free opening area of at least three times the area of the suction pipe. The end of the suction pipe should be submerged in the fluid a distance of at least four to five times the diameter. Always support lines independently from the pump near the pump casing.
- d) **Discharge Hose:** Use standard hose capable of handling maximum pump pressure. Hose size should be at least as large as the discharge side tapping of the pump. All pipe joints and connections should be sealed with appropriate sealing compound and should be thoroughly tightened. Use the minimum length of line required in your application. Avoid unnecessary bends, lengths, elbows or expansion/reduction fittings if they are not absolutely necessary. If expanding a discharge line size, use concentric fittings with an angle no larger than 14°. Do not use standard pipe reduction fittings if possible. Avoid bends in hose lines during operation. A check valve and a gate valve should be installed in the discharge line with the check valve between the gate valve and the pump. Monarch check valve elbows are available as optional equipment if your pump has not already been equipped with one. Always support lines independently from the pump near the pump casing.
- e) **Foot Valve:** The installation of a foot valve at the suction entrance allows for easier pump priming if an ejector/exhauster/vacuum pump is not used. A foot valve may be used if the suction lift is not very high, but should not be used if there is high static head. In high head installations, severe water hammer results at the foot valve when the pump is quickly shut down. A foot valve is especially useful in automatic systems where the system must maintain prime while the pump is not operating. The foot valve should be of the flap type rather than of the multiple spring type. Passage opening of the valve should be at least of the same area as that of the suction pipe. Monarch foot valves are available as optional equipment.
- f) **Air In Liquid:** It sometimes happens that there is considerable amount of air or gas in the liquid pumped. If this is so, there may be a tendency for the gases to separate in the passages of the pump. For this reason air cocks placed on top of the casing should be opened occasionally to allow the air to escape. If there seems to be an unusual amount of air, these vents may be left open slightly at all times during operation of the pump. These vents may be connected to drain pipes if desired.

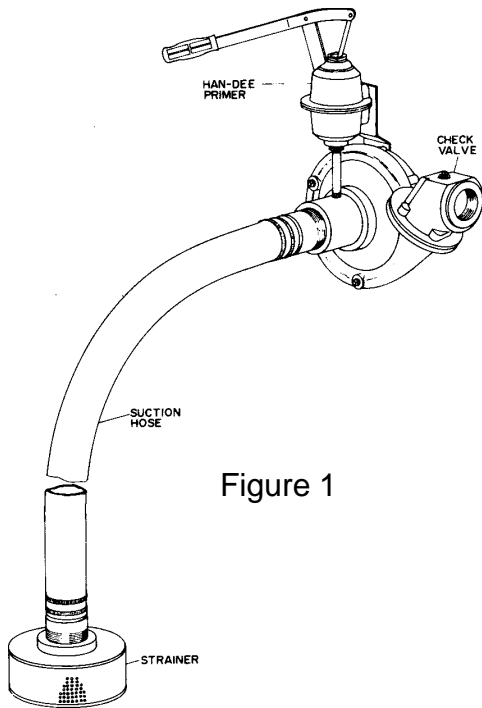


Figure 1

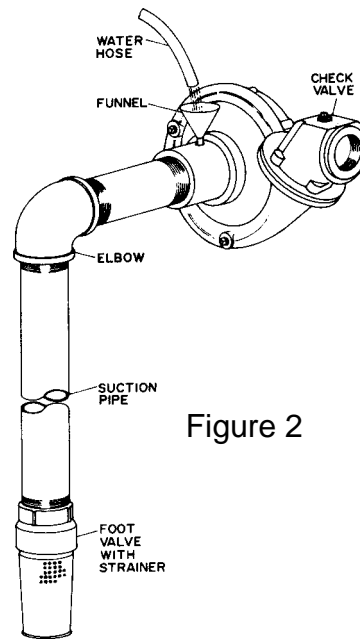


Figure 2

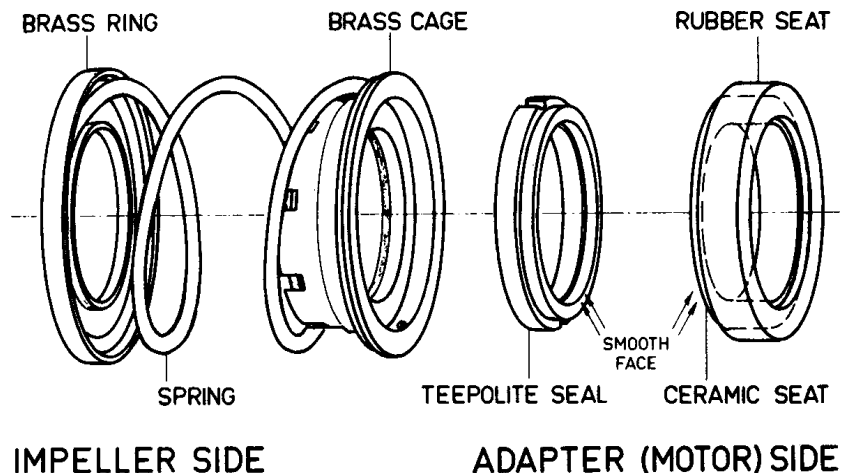
OPERATION

- a) Engine: Check the engine manual for engine preparation and normal operational procedures. Do not change engine governor speed setting, as engine damage may result. (Be sure to check engine oil level before starting).
- b) Priming: Before starting the pump, the casing and suction line must be filled with liquid. The pump must not be run unless it is completely filled with liquid, as there is a danger of damaging some of the parts of the pump which depend upon liquid for their lubrication. The pump may be primed by any of the following methods:
 - (i) Ejector or Exhauster - Attach the ejector to the highest point in the pump casing. This will remove the air from the pump and suction line, provided a tight valve is located in the discharge line close to the pump. As soon as the ejector waste pipe throws water continuously the pump may be started. If the pump doesn't deliver water within seconds it should be stopped and the process of priming repeated. A foot valve is not required for this method of priming.
 - (ii) Vacuum Pump - A vacuum pump may be used to remove the air from the pump casing and suction pipe. Mon-arch hand primers are available as optional equipment.
 - (iii) Foot Valve - With a foot valve on the suction pipe, the simplest method of priming is to fill the suction line, pump casing and discharge pipe (to an elevation of a foot above the pump discharge) with liquid. An air vent at the top of the pump casing should be left open until water flows through it without a trace of air. If a portion of the suction line is horizontal, several minutes may be required for the air to get to the vent hole. Rotate the impeller several times by hand in order to release air trapped in the impeller. Close the vent hole and start the pump. A tight foot valve will keep the pump constantly primed so that the pump may be used for automatic operation. However, the valve must be inspected frequently to see that it does not develop leaks.
- c) Starting: It is essential that the pump is not operated under power before it is fully primed. For initial starting the gate valve in the discharge line should be closed and opened gradually as the engine approaches full speed. After the pump has been in operation so that the discharge line has been completely filled, it then is unnecessary to close the valve for starting. The pump must not be throttled by the use of a valve in the suction line.
- d) Draining: If the pump is subject to freezing temperatures it should be drained each time it is stopped for any appreciable length of time. To drain the pump, remove the drain plug at the bottom of the pump casing and vent plug at the top.

MAINTENANCE

- a) Lubrication: The pump seal is water lubricated and requires no further lubrication. For this reason, operation of the pump without continuous fluid flow may severely damage this seal. For engine lubrication see engine manual.
- b) Replacing Mechanical Seals: (See Figure 3)

Figure 3



To Disassemble

- (i) Remove the pump casing. To prevent damaging the impeller hub, pull the pump casing off straight.
- (ii) Remove the impeller lock nut and the impeller. To remove the impeller insert a flat piece of metal between the impeller vanes and rotate it counter-clockwise.
- (iii) Remove the adapter plate from the frame. The shaft sleeve and mechanical seal will come off with the adapter plate.
- (iv) To remove the ceramic seat from the adapter plate push it out towards the impeller end.

To Assemble

- (i) Clean all parts thoroughly before assembling. Inspect pump components for wear.
 - (ii) Oil the rubber seat on the ceramic seat and press it into the adapter plate using thumbs only. Make sure the smooth surface faces outwards.
 - (iii) Replace the adapter plate being very careful not to damage the ceramic seat when sliding it over the shaft.
 - (iv) Oil the sleeve and slide the rotating seal on to it. Then slide the sleeve together with the seal on the shaft with the seal face facing the ceramic seat.
 - (v) Replace the impeller, impeller lock nut and pump casing.
- c) Wearing Rings: On some models wearing rings provide a close running clearance to reduce the quantity of liquid leaking from the high pressure side to the suction side. These rings depend on the liquid in the pump for lubrication. They will eventually wear so that the clearance becomes greater and more liquid passes into the suction. The rate of wear depends on the character of the liquid pumped.

TROUBLES AND THEIR CAUSES

a) No Discharge:

1. Pump not properly primed.
2. Speed too low.
3. Direction impeller rotation.
4. Suction lift greater than that for which the pump was designed.
5. Discharge too high.

b) Reduced Capacity and/or Head:

1. Air leaks in suction line.
2. Clogged impeller.
3. Foot valve strainer too small or clogged.
4. Excessively worn impeller or wear ring.
5. Speed too low.
6. Wrong direction of rotation.
7. Suction lift too great or insufficient NPSH. Net Positive Suction Head (NPSH) is the total suction head in feet of liquid (absolute) less the vapor pressure of the liquid in feet (absolute).

c) Pump Loses Prime:

1. Air leaks in suction line.
2. Excessive amount of air or gas in liquid.
3. Casing gasket defective.
4. Shaft seal is worn out.
5. Suction pipe insufficiently submerged.
6. Suction lift too great.
7. Worn wear rings.

d) Excessive Power Consumption:

1. Speed too high.
2. Stuffing box too tight.
3. Specific gravity or viscosity of liquid too high.

e) Noise:

1. Misalignment.
2. Bent Shaft.
3. Bearings.
4. Suction and discharge piping not properly supported and anchored.
5. Cavitation - check NPSH.

f) Factors That May Disturb Alignment:

1. Settling, seasoning or springing of the foundation.
2. Pipe strains distorting or shifting the machine.
3. Wear of the bearings.
4. Shifting of the building structure due to variable loading or other causes.

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