Aero 7DT7 & 5DT6

Pump Manual

HORIZONTAL CLOSE COUPLED

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1. General Instructions

HORIZONTAL CLOSE COUPLED PUMPS

A. Inspection of Equipment
B. Storage
C. Placing Stored Pumps Into Service
D. Application Considerations
E. Recommended Spare Parts

When properly installed and given proper care and maintenance, regenerative turbine pumps should operate satisfactorily for many years. Because of the high differential pressures expected of a regenerative turbine pump, close running clearances are used to maximize efficiency. Abrasive particles in the pumpage therefore, in high enough concentrations, can open up clearances and reduce performance. For this reason, duplex pump systems are often recommended.

1A Inspection of Equipment

Immediately upon receipt of the shipment, inspect the pump for damage or missing components. Inspect the box and any wrapping material before discarding. Parts or accessories are sometimes wrapped individually and placed in the pump box. Put the instructions that came with the shipment in a safe place where they will be available to those who will be using them for installation and service.

1B Storage

If the pump is to be stored before use, it should be inspected as described in 1A, reboxed and stored in a dry location. For extended storage , Ethylene Glycol can be used inside the pump to minimize any potential of galvanic corrosion. Remove the top protective caplug, and pour in Ethylene Glycol (antifreeze containing corrosion inhibitors) until you see the liquid level, and recap. Regardless of these precautions and depending on the materials of the pumps construction, putting the pump into service is the best way to insure the pump will operate when needed.

1C Placing Stored Pumps into Service

Care must be taken when placing stored pumps into service. First, flush out the Ethylene Glycol, other fluid or residue. Then, make sure that the pump will turn. To do this, remove the SAE inspection/drain plug in the end of the pump. Use a 5mm hexagonal allen wrench and turn it to the right, only (turning left could loosen this inspection screw). It may be necessary to loosen the four 3/8 bolts with a 9/16" wrench that hold the casing in place in some circumstances. Loosen all four evenly about 1 turn. You have effectively increased the internal tolerances and the pump should turn. Now, after turning the inspection screw to be sure that the pump is now free of residue, gently retighten the four casing bolts evenly. Be sure that the pump still turns. If the pump will not turn easily, go to section 4D12 Adjustment Procedure.

1D Application Considerations

1D1 Valves

The first valve to be considered for a regenerative turbine pumping system might be a pressure relief valve. Because this type of pump has a horsepower requirement similar to that of a positive displacement pump (constantly rising hp along with pressure) a relief valve can be effectively used to limit horsepower. It can be of critical importance if the system flow rate can vary widely.

There are few circumstances where a flow modulating valve will work successfully in a regenerative turbine pumping system pumping into a boiler. The steep pumping characteristic produces very large pressure changes with small variations in flow rate. As a result, the flow from these valves introduces sharp pressure shock waves that can damage pieces of equipment in the system.

If a shutoff valve is necessary in the suction line, use a gate, ball, butterfly, or other full port valve. Globe or other flow restricting valves can reduce pump flow or increase chances of damging cavitation.

A foot valve is recommended when lifting fluid from a sump. This can save wear and tear on any pump.

A strainer is sometimes recommended immediately ahead of the pump. This is advisable when there is a probability that foreign material large enough to damage pump clearances is possible.

Valves in the outlet piping of a regenerative turbine pump should always be open as far as possible when the pump is started. This reduces the start-up load on the pump and motor. Never start the pump with the discharge valve closed. Inlet valves should be open when starting any pumping system. Without fluid in the pump, galling or lock up can occur. Violent pump/motor failure will result from continued operation with inlet valves closed.

1D2 NPSH (Net Positive Suction Head)

The NPSH required is shown on the attached pump performance curve. If the NPSH available is not equal to or greater than that required by the pump, it must be increased or a different pump selected. The usual method for increasing NPSH is to raise the static head on the pump inlet. This

can be accomplished by raising the fluid level at the source, reducing suction piping losses, either way, increasing the differential of the fluid level above the inlet of the pump.
Another way is to reduce the temperature of the fluid. In the case of water, temperatures above 190 deghrees F. often lead to reduced pumping capacity and pump life. Reducing the water temperature from 190 F to 180 F will have the same effect as raising the water height by 5 feet.

1D3 Noise
Regenerative turbine pumps typically produce a high pitched tone that increases in intensity as the differential pressure produced in the pump increases. Adequate support for the inlet and discharge piping is important for noise reduction as well as reducing stress on the pump casing.

1D4 Freezing
When ambient temperatures drop below the freezing point of the fluid in a pump, consideration should be given to heating, insulating, or draining the pump. If you choose to drain the pump, first remove the inspection/ drain plug, and then drain the inlet and outlet lines. Blow out the pump with compressed air to clear all internal passages.

1E Recommended Spare Parts
FOR CRITICAL SERVICES – a duplex installation, with two identical pumping units in parallel, is the safest and many times most cost effective choice.

FOR IMPORTANT SERVICES – a standby pump, ready for installation, is advised. Special pricing and new pump warranty is offered for factory rebuilding. Turn around time can be as short as one or two days plus shipping time.

FOR ROUTINE MAINTENANCE – only the mechanical seals and a complete set of O-rings are recommended. Should additional components show wear, they are available from stock at the factory.

2. Installation

A. Location
B. Foundation
C. Piping
D. Typical Installation

In order to insure that pumping equipment is installed properly and to obtain reliable pump operation, it is recommended that only experienced, qualified mechanical contractors undertake this task. Read the instructions thoroughly before beginning.

2A Location
The first consideration for locating a pump is elevation. The lowest possible elevation using the shortest possible suction piping is usually the best. Questions regarding possible locations should be resolved by making inlet head calculations including all friction losses. The one producing the highest inlet pressure should be selected. One reason for this precaution is that, the greater the inlet pressure, the less likelihood of NPSH problems. Also a flooded suction is particularly helpful on start-up when the seals or the entire pump can be ruined because it is not properly primed and purged of air. A dry easily accessible location is also important. Allow ample clearance around the unit for free air circulation. If a dry location is not available, the pump can be mounted on framework above the floor. Place the pump so that it can be easily inspected and serviced during operation.

2B Foundation
Close coupled pumps can be mounted on a steel base prior to installation or mounted directly to framework. Place shims under one or more of the motor feet so that strain and distortion will not result when the mounting bolts are tightened.

2C Piping
2C1 Alignment
It is important that all piping be lined up and not forced into place. It is recommended that you begin piping at the pump. If the lines are ended at the pump, particularly if the last piece is cut a little too short or long, the pump will be forced to meet the pipe and strain or distortion will result. Elbow strainers are available which utilize a rubber grommet, to help solve misalignment problems. They offer the added benefit of being an inlet strainer to remove debris, which could be harmful to the pump.

2C2 Piping Support
Never allow the pump to support piping.
Other means such as pipe hangers and pipe supports should be used to carry piping to avoid misalignment and pump distortion. Consideration should be given to thermally induced expansion and contraction, particularly in long runs of straight pipe.

2C3 Piping Size
In general, outlet and especially inlet pipe sizes should be equal to or larger than those of the pump. However, if the runs are of considerable length, the inlet must be sized one or two pipe sizes larger to cover friction losses. The discharge piping is of less concern, but too small of pipe will make the pump work harder. Consult an engineer if there is doubt.

3. Operation

3A Rotation
Standard rotation is clockwise when looking at the motor end of the pump. It is necessary to be able to observe the motor shaft or fan to determine the motor rotation. On ODP motors, remove the plastic cap which covers the shaft, with a knife or small screwdriver, and the motor shaft can be observed. On TEFC motors, the fan can be observed through the fan guard. Operating the pump in reverse for a short period will not harm the pump, but of course, the direction of flow will be reversed. Single phase motors will come from the factory wired correctly. Check the motor name plate for instructions. Without a special rotation checker, it is impossible to know which direction a three phase motor will run until it is tried. If incorrect, switch any two power leads, either at the motor or the control panel.

3B Inlet and Outlet Locations (Refer to Figure 3-1)
The pump inlet (suction) is located on the front of the pump, and the discharge or outlet is on top, side, or bottom depending on how the pump was ordered. Normal discharge position is on top.

3C Foreign Material
All regenerative turbine pumps have close running clearances in order to provide exceptional efficiency. Take extra precautions to insure that no foreign material larger than 25 microns or .001 inches is allowed to pass through the pump. Even particles of this size can damage the pump if allowed to circulate continuously. Regenerative turbine pumps are not designed to pump slurries. Large particles, weld spatter, and other materials found in new piping systems can bend impeller vanes and may lock up the pump. If a new pump does not produce the design pressure, the first thing to check for is damage from foreign material.

3D Electrical
It is important to be aware of and follow the appropriate local and national electrical codes. Select starter heaters or time delay fuses and wiring for the maximum current the motor can use at full service factor loads.

3E Adjustments
No adjustments are required or advisable on new pumps. New pumps from the factory are tested using rust inhibitors to help preclude sticking on first start up. If it is allowed to dry out this may occur over time. In this case, do the following:

1. Fill the pump with fluid and wait a few minutes for the fluid to work its way into close fits.
2. Remove the plastic plug on the back of the motor, which covers the shaft. The motor shaft has a slot in the end.
3. Using a large screwdriver, apply clockwise torque to the motor shaft. Usually this will break the pump loose without damage, unless foreign material has entered the pump.
4. Alternatively, remove the inspection/drain plug and rotate the impeller using a 5mm hex allen wrench. (Only turn clockwise)
5. Jog the pump momentarily using the on/off buttons if preferred.

This procedure will flush residue from the high tolerance impeller surfaces. If the motor shaft cannot be turned in this manner, refer to section 5E. Because of the large areas of accurately fitted surfaces inside these pumps, it takes only microscopic residue to produce substantial resistance to rotation. Once loosened, this material is quickly dispersed.

3F Priming
Pumps should not be operated unless they are completely filled with liquid. The impeller and seal rely on liquid for their lubrication. Impellers can seize quickly when a pump is run dry. Without lubrication, seal faces can be damaged from heat buildup.

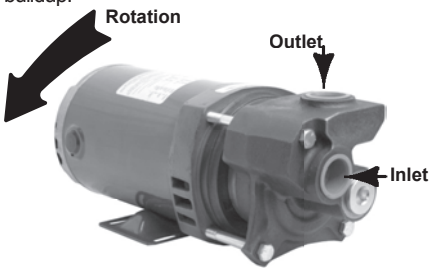

Figure 3-1

The best way to prime a pump is to use a flooded suction, or in simple terms, locate the pump below the liquid reservoir. Make sure all valves are open to allow the inlet to be flooded and trapped air to escape.
In many cases the assumption is made that if all valves are open, the pump must be full of liquid. Experience has shown that this is not always the case. To be sure, loosen the drain/inspection plug in the center of the pump. Liquid should leak out. If not, the pump is not primed.

3G Starting
Before starting a pump for the first time, be sure that all the preceeding operations have been carried out. Proper rotation, priming, and a free turning pump are most important.

1. Start the pump with the minimum possible line restriction.
2. Open discharge valves before pressing the starter.
3. Start the pump and let the system clear of air.
4. Listen for foreign material being carried through the pump.
5. Slowly close necessary valves or otherwise place the pump into service.
6. Listen for indications of undue load or other sounds indicating problems.
7. Use a clip-on ammeter to check for a steady load after approximately fifteen minutes of operation.

3H Stopping
After a successful start, if the pump will be unused for more than a few months, it may be advisable to drain and fill it with glycol and a corrosion inhibitor, or if there is liklehood that the pump will drain dry. Follow the instructions for long term storage, Section 1B Storage. After any prolonged stoppage, turn the pump over by hand before restarting, to be sure it is free.

4. Service

Pump Ends
A. Preliminary
B. Disassembly
C. Inspection of Components
D. Reassembly
E. Testing and Final Adjustments

4A Preliminary
Before attempting any service on the pump or motor, disconnect the electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration. Use colored or numbered tape to mark the wire connections of the motor and power source, for reconnection. Disconnect the inlet and outlet piping before unbolting the pump from its mounting. All work on the unit should be performed on an elevated workbench whenever possible.

4B Disassembly
The following tools and equipment are needed for disassembly.
1. Plastic or wooden mallet.
2. 9/16" wrench or socket
3. Snap ring pliers
4. 9/16" hex key wrench
5. 7/16" wrench or socket
6. Penetrating oil
7. 2 medium size flat blade screwdriver
8. Large flat blade screwdriver
9. 5mm hex key wrench

To disassemble the pump:
Refer to figure 4-1 for reference to the numbered parts in the procedure below.

1. If possible, remove liquid from the pump. Air blown through the pump will remove the water quickly.
2. Using a 9/16" hex key wrench, remove the drain plug (#22A).
3. Using a 7/16" wrench or socket, remove the plug (#22).
4. Using a 9/16" wrench or socket, remove the three shorter bolts (#33) and one longer bolt (#19).
5. Using a mallet, drive the casing (#108) free from the motor bracket (#84). This may be difficult to do especially if the parts are rusty. Use penetrating oil to help loosen parts. Tap evenly around the casing so as to not cock the casing and cause it to bind.
6. Using a 5 MM hex key wrench, remove the screw (#19A) and washer (#41) which holds the impeller on the motor shaft. (See Figure 4-2)
7. Slide the impeller (#11) off the motor shaft. If the impeller is to be re-used, be careful not to damage the blades.
8. Remove the impeller drive key (#23) from the slot.
9. Using a snap ring pliers, expand the snap ring (#4) slightly and slide it off the motor shaft.
10. Stand motor vertically with shaft up. Apply

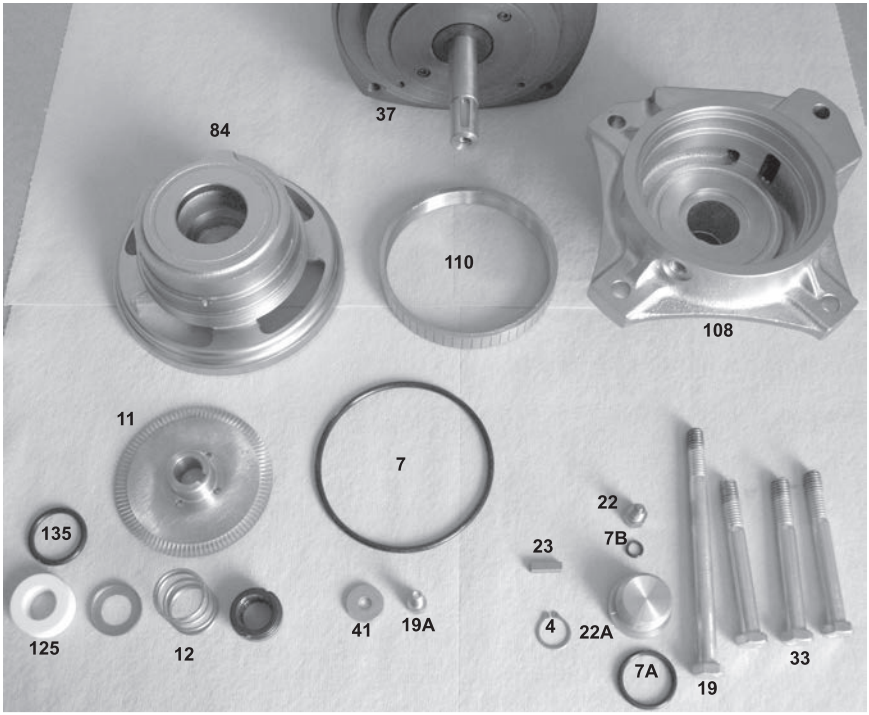

Figure 4-1

Ref #	Description	QTY
108	Casing	1
84	Motor Bracket	1
11	Impeller	1
110	Adjusting Ring	1
23	Impeller Key	1
4	Snap Ring	1
7	O-Ring	1
7A	O-Ring	1
7B	O-Ring	1
12	Seal, Rotating Element	1
125	Seal Seat	1
135	Seal Seat O-Ring	1
19	3/8-16 X 5" Bolt	1
19A	Impeller Screw	1
22	Drain Plug	1
22A	Plug	1
33	3/8-16 X3 1/4" Bolt	3
37	3/4HP 1PH ODP Motor	1
41	Washer	1

penetrating oil liberally to the motor shaft just above the rotating element (#12), with the intent to loosen the grip of the rubber boot on the motor shaft. Slide the rotating element off the motor shaft.

11. Remove the motor bracket (#84) from the motor. If it is stuck, it may be necessary to use penetrating oil and the mallet to remove.

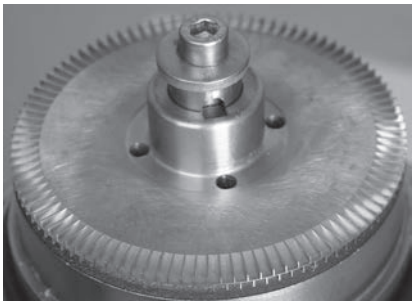

Figure 4-2

12. Again, if necessary apply penetrating oil to the adjusting nut (#110), and unscrew counter clockwise.
13. Turn the motor bracket upside down and using a soft tool (wood dowel or equivalent), push or drive the seal seat (#125) out.

4C Inspection of Components

Thoroughly clean all parts. All components should be examined for wear and corrosion. Replace any parts that show visible wear. The O-rings should be replaced if they are hard and deformed or cut. If seal components must be reused,

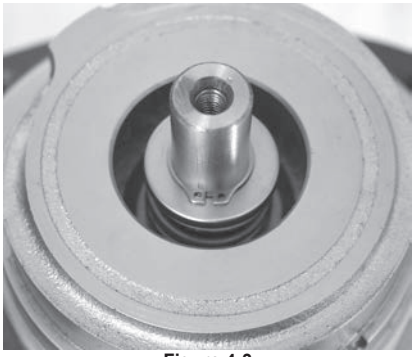

Figure 4-3

carefully inspect for microscopic cracks and nicks. Scratches that might be ignored elsewhere can produce leakage if they are on seal carbons and seat wearing surfaces. Cleanliness is imperative when working with mechanical seals. Almost unnoticeable particles between seal faces can be, and often are, the cause of early seal failure. Check the impeller; it is designed to float or slide easily, but not wobble, on the shaft. Check the motor shaft for galling, pitting, and corrosion. If the shaft is corroded where the seal comes in contact, it must be cleaned. Surface corrosion must be removed so that the seal can slide freely during assembly. The shaft diameter should be no smaller than .623. Remove any nicks or burrs, which may have occurred during disassembly.

4D Reassembly

All parts should be visually inspected and cleaned or replaced as outlined in 4C.

1. The seal seat must be installed in the motor bracket (#84) before the bracket is installed on the motor. The seal seat is actually two components; the ceramic seat (#125) and an o-ring (#135). The seat has one highly polished face. Be very careful when handling to prevent any marks on the polished face, as this is the sealing surface. Use a lubricant that will not harm rubber products. Liquid soap works well. Slip the o-ring over the seat into the peripheral groove. Then insert the o-ring/seat assembly into the bore in the motor bracket, with the polished surface up. Make sure that the seat goes completely into the bore and is not cocked.
2. Stand the motor vertical with the shaft up. Block as necessary so as to be stable.
3. Install the motor bracket onto the motor. Make sure that it sits down flat against the face of the motor, and can be rotated by hand, as it will be necessary to rotate it later for alignment. (See Figure 4-4)

Figure 4-4

4. The seal rotating element (#12) is composed of three components; a carbon ring with a highly polished face glued to a rubber ring held together by a stainless steel carrier, a spring, and a washer. Install the rotating element (#12) onto the motor shaft with the shiny carbon face down towards the ceramic seat. It will be necessary to lubricate the motor shaft and the inside of the rubber that contacts the shaft. The rotating element must slide freely on the shaft when well lubricated and slide down until the carbon face contacts the ceramic seat. The spring and washer sit on top of the rotating element and supply light pressure to maintain seal face contact.
5. Using a snap ring pliers, slightly expand the snap ring (#4) so that it slips over the motor shaft, and slide it down against the washer backing up the spring and seal. Push down until the snap ring drops into the groove in the motor shaft. Make sure that the snap ring is completely seated into the groove, and has not been stretched beyond return. This should have compressed the spring about halfway. (See figure 4-5)

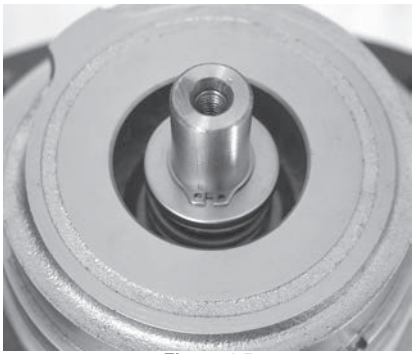

Figure 4-5

6. Install the impeller drive key (#23) into the shaft keyway.
7. Assemble the impeller (#11) with the hub up, onto the shaft, aligning the keyway, and down until it sits against the motor bracket. The impeller must slide freely. (See Figure 4-6)

Figure 4-6

8. Apply a few drops of Locktite #271 threadlocker to the impeller retaining screw (#33A). Assemble the thick washer (#41) onto the screw and screw into the end of the motor shaft. Hold the impeller with a rag and tighten the screw with a 5mm hex key wrench, clockwise. (See Figure 4-7)

Figure 4-7

9. Apply lubricating grease to the threads on the motor bracket. Screw the adjusting nut (#110) all the way onto the motor bracket, but do not tighten.
10. Assemble the large o-ring (#7) over the motor bracket, down against the shoulder immediately above the adjusting nut. (See figure 4-8)
11. Now turn our attention to the casing (#108). Assemble the small o-ring (#7B) onto the plug (#22) and screw the plug into the hole in the side of the casing. Tighten with a 7/16" wrench. <u>This plug will properly align the casing to the motor bracket.</u>
12. We are now ready to close the pump up by

Figure 4-8

installing the casing (#108). Assuming that we want the motor feet on the bottom, and the pump discharge on the top, rotate the motor bracket so that the groove machined into the outside diameter of the motor bracket lines up with the plug hole in the casing. Lubricate the o-ring on the motor bracket as well as the inside of the casing. <u>Fit the casing over the motor bracket and gently lower it down, **making sure that the alignment plug slides into the slot on the motor bracket,** until it nearly contacts</u> the adjusting ring. The large o-ring should have nearly disappeared inside the casing. (See figure 4-9)

Figure 4-9

13. Put three 3/8 x 3 ¼" long bolts (#33) through the ears on the casing, and screw them into the motor, finger tight. Put one 3/8 x 5" long bolt (#19) through the fourth hole in the casing and screw in finger tight. It is recommended to put a spot of grease onto the bolt threads before installing, as they may need to be tightened and loosened several times during the adjustment process. Using a 9/16" wrench or socket, evenly tighten the four bolts snug.
14. Lay the pump/motor assembly down on the motor feet with the pump facing forward. Rotate the adjusting ring counterclockwise as far as possible to bring it up against the casing. Put a witness mark on the casing coinciding with a mark on the adjusting ring. Loosen the four bolts approximately 1 turn that hold the casing in place. Now rotate the adjusting ring

Figure 4-10

counterclockwise seven marks as they pass the witness mark. Retighten the 4 bolts evenly that hold the casing in place. (See figure 4-10)

15. Now the adjustment procedure. Using a 5mm hex key wrench, go in through the center bore of the casing and into the impeller retaining screw, and try to turn the motor shaft clockwise. It should turn freely. If it is locked up or very stiff, loosen the four 3/8 bolts until the adjusting ring can be rotated, and turn the adjusting ring 3/8" on the periphery counter clockwise, which will add clearance. Snug up the four bolts and try turning the motor shaft. Repeat until the impeller can be turned freely. When finished adjusting clearance, torque the four bolts to 12 foot-pounds. Each 3/8" movement on the periphery of the ring will make a difference of .002 impeller clearance. Too much clearance, and the pump will loose performance. Too little clearance, and the motor will overload, or not be able to rotate. This completes adjustment. Note that it is also possible to turn the motor shaft from the back with a large flat blade screwdriver.
16. Finish assembly by putting the o-ring (#7A) onto the large plug (#22) and screwing it into the center bore of the casing. Tighten with a 9/16" hex key wrench.

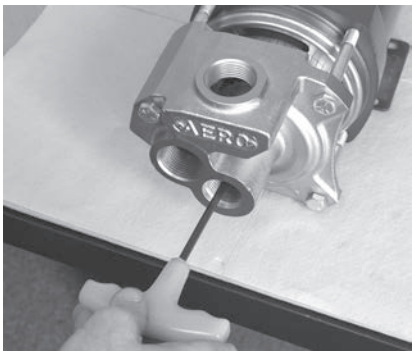

Figure 4-11

5E Restoring Performance To A Used Pump

All mechanical devices wear over time. One substantial advantage to the AERO Pump is the ability to restore lost performance do to wear without pump disassembly. Depending upon pump accessibility, it may be possible to make the adjustments without removing the pump from service, or disturbing piping. It will be necessary to rotate the motor shaft during the adjustment procedure to determine when there is too little impeller clearance. The shaft can be accessed from the rear of the motor by removing the plastic center cap and using a large flat blade screwdriver, or from the pump end by removing the brass center plug and inserting a 5 MM hex key wrench. The simple adjustment procedure allows excess impeller side clearance to be removed. In many cases, this will bring the pump back to nearly new performance. The procedure is essentially the same as described in step 3D-15 above. Read and understand this first; then follow the below steps:

1. Assuming that the pump is still piped up, remove the plastic cap on the back end of the motor that covers the shaft, and using a large flat blade screwdriver, turn the motor a turn or so to be sure that it turns free. If it is impossible to access the motor from the rear, work from the front by removing the brass drain plug from the center of the pump casing. From the pump end, rotate clockwise only. Remember to isolate the pump from the water supply by shutting off the inlet and discharge valves.
2. Using a 9/16" wrench or socket, loosen the four bolts about 1 revolution each, that hold the pump to the motor.
3. Use an ink marker to make a reference mark on the casing aligned with one of the marks on the adjustment ring.
4. Rotate the adjustment ring one mark clockwise. This will reduce the impeller side clearance by .002. The adjustment ring may be difficult to rotate by hand. If so, use a flat blade screwdriver or chisel with a mallet. Also, it may be necessary to loosen the four bolts a little more and tap on the pump casing with a mallet to loosen.
5. Snug up the four bolts and try turning the motor shaft. If the motor shaft still turns freely, loosen the four bolts and repeat the procedure.
6. At the point when the motor shaft no longer turns freely, back the adjustment ring off, counterclockwise, 1 mark.
7. Evenly tighten all four bolts and torque to 12 foot-pounds.

8. Check that the motor still turns freely.
9. If the pump was drained of water, open the inlet and discharge valves, and make sure that pump is filled with water before returning to service.

This completes the adjustment procedure. A noticeable improvement in performance should result.

5. Troubleshooting

A. Failure to Pump
B. Reduced Capacity
C. Reduced Pressure
D. Pump loses Prime After Starting
E. Excessive Power Consumption
F. Pump Vibrates or is Noisy
G. Mechanical Problems
H. Seal Leakage

5A Failure to Pump

1. Check to see if wired for correct voltage.
2. Pump not up to speed – Use tachometer to determine actual RPM. Check voltage and wiring connections.
3. Pump not primed – Confirm that pump and all inlet piping is filled with fluid.
4. Discharge head too high – Install a pressure gauge at the pump discharge to determine the actual operating pressure. Compare readings with pump performance curve.
5. Excessive suction lift – Relocate pump, supply tank, or both to minimize suction lift.
6. Wrong direction of rotation – Compare pump rotation with arrow on pump. Standard rotation is clockwise when looking at back of motor. Reverse two leads on a three phase motor to change rotation. Check motor nameplate for single phase operation.
7. Clogged suction line, strainer or valve – inspect and clean out if necessary.

5B Reduced Capacity

1. Pump not up to speed – Use a tachometer to determine actual RPM. Check voltage and wiring connections.
2. Excessive suction lift – Relocate pump, supply tank or both to minimize suction lift.
3. Insufficient NPSH – Relocate pump, supply tank or both to improve NPSH available is possible. Increase suction pressure. Reduce fluid temperature. Select a different pump with lower NPSH requirements.
4. Mechanical damage – Rotate the pump by hand to determine if there are tight spots. Broken or bent impeller vanes can sometimes be detected in this manner. If there is a suspicion of damage, remove the pump from service and disassemble for inspection.
5. Air leak in the suction line – Fill the system with fluid and hydrostatically test. Tighten connections or replace leaky components.
6. Air pockets in the suction piping – Operating the system at maximum flow conditions will usually clear the lines. Evacuate the system with a vacuum pump if necessary.
7. Suction lines, strainer, or foot valve too small or clogged – Inspect and clean out as necessary. Fittings and lines should be at least equal to the pump suction size.
8. Discharge head too high – Install a pressure gauge at the pump discharge to determine the actual operating pressure. Compare readings with pump performance curve. A larger pump may be necessary.
9. Excessive wear – If a pump had previously performed satisfactorily and now gives evidence of reduced performance, it should be disassembled and examined for wear after the simpler possible problems have been investigated.

5C Reduced Pressure

1. Pump not up to speed – Use a tachometer to determine actual RPM. Check voltage and wiring connections.
2. Air or vapor in liquid – install a separator in the suction line. Hydrostatically test the system to insure that there are no leaks.
3. Mechanical wear or damage – Rotate the pump by hand to determine if there are tight spots. Broken or bent impeller vanes can sometimes be detected in this manner. If there is a suspicion of damage or wear, remove the pump from service and disassemble for inspection. Look for wear on the impeller, suction cover, and motor bracket.
4. System head less than expected – Replace pump with higher capacity unit or add a valve or orifice to increase discharge line resistance.

5D Pump Loses Prime After Starting

1. Leak in suction line – Fill the system with fluid and hydrostatically test. Tighten connections or replace leaky components.
2. Air entering pump through inlet seal or “O” ring – Hydrostatically test the pump and look for

leaks. Replace faulty seal or "O" ring.
3. Insufficient NPSH or too much suction lift – Relocate pump, supply tank, or both to improve inlet conditions. Increase suction pressure. Reduce fluid temperature. Select a pump with lower NPSH requirements.

5E Excessive Power Consumption
1. Speed too high – Check RPM with tachometer.
2. Discharge head too high – Install a pressure gauge at the discharge to determine the actual operating pressure. Compare readings with pump performance curve. A different pump, motor, or both may be necessary.
3. Specific gravity or viscosity too high – Check fluid involved. A different motor may be necessary.
4. Mechanical damage – Turn pump over by hand. After a few days run in period, there should be no tight spots. An exception to this is when the pump has been idle for some time. In this case, run the pump for a few hours before checking for tight spots. If there is a suspicion of damage, remove the pump from service and disassemble for inspection.
5. Pump not fully "broken in" – It is normal for a new pump to consume higher than normal current during the break-in period. If high power consumption persists beyond a few weeks, it is unlikely that further operation will reduce consumption.
6. Pump not properly adjusted – Follow the instruction in section 3, G12 for proper adjustment procedure.

5F Pump Vibrates Or Is Noisy
1. Insecure mounting – Follow instructions in section 2, 2B.
2. Piping load on pump – Install piping supports and check to see that there is no strain on the pump.
3. Mechanical damage – If mechanical damage is suspected, check first to determine if the pump turns freely. Disassemble for inspection if tight spots are found.
4. Pump has a high pitched whine – This is typical of a regenerative turbine pump. The intensity should increase as pressure increases. Over a period of a few weeks the noise level will diminish as the pump approaches "run in"condition.

5G Mechanical Problems
1. Short bearing life – Motor bearings are lubricated for life. However, if the pump seal leaks and is allowed to run this way for some time, the front motor bearing may fail due to corrosion.
2. Pump locked up – Pump dried out and close clearance areas rusted. Follow installation instructions for loosening the pump. Foreign material in pump – Flush out. Disassemble if flushing is not successful.
3. Pump leaks – Seal or "O" rings are usually the problem. Disassembly and replacement is the solution.

5H Seal Leakage
1. Worn seat or rotating element – Seals will last many years operating on cold water or other clean fluid with reasonable lubricity. Particles, even microscopic, increase normal wear rates. Temperatures near the fluid's boiling point can reduce lubricity, which in turn, increases wear. Some chemicals will erode the seal faces or plate out on the faces producing an abrasive effect. Immediate seal replacement is recommended when leaks become evident, since bearings are quickly ruined as a result of moisture. Severe mechanical damage results when the bearings fail.
2. Improperly installed seat or rotating element – If a seal has recently been replaced, look for a missing "O" ring around the seat, or a seat that was installed cocked or backwards. The smooth surface should face the rotating element. The rotating element may be in backward or improperly positioned. Refer to the appropriate seal diagrams and instructions to confirm the correct seal orientation. Rotating elements sometimes stick in the wrong position if left partially assembled for some time. Make sure a rotating element can be moved axially on the shaft before closing up the pump, and then make the final adjustments as soon as possible.
3. Seat broken during assembly – Ceramic seats are particularly vulnerable to damage. Carefully follow reassembly instructions for seals.

Pitted shaft under the seal – Motor shafts are made from 316 stainless steel and are highly resistant to corrosion and pitting. If the motor shaft has been damaged or is pitted where the rubber boot of the rating element sits, leakage may occure. Replacing the motor is the only option.

6. Parts and Repair Services

A. Parts
B. Repair Service

6A Parts

Repair parts may be obtained from the distributor where you purchased the pump. Your local distributor can be found by calling or emailing the factory at:

DLT Electric, LLC
202 West Main Street
Plano, Illinois 60545
Email: Sales@DLTElectric.com
http://www.DLTElectric.com

6B Repair Services

Repair service for this pump should be obtained from the company through which it was purchased. In the event that it is necessary to return the pump to the factory for repairs, remove all accessories, piping, etc attached to the pump. We cannot accept responsibility for their safe removal, storage, and return.

6C Warranty Service

All requests for warranty claims can be made directly to the factory. Details on what is wrong helps the factory repair department. Refer to the DLT Electric Limited Warranty statement. Return authorization must be obtained prior to returning any equipment.

To register your pump for factory service at some future time, it is important that you fill out the attached warranty service card which outlines this important customer service. A copy is shown here for your records:

7. Limited Warranty

All requests for warranty claims should be made through the company from which the product was purchased or supplied. Complete details on what is wrong with the product must be provided along with information on the system in which it is installed. Refer to the DLT Electric, LLC Limited Warranty statement below for more information. Return authorization must be obtained prior to returning any equipment.

DLT Electric, LLC hereinafter referred to as "DLT", warrants for a period of twelve (12) months from the date of installation ("The Warranty Period"), that the products manufactured by it will be free from defects in material and workmanship. DLT will correct defects in material or workmanship which may develop in its products under proper or normal use during the Warranty Period and under the conditions of this Warranty. Warranty claims for special order items or accessories not manufactured by DLT (such as mechanical seals) should be directed to those who manufactured the item (Mechanical Seals are manufactured by John Crane Inc.).This Warranty does not extend to anyone except the original consumer-purchaser. Damage to the product due to improper handling, improper storage, improper maintenance, or improper application is not covered by this Warranty. DLT will repair or replace, at its option and expense, its products proved to be defective after examination by an authorized representative of DLT. This is DLT's sole warranty. DLT makes no other warranty of any kind, express or implied, and all implied warranties of merchantability and fitness for a particular purpose which exceed DLT's aforestated obligations are hereby disclaimed by DLT and excluded from this warranty. DLT neither assumes nor authorizes any person to assume for it, any other obligation in connection with the sale of the Product and any enlargement of this Warranty by a purchaser shall be for its own account and its exclusive responsibility. This Warranty shall not apply to any Product or parts of Products which: (a) have been repaired, assembled, or altered outside of DLT's factory, in any manner; or (b) have been subjected to misuse, negligence or accident; or (c) have been used in a manner inconsistent with DLT's printed instructions, specifications, or the customer supplied application specification; or (d) have been damaged due to defective power supply or faulty installation. DLT shall not be liable for incidental and consequential losses and damages under this express warranty, any applicable implied warranty, or claims for negligence, except to the extent that this limitation is found to be unenforceable under the applicable State law. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from State to State.