

# MT SERIES MAG-DRIVE SEALLESS REGEN TURBINE PUMPS

## INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

TO OBTAIN THE BEST PERFORMANCE FROM YOUR TECH-MAG MT PUMP,  
PLEASE READ THIS MANUAL CAREFULLY.

**Failure to follow the recommended procedures may result in premature and severe damage to your TECH-MAG pump, and may also void the warranty.**

Thank you for your purchase of a TECH-MAG MT Series regenerative turbine pump. Proper installation and maintenance will provide many years of trouble free operation.

### **INSTALLATION:**

**1) LOCATION:** Locate the pump as close to the liquid source as possible.

**2) PRIMING:** The MT pump will self-prime approximately 1 to 1½ feet only if the pump head is primed (*pump filled*) with fluid, and if the pump ports are facing in the upright position. Consult the Factory if the pump is expected to lift prime more than 1½ ft.

### **3) SYSTEM PIPING:**

a) The nominal diameters of the pump ports shall not be taken as indicating system piping size selection. The pipe diameter shall be selected according to the system capacity and related friction losses. The inlet pipe should never be smaller in diameter than the size of the pump inlet port. As a general rule the maximum fluid velocities are as follows: approx 5 ft/s for the suction line and 7 ft/s for the discharge line.

**NOTE:** Restriction of the suction pipe work may cause cavitation leading to a loss of efficiency and performance along with rapid premature wear.

b) Any possibility of an air pocket (*piping "U" bend, concentric reducers etc.*) or air entrance in the suction line must be avoided.

c) All piping must be connected to the pump without forcing. All pipe work should be properly supported *and free standing*. Flexible pipe connections should be if thermal cycling is likely, such as outdoor installations, to prevent piping stress that will transfer to the pump.

d) The suction and discharge piping must be cleaned of any foreign objects and flushed before connections are made.

e) Mounted pipe lines must be checked to ensure proper sealing, particularly on the suction pipe.

f) Keep the suction pipe as short and straight as possible.

g) Use rigid or reinforced pipe that will not deform or collapse under suction conditions.

h) Gate or check valves should be installed if there is any possible of water hammer when the pump is shut down.

i) A pressure relief valve with by-pass or pump protection power sensing relay is recommended if excessive pressure or other process upset conditions are likely.

j) A pressure gauge with gauge guard is recommended as close to the discharge port as possible for visual monitoring of system pressure.

**NOTE:** Dead-head operation may damage the pump and over-load the drive.

**NOTE:** A 100 mesh suction strainer is required for removing solids in the process that are larger than 0.005". A strainer one size larger than the line size is also advised to minimize pressure drop and cleaning cycles.

## **OPERATION:**

Two conditions are critical when operating a mag-drive pump:

**DO NOT RUN THE PUMP WITHOUT FLUID IN THE PUMP!  
DO NOT DEAD-HEAD THE PUMP!**

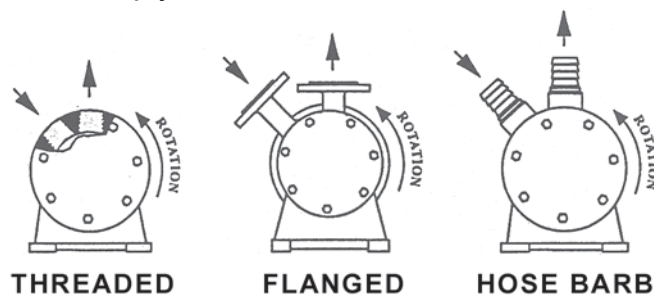
1) Fill the pump body with liquid before starting the unit. If pump has flooded suction, open the suction valve. If the unit is priming, pump should be filled through the top port.

**NOTE:** If the fluid is extremely hot or cold, the pump should be gradually brought to operating temperature before the fluid is introduced to prevent possible thermal shock damage.

2) If the unit is long-coupled, the bearing frame housing should contain the proper oil at the proper level. The unit must also be properly aligned. Consult the **BEARING FRAME OPERATION AND MAINTENANCE INSTRUCTIONS** before proceeding.

3) Consult the **MOTOR OPERATION AND MAINTENANCE INSTRUCTIONS** for wiring, and other driver information.

4) When the pump is ready to run, bump start the motor to check rotation (*see Figure 1*) To change the suction and discharge ports, simply reverse motor rotation.



**Figure 1:** Direction and Port Location

Check the **MOTOR OPERATION AND MAINTENANCE INSTRUCTIONS** if rotation is not as indicated for top discharge pumping.

## **MONITORING:**

Flow metering or power sensing relays are strongly recommended to prevent unsuitable operation conditioned (*i.e. dead-heading, dry-running, cavitation, etc*). Current amp sensors are not advisable. Consult with your local sales representative of TECH-MAG pump division for appropriate minimum and maximum flow limits for a specific pump model. Maximum flow settings often are contingent upon the NPSH available from the system.

## **ESSENTIAL RUNNING PRECAUTIONS:**

### **A) DO NOT RUN THE PUMP DRY!**

The process fluid acts as the lubricating and cooling medium. Without fluid in the pump, frictional heat is generated that will damage the pump.

### **B) DO NOT DEAD-HEAD THE PUMP!**

In general, the inlet and discharge lines should not be restricted any more than necessary.

Restricting the suction line may lead to cavitation, or if completely blocked, a dry run. Restricting the discharge pipe may overload the motor *as turbine pump requires more power with increasing head*.

If completely obstructed (*dead-head*), the fluid will not cool or lubricate the bearings properly and may overload the motor and severely damage the pump. Consult the factory on minimum flow.

### **C) DO NOT PUMP FLUIDS WITH FERRO-MAGNETIC PARTICLES!**

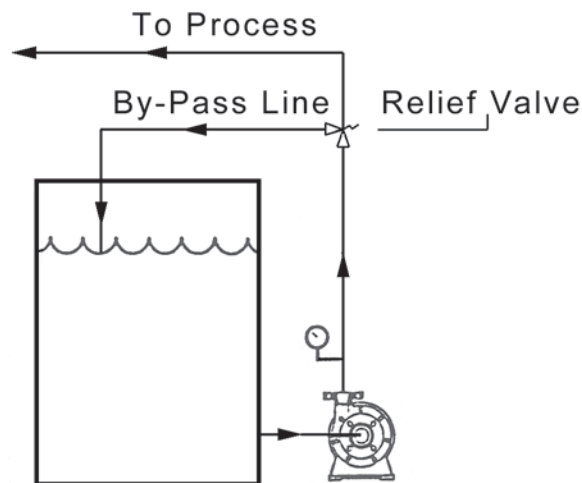
Magnetic particles will collect on the internal magnet - regardless of size. Consult the factory for guidance when handling magnetic solids or other particulates.

### **D) PUMP FLUIDS THAT ARE CLEAN**

Mag drive pumps are designed to handle clean liquids. If particulates are present, a 50 to 100 micron suction strainer is recommended. If the concentration of solids might plug strainer, make sure the suction fluid flow is not impeded. An oversized strainer is advised. Consult factory for assistance.

### **E) FLOW BY-PASS LINES:**

Throttling a regenerative turbine pump may not be the best way to control flow. Throttling may induce unnecessary head that will increase motor load. Turbine pumps have a minimum flow requirement. Applications that require flow throttling must be checked by the factory. The best ways to control the flow of a turbine pump is to use a VFD or use a by-pass line. The by-pass line should run from the discharge of the pump preferably back to the supply tank (*although return to suction may be used*). Line fluid velocity of 7 ft/s is indicated (*see Figure 2*).



**Figure 2:** By-pass Configuration

### **F) FLUSHING THE PUMP:**

The pump should be flushed with water (*or other fluid compatible with the pump materials*) to prevent deposits from drying or crystallizing. Deposits may form if the unit is down for an extended period of time, or if the pump is cooled to the point where crystals form. The pump need not be operating during flushing cycle. If the pump is to be flushed while in operation the volume of fluid should be adequate for the particular unit. If the normal system flow is 10 gpm, the flush flow should be the same 10 gpm.

### **MAINTENANCE:**

In general, the TECH-MAG MT series pump requires no routine maintenance, and therefore requires no regular disassembly / inspection. However, it is advisable to check the impeller sleeve bearings for wear on an annual basis.

### **DISMANTLING THE PUMP:**

The pump may be dismantled in two ways:

- a) The pipe work is disconnected from the pump, and the pump end is removed. This allows the motor and bracket to remain undisturbed.
- b) The motor and bracket are withdrawn from the pump end. This allows for the pipe work to remain intact on the volute casing.

## MT INSTRUCTIONS:

- 1) Shut off power supply to the motor before disconnecting leads.
- 2) Drain the fluid from the system, and the pump, then isolate the unit. It may be necessary to blow down the pump to insure complete drainage. The pump may be flushed with water (*or compatible fluid*) to avoid deposit formation.
- 3) Remove bolts securing the pump head to the bracket.

**The next steps are to be followed if procedure “a” is chosen.**

- 4) Remove the pump head from bracket.

**NOTE:** THE POSITION OF THESE PARTS, in particular the fashion in which the end cover, pump body, and rear ring are assembled. A guide pin locates the rear ring.

- 5) Carefully guide the pump internals from the bracket. Grasping the rear ring, and sliding the internals out is most effective. The rear casing should be removed if it did not come out with internals. Models MT12002 through MT16003 have a metal ring behind rear casing, this ring is to be **SAVED**. The ring is required for proper tolerances, and is not included as a part in a Rear Wet End or Wet End.

**CAUTION:** MAGNETS CAN PRODUCE STRONG MECHANICAL FORCES  
WHEN THEY ARE CLOSE TOGETHER!

- 6) Examine the shaft, bearings, and impeller for signs of wear, and also check for minimal play. Examine the O-ring. If particles have entered the pump, check the impeller mating surface of the pump head and rear ring for wear.

**The next steps are to be followed if procedure “b” is chosen:**

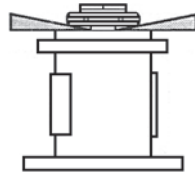
- 4) Remove the motor from the bracket. With small turbine pumps, the motor and attached bracket may be removed from the pump, since the bracket is not the mounting device. For units that are mounted with the bracket, loosen the bolts that secure the bracket to the foundation.
- 5) Carefully guide the bracket, or bracket motor assembly, away from the pump head. Do not angle or use side-to-side motion to remove the bracket from the pump, as this may damage the pump. At this point the pump internals should be retained in the bracket housing. It is advisable to have an operator stand-by to assure that the internals do not drop out on to the foundation. **Models MT12002 through MT 16003** have a metal ring behind the rear casing, this ring is to be **SAVED**. The ring is required for proper tolerances, and is not included as a port in a Rear Wet End or Wet End.

**NOTE:** THE POSITION OF THESE PARTS, in particular how the pump head and rear ring are assembled (*there is a guide pin.*)

**CAUTION:** MAGNETS CAN PRODUCE STRONG MECHANICAL FORCES  
WHEN THEY ARE CLOSE TOGETHER!

## REASSEMBLING THE PUMP:

To reassemble the pump, simply reverse the order above according to procedure “a” or “b”. Once again it must be stated that care should be taken when the internal and external magnets are brought together. For larger MT pumps (*MT5002 and above*), the use of a wedge may be advised. The wedge (*shown in Figure 3*) allows for slow guided insertion of the pumps internals into the bracket. Gloves are advisable while grasping the impeller.



**Figure 3:** Wedge Sample

### **SPECIAL MAINTENANCE PROCEDURES:**

Occasionally parts may require replacement. This section involves the proper procedures to follow.

### **SLEEVE BEARING REPLACEMENT:**

1) Remove the bearings from the pump head, rear casing, and internal magnet.

**NOTE:** If the bearing in the rear casing of **Models MT7003 through MT16003** need replacement, the shaft must be removed first  
(see *Shaft Replacement*, and take special care to pad the shaft.)

To remove the bearing from the rear casing of these models, insert a large flat head screwdriver into the bearing. Push the screwdriver into the bearing until it bites into the bearing material. Twist and pull bearing loose.

**CAUTION:** Do not use too large of a screwdriver as that may cause the bearing seat to break.

2) Insert the new bearings squarely into the head, rear casing and internal magnet. Do not use a side-to-side or twisting motion to insert the bearings. If a arbor press is to be used, be sure to pad the bearing to avoid breakage.

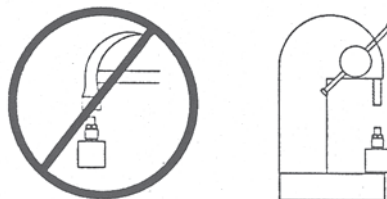
### **SHAFT REPLACEMENT:**

Three designs are currently in use, and have different procedures.

#### **Models MT1003 through MT3002:**

1) Place shaft into vise, and twist/pull shaft out. Do the same for the other side.

2) Of the two shafts supplied, insert the one with the wider lip into the impeller end. The other shaft is to be inserted into the internal magnet. Not that the shaft in the impeller end should be recessed, the shaft will deform if it is used as the base (**Figure 4.**) If a arbor press is used, be sure to cushion the end contacting the shaft. Shafts are supplied as a set of two for this pump design.



**Figure 4:** How **NOT** to Insert the Shaft Into the Internal Magnet

#### **Models MT3003 through MT7002:**

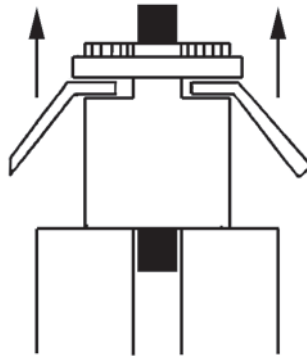
Follow the same procedure for Models MT1003 through MT3002, noting the following exception - either shaft may be inserted into either end, because these shafts do not have a lip. The shafts for these pumps will bottom-out when they are fully inserted. Shafts are supplied as a set of two for this pump design.

### Models MT7003 through MT16003:

- 1) Cushion the shaft with fiber reinforced gasket material. Regular gasket material may twist out of the vise.
- 2) Place shaft into vice, tighten vise, and twist/pull shaft out. If the shaft is too short for pliers, it must be broken out. If this last option is tried, be careful not to damage the rear casing - and  
**WEAR SAFETY GOGGLES.**
- 3) Insert the new shaft into the bearing in the rear casing. If an arbor press is used, be sure to cushion the end contacting the shaft. The shaft for these pumps will bottom-out when it is fully inserted. There is only one shaft supplied for this pump design.

### IMPELLER REPLACEMENT:

- 1) Insert the boxed end of two wrenches between the rear ring and the internal magnet. These ends should be cushioned, so as not to deform the rear ring or internal magnet.
- 2) Apply force on the wrenches against the internal magnet and rear ring to pop off the rear ring and impeller. Placing the assembly on a raised surface may provide additional leverage (*see Figure 5.*)



**Figure 5:** Impeller Removal Example

- 3) To assemble, put the rear ring on the internal magnet.
- 4) Place the impeller on with the recessed end towards the internal magnet. Be sure to align the impeller so that it slides over the proper guide pins. If it appears that the impeller will not slide on, rotate it such that another pin arrangement is chosen. Usually there is a preferred pin/impeller configuration. If an arbor press is used, be sure to cushion the end contacting the impeller.

**For More Information, Please contact:**

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