OPERATION AND
SERVICE GUIDE
O-2535
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SERIES 'HH' HORIZONTAL PUMPS

MODELS
HH 1 x ¾C
HH 1 x ¾K

Refer to Bulletin P-206 and Parts List P-7275.

SAFETY PRECAUTIONS BEFORE STARTING PUMP

1. Read operating instructions and instructions supplied with chemicals to be used.
2. Refer to a chemical resistance data chart for compatibility of materials in pump with solution to be used.
3. Note temperature and pressure limitations.
4. Personnel operating pump should always wear suitable protective clothing: face mask or goggles, apron, gloves.
5. All piping must be supported and aligned independently.
6. Always close valves slowly to avoid hydraulic shock.
7. Ensure that all fittings and connections are properly tightened.
8. Ground motor before connecting to electrical power supply. Failure to ground motor can cause severe or fatal electrical shock hazard. DO NOT ground to gas supply line.

BEFORE CHANGING APPLICATION OR PERFORMING MAINTENANCE

1. Wear protective clothing as described in Item 4 above.
2. Flush pump thoroughly with a neutralizing solution to prevent possible harm to personnel.
3. Verify compatibility of materials as stated in Item 2 of SAFETY PRECAUTIONS above.
4. Shut off power to motor at disconnect switch.

IMPORTANT

1. The pump is constructed of CPVC or PVDF. Refer to pump model and product bulletin for mechanical seal material components. The pump may be chemically compatible with the solution but care should be taken to protect the pump components against unnecessary wear and physical abuse.
2. Record model and serial number for future reference. Specify model and serial number when ordering parts.
3. Pump flow curves are based upon water. Increased motor horsepower may be necessary for pumping other liquids or reduced motor horsepower may be permissible when pumping at higher discharge head.
4. Impellers are designed to offer maximum pump output and the motors are sized for non-overloading at maximum flow conditions.
5. Pump inlet piping should be one to two sizes larger than pump suction size. Refer to Bulletin A-213 for pipe fittings, etc.
6. Review parts list and maintain an emergency inventory of replacement items to assure that pump is returned to service with the least delay.

PLUMBING

All piping should be supported independently of the pump. Piping should not exert any stress on the pump connections.

1. Suction Piping

Suction line must provide adequate suction pressure and smooth liquid flow for proper pump operation. Air entrapment in the suction line because of leaks or improper design may cause the pump to lose prime and fail. This pump is not self-priming, therefore the suction must be flooded at start up. Also, the suction line must provide sufficient pressure and smooth flow to pump inlet to prevent pump cavitation. A length of straight pipe a minimum of 5 times the pump inlet diameter and preferably 10 times the diameter should be installed in the suction line where it enters the pump. Elbows, fittings or valves installed close to the suction can disrupt liquid flow and cause malfunction. Suction lines must be at least the same size as the pump inlet or larger if possible. It is not recommended to use foot valves in the suction line to maintain liquid in the pump when it's not operating. If foot valves are used due to suction lift conditions, they must be properly maintained to avoid leaks resulting from wear or fouling. Suction piping must be designed to prevent air from being trapped in high spots in the piping. This condition may cause the pump to vapor lock as the air bubble moves into the pump.

2. Discharge Piping

For flow and discharge head control, it is advisable to install a valve (globe, ball, or other adjustable and non-leak type) in the discharge line close to the pump. The valve may be closed during system repairs to prevent backflow. By installing a check valve in the discharge line, backflow can also be prevented during maintenance or during periods of pump stoppage.

PRE-START-UP

1. These pumps require no special care in mounting, although it is suggested that they be firmly bolted to a level surface. Adequate air movement over motor will help prevent overloads.
2. Connect electrical supply to the motor starter. Match voltage to nameplate voltage on motor. Incorrect voltage can cause fire or seriously damage motor, voiding warranty. if starter is furnished, verify that the starter is wired for the correct operating voltage and with the correct overload heaters. It is recommended that a motor starter be installed for overload protection if one was not provided with the pump assembly.

3. Pump rotation is counterclockwise when looking at the pump suction, or clockwise when looking down on the motor fan. (Check rotation arrow.) For 3-phase motors, it is necessary to verify correct direction of rotation by momentarily "jogging" the motor. An instantaneous "ON-OFF" of the starter is ample to check rotation. To change direction of rotation, interchange any two of lines L_1, L_2, or L_3.
   NOTE: Incorrect rotation will cause pump damage, reduced performance or failure, voiding warranty.
   WARNING! Do not operate pump without liquid for more than a few seconds, as damage to the mechanical seal will result.
4. All units are factory tested to confirm that the pump and motor functioned properly at time of shipment.
5. Suction casing must be flooded prior to starting.
6. Check correct operation of level control Make necessary adjustments for establighing high level and low level.

OPERATION

Priming

Fill the volute and suction lines prior to operation. It is suggested that during initial start up, the discharge valve be closed and then opened as the motor develops full rpm's. If pump does not build up pressure as motor speed increases, shut down and reprime pump. Make sure that liquid flow into pump is not restricted (see "TROUBLESHOOTING").

Note: A centrifugal pump's flow and head (pressure) will vary with the amount of resistance (friction and flow restrictions) in the discharge line. As a valve on the discharge line opens, the flow and motor amp draw will increase and head will drop. As a valve on the discharge is closed, the flow and amp draw will decrease and the head will increase. If resistance in the discharge line is not sufficient, the pump will operate at a condition of maximum (or "choked") flow, also sometimes called "end of performance curve." Maximum horsepower is required to operate at this point and motor overload may result. If excessive amp draw and motor overload is recurring, reduce the system flow by installing a valve on the discharge line and restricting flow. Alternatively, reduce pump head by trimming impeller to a smaller diameter. Consult Application Engineering Department for assistance.

PUMP SERVICE

CAUTION:

Disconnect power to pump before servicing to avoid dangerous or fatal electrical shock hazards.

If pump has been used to pump hazardous materials, be certain that all materials have been removed prior to working on the pump. Inverting pump with liquid in it could cause liquid to get into motor bearings and cause damage. Before disassembling, be certain all liquid is removed from the pump.

IMPORTANT

Many causes of pump system failure are due to improper system design. Refer to the Troubleshooting List in this guide before carrying out pump inspection.

TROUBLESHOOTING

1. **Pump fails to build pressure.**
   Check for:
   a. Pump not primed.
   b. Incorrect rotation.
   c. Driver speed too low.
   d. Suction line restricted.
   e. Driver failure.
   f. Plugged or damaged impeller.
   g. Pump or impeller undersized.
   h. Pump cavitation.
   i. Impeller rubbing volute.
2. **Pump fails to provide enough flow.**
   Check for:
   a. System resistance too high.
   b. Pump undersized.
   c. Pump not primed.
   d. Driver speed too low.
   e. Poor suction conditions.
   f. Impeller rubbing volute due to improper installation.
   g. Pump cavitation.
   h. Plugged or damaged impeller.
3. **Excessive noise or vibration during operation.**
   Check for:
   a. Motor bearing failing.
   b. Pump cavitation.
   c. Impeller rubbing volute.
4. **Leaking mechanical seal.**
   Check for:
   a. Improper assembly.
   b. Worn or cracked seal faces.
   c. Abrasive material build up around seal.
   d. Liquid flashing at seal faces (temp. too high).
   e. Seal pressure rating too low for the service.
   f. Chemical attack on seal parts.
   g. Seal operated dry or with a liquid having poor lubricating properties.
5. **Pump gradually loses pressure and head.**
   Check for:
   a. Increasing temperature causing cavitation or liquid vaporization.
   b. Driver failure.
   c. Suction lift too high.
   d. Air entering suction line.
6. **Motor/pump overheating.**
   Check for:
   a. Excessive flow and amp draw. (Throttle discharge)
   b. Low voltage or frequency.
   c. Flow too low with resulting heat rise.
   d. Bearing failure.
   e. System temperature too high.

DISASSEMBLY

1. Disconnect power source to motor.
2. Disconnect electrical connections, tagging wires carefully to preserve correct rotation. Loosen pump base.
3. Remove pump and motor assembly to repair area. Observe position of all parts prior to disassembly.
4. Remove eight volute bolts and remove volute from pump.
5. Remove split collar from impeller sleeve. Loosen two Allen cap screws and setscrew in split collar. Slide impeller off of the motor shaft.
6. Remove seal head from the shaft. Remove seal by sliding it off of the shaft sleeve.
7. Remove four motor bolts and remove bracket from motor.
8. Remove seal seat from bracket. Use wooden or plastic dowel to tap the seat from the bracket.

REASSEMBLY

1. Place the bracket on a firm surface with the seat cavity (pump end) up.
2. Clean seal cavity of the bracket thoroughly.
3. Place the seat in the seal cavity with the polished face up toward the pump end (lubricate elastomer with water to ease seat installation). Evenly push seat into seat cavity with fingers, then gently tap seat into place with a wooden dowel or plastic rod (1½" outside diameter)
4. Install seal head assembly:
   a. Thoroughly clean impeller sleeve. Assure that the shaft is not grooved and that there is no evidence of pitting or fretting under the seal head.
   b. Install rotary seal head onto impeller sleeve with the carbon facing away from the impeller. Using a twisting motion, slide seal head all the way up to the hub of the impeller.
5. Place the sleeve of the impeller through the ceramic seat until carbon touches ceramic. Place the split collar around the end of the sleeve so that it is flush with the end of the sleeve. Align the center setscrew until it enters the impeller sleeve hole. Do not tighten. Snug the cap screws in the split collar at this time.
6. Install volute.
   a. Lubricate the volute 'O'-ring with water only.

⚠ **WARNING:** Organic oils will attack CPVC and cause stress cracks.

   b. Place the 'O'-ring around the register fit on the bracket. Place the volute on the bracket over the 'O'-ring and squeeze together with two hands.

NOTE: The discharge must be aligned with the bracket so that the discharge is pointing up in the same direction as the seal flush boss on the pump bracket. The volute will only fit this one way. To rotate volute discharge position your must rotate the bracket on the motor.

   c. Install volute bolts, washers and nuts. Tighten all eight bolts evenly to 8-10ft./lbs.

Installing Pump End onto Motor

1. Thoroughly clean motor shaft. Assure that the shaft and keyway have no burrs. Polish the shaft with extra fine emery cloth and clean the keyway.
2. With motor resting on flat surface, shaft end up, carefully place assembled pump end onto motor shaft. Be sure to align key in impeller sleeve with keyway in motor shaft.
3. Install motor bolts and base (if applicable). Tighten motor bolts evenly.
4. Using a screwdriver or ¾" diameter rod inserted through the suction of the pump, gently push the impeller down onto the motor shaft until it bottoms out on the shaft. Align center cup point setscrew in split collar with hole in impeller sleeve. It must clear all sides of locating hole to ensure full contact with motor shaft. Tighten two Allen capscrews in the split collar to 8-10ft/lbs. The center cup point must remain loose until the two Allen capscrews are tight. Tighten center cup point setscrew to 4-5ft/lb.
5. After assembly of pump end to motor, the unit must be checked to insure the shaft and impeller rotate freely. If not, loosen setscrews and repeat step 4.
6. Return pump to installation, reconnect electric connections.
7. Start pump momentarily to observe shaft rotation. If rotation corresponds to the rotation arrow on the pump, it may be put into service. If rotation is incorrect, switch any two leads on 3-phase motors to change rotation. Check wiring diagram of motor for single phase rotation correction.
8. Remove top pipe plug (if applicable) from the front of volute and prime pump thoroughly, making sure all air is purged. Turn shaft one revolution and then refill. Replace the pipe plug.
9. Start pump allowing adequate time to purge all air from system. Observe any gauges, flow meters, etc, to see if pump performs properly.

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