APPLICATIONS:
- Circulating pump for gas glycol dehydrators, gas amine units and other pumping applications.

FEATURES:
- No Gas Emissions
- No Packing
- Hydraulically Balanced Diaphragms
- Inline Service
- Pulse-Free flow
- Direct Driven

SPECIFICATIONS:
- Capacity @ max. pressure: rpm gpm l/min 1200 psi (83 bar) 1750 2.2 8.3
- RPM: 1750 max.- 200 min.
- Inlet 250 psi max.
- Connections:
  Inlet: 1/2” NPT
  Outlet: 3/8” NPT
- Temperature:
  Max: 230° F (121.1° C)
  Min: 30° F (4.4° C)
- Fluid End Material, Manifold : SA395 / SA479
- Elastomers: HNBR
- Oil Capacity: 1 Quart KIMRAY Part No. 7266 0.95 Liters
- Weight (dry): 37 lbs (16.8 kg)
- Bi Directional Shaft Rotation
- For use with NEMA 56c Footed Motor only

OPERATION:
The KIMRAY ELECTRIC GLYCOL PUMP is a uniquely designed hydraulically balanced diaphragm/plunger positive displacement pump. Power to the pump is provided by a properly sized and specified electric motor either directly connected or belt driven. PLUNGERS are utilized to energize DIAPHRAGMS which in turn pressurize glycol/amine solutions used in gas processing. The Plungers operate and are lubricated in clean oil isolated from the process fluids by DIAPHRAGMS. The DIAPHRAGMS are in contact with the hydraulic oil on one side and the glycol/amine solution and on the other side. KIMZOIL EGP1 is a hydraulic/lubrication oil designed for high end pump performance designed for this application. This design allows for the protection of the reciprocating pumping internals from the process fluids.

As shown in the diagram, the PLUNGER(S) are connected to the CROSSHEAD(s) and displace the oil (YELLOW) in the HYDRAULIC CHAMBER as they reciprocate. As the Plunger moves to the right on the pressure stroke, oil is displaced in the Hydraulic Chamber and forces the DIAPHRAGM(s) to move to the right. The Diaphragm movement displaces the glycol/amine solution (GREEN) on the opposing side of the Diaphragm and forces it through the DISCHARGE CHECK VALVE(s). During the pressure stroke, a small amount of oil (YELLOW) leaks past the clearance between the Plunger and cylinder.

When the Diaphragm moves too far forward, the Under-Fill port closes and the Over-Fill port opens. The Under-Fill Valve is a check valve that lets oil in during the suction stroke, but will not allow oil to leave. The OVER-FILL VALVE is a check valve that lets oil out during the pressure stroke, but prevents oil from coming in. The spool valve position opens the port to one of the two valves depending on the need for more or less oil.
**LOCATION:**
Locate the pump as close to the fluid supply source as possible. Allow room for checking the oil level, changing the oil (two drain plugs on the bottom and back of pump), and removing the pump head components (inlet and discharge retainer plates, manifold, and related items).

**MOUNTING**
The pump shaft can rotate in either direction.
To prevent vibration, mount the pump and motor securely on a level rigid base.
On a belt-drive system, align the sheaves accurately; poor alignment wastes horsepower and shortens the belt and bearing life. Make sure the belts are properly tightened, as specified by the belt manufacturer.
On a direct-drive system, align the shafts accurately. Unless otherwise specified by the coupling manufacturer, maximum parallel misalignment should not exceed 0.015 in. (0.4 mm) and angular misalignment should be held to 1° maximum. Careful alignment extends life of the coupling, pump, shafts, and support bearings. Consult coupling manufacturer for exact alignment tolerances.

**ACCESSORIES**
Consult installation drawing above for typical system components. Contact KIMRAY INC. or the distributor in your area for more details.

**IMPORTANT PRECAUTIONS**
Adequate Fluid Supply. To avoid cavitation and premature pump failure, be sure that the pump will have an adequate fluid supply and that the inlet line will not be obstructed.
Positive Displacement. This is a positive-displacement pump. Install a relief valve downstream from the pump.
Safety Guards. Install adequate safety guards over all pulleys, belts, and couplings. Follow all codes and regulations regarding installation and operation of the pumping system.
Shut-Off Valves. Never install shut-off valves between the pump and discharge pressure regulator, relief valve, or in the regulator bypass line.
Freezing Conditions. Protect the pump from freezing. See also the Maintenance Section.
Consult the Factory for the following situations:
- Extreme temperature applications – above 250° F (82° C) or below 40° F (4.4° C)
- Viscous fluid applications above 100 Cps
- Chemical compatibility problems
- Hot ambient temperatures – above 110° F (43° C)
- Conditions where pump oil may exceed 200° F (93° C) because of a combination of hot ambient temperatures, hot fluid temperature, and full horsepower load — an oil cooler may be required
- Pump RPM less than 200

**CALCULATING REQUIRED HORSEPOWER (KW)**
\[
\text{6XRPM} \times \text{GPMXPSI} = \text{electric motor HP*}
\]
\[
= \text{electric motor kW*}
\]
* HP/kW is required application power.

**ATTENTION!**
When sizing motors with variable speed drives (VFDs), it is very important to select a motor and a VFD rated for constant torque inverter duty service and that the motor is rated to meet the torque requirements of the pump throughout desired speed range.

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Current Revision:
Change Pressure legend & NPSHr chart

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G:20.11
Issued 2/15
**GLYCOL PUMPS**

**ELECTRIC PUMPS**

**STEEL**

<table>
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<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
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<th>KIT</th>
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<tr>
<td>1</td>
<td>G10-024-2010</td>
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<td>2</td>
<td>D11-048-2011</td>
<td>Washer, flat, hardened</td>
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<td>3</td>
<td>G03-004-1036</td>
<td>Manifold, 316 SST</td>
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<td>4</td>
<td>D03-073-2140</td>
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<td>5</td>
<td>D25-046-2110</td>
<td>O-ring, valve seat, Buna</td>
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<tr>
<td>6</td>
<td>D15-020-2010</td>
<td>Valve Seat, 17-4 SST</td>
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<td>D03-092-2110</td>
<td>Tetra Seal, Buna</td>
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<td>Retainer, valve spring, 17-7 SST</td>
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Items denoted with a 1 are part of Valve Kit
Items denoted with a 2 are part of Complete Kit
Items denoted with a 3 are part of Diaphragm Kit

---

**DETAIL "B" (Valve Assemblies)**

**DETAIL "A" (Piston Assembly) (Kel-Cell)**

**Valve Assemblies (see Detail "B")**

**Plastic Retainer**

**Metal Retainer**

---

<table>
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<td>D10-015-3010</td>
<td>Ball</td>
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<td>22</td>
<td>D03-043-1000</td>
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<td>Piston Assembly</td>
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<td>52</td>
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<td>D03-031-2110</td>
<td>Seal, Buna</td>
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<td>56</td>
<td>D10-085-2210</td>
<td>Key, shaft</td>
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<td>57</td>
<td>D03-009-1042</td>
<td>(E) Crank Shaft, shaft-driven, 2.2 GPM</td>
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<td>D10-076-2210</td>
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<td>63</td>
<td>D03-039-1030</td>
<td>Cap with O-ring, oil fill</td>
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<table>
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<th>ITEM NO.</th>
<th>PART NUMBER</th>
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<th>KIT</th>
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<td>G25-048-2010</td>
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<td>G10-028-2010</td>
<td>Nut, hex, M10</td>
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<td>68</td>
<td>D03-010-2910</td>
<td>Front Bearing</td>
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<td>D03-130-1000</td>
<td>Front Cover</td>
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<td>72</td>
<td>D03-025-1010</td>
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<td>Cap Screw, hex-head, 3/4&quot;</td>
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<td>75</td>
<td>D03-001-1006</td>
<td>Pump Housing</td>
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<td>D10-040-2410</td>
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<td>G25-106-2318</td>
<td>Gasket, cover</td>
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<td>H25-105-1015</td>
<td>Cover, housing</td>
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<tr>
<td>80</td>
<td>D03-026-2211</td>
<td>Pin</td>
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</tbody>
</table>

Items denoted with a 1 are part of Valve Kit
Items denoted with a 2 are part of Complete Kit
Items denoted with a 3 are part of Diaphragm Kit

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Kimray is an ISO 9001-certified manufacturer.
INLET PIPING (Suction Feed)

CAUTION: When pumping at temperatures above 250° F (121.1° C), use a pressure-feed system. Install drain cocks at any low points of the suction line, to permit draining in freezing conditions. Provide for permanent or temporary installation of a vacuum gauge to monitor the inlet suction. To maintain maximum flow, vacuum at the pump inlet should not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). Do not supply more than one pump from the same inlet line if possible.

Supply Tank
Use a supply tank that is large enough to provide time for any trapped air in the fluid to escape. The tank size should be at least twice the maximum pump flow rate. Isolate the pump and motor stand from the supply tank, and support them separately. Install a separate inlet line from the supply tank to each pump. Install the inlet and bypass lines so they empty into the supply tank below the lowest water level, on the opposite side of the baffle from the pump suction line. If a line strainer is used in the system install it in the inlet line to the supply tank. To reduce aeration and turbulence, install a completely submerged baffle plate to separate the incoming and outgoing liquids. Install a vortex breaker in the supply tank, over the outlet port to the pump. Place a cover over the supply tank, to prevent foreign objects from falling into it.

Hose and Routing
Size the suction line at least one size larger than the pump inlet, and so that the velocity will not exceed 1-3 ft/sec (0.3 to 0.9 m/s). For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID²
For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID²
Keep the suction line as short and direct as possible. Use flexible hose and/or expansion joints to absorb vibration, expansion, or contraction. If possible, keep suction line level. Do not have any high points collecting vapor unless high points are vented. To reduce turbulence and resistance, do not use 90° elbows. If turns are necessary in the suction line, use 45° elbows or arrange sweeping curves in the flexible inlet hose. If a block valve is used, be sure it is fully opened so that the flow to the pump is not restricted. The opening should be at least the same diameter as the inlet plumbing ID.

INLET PIPING (Pressure Feed)
Provide for permanent or temporary installation of a vacuum/pressure gauge to monitor the inlet vacuum or pressure. Pressure at the pump inlet should not exceed 250 psi (17 bar); if it could get higher, install an inlet pressure reducing regulator. Do not supply more than one pump from the same inlet line.

INLET CALCULATIONS

Acceleration Head
Calculating the Acceleration Head
Use the following formula to calculate acceleration head losses. Subtract this figure from the NPSHa, and compare the result to the NPSHr of the Hydra-Cell pump.

\[ Ha = \frac{(L \times V \times N \times C)}{(K \times G)} \]

where:
- \( Ha \) = Acceleration head (ft of liquid)
- \( L \) = Actual length of suction line (ft) — not equivalent length
- \( V \) = Velocity of liquid in suction line (ft/sec) \[ V = \text{GPM} \times \left(\frac{0.408}{\text{pipe ID}^2}\right) \]
- \( N \) = RPM of crank shaft
- \( C \) = Constant determined by type of pump — use 0.066 for the EV50015 Hydra-Cell pumps
- \( K \) = Constant to compensate for compressibility of the fluid — use: 1.4 for de-aerated or hot water; 1.5 for most liquids; 2.5 for hydrocarbons with high compressibility
- \( G \) = Gravitational constant (32.2 ft/sec²)

Friction Losses
Calculating Friction Losses in Suction Piping
When following the above recommendations (under “Inlet Piping”) for minimum hose/pipe ID. and maximum length, frictional losses in the suction piping are negligible (i.e., \( H_f = 0 \)) if you are pumping a water-like fluid.
When pumping more-viscous fluids such as lubricating oils, sealants, adhesives, syrups, varnishes, etc., frictional losses in the Kimray is an ISO 9001 certified manufacturer.
GLYCOL PUMPS

ELECTRIC PUMPS

INSTALLATION

suction piping may become significant. As $H_f$ increases, the available NPSH (NPSHa) will decrease, and cavitation will occur. In general, frictional losses increase with increasing viscosity, increasing suction-line length, increasing pump flow rate, and decreasing suction-line diameter. Changes in suction-line diameter have the greatest impact on frictional losses: a 25% increase in suction-line diameter cuts losses by more than two times, and a 50% increase cuts losses by a factor of five times. Consult the factory before pumping viscous fluids.

Minimizing Acceleration Head and Frictional Losses
To minimize the acceleration head and frictional losses:
- Keep inlet lines less than 6 ft (1.8 m) or as short as possible
- Use at least 1-1/2 in. (38.1 mm) I.D. inlet hose
- Use suction hose (low-pressure hose, non collapsing) for the inlet lines
- Minimize fittings (elbows, valves, tees, etc.)
- Use a suction stabilizer on the inlet.

Net Positive Suction Head
NPSHa must be equal to or greater than NPSHr. If not, the pressure in the pump inlet will be lower than the vapor pressure of the fluid — and cavitation will occur.

Calculating the NPSHa
Use the following formula to calculate the NPSHa:

$$\text{NPSHa} = \frac{\text{Friction losses in suction piping}}{\text{Acceleration head at pump suction}}$$

where:

- $P_t =$ Atmospheric pressure
- $H_z =$ Vertical distance from surface liquid to pump center line
  (if liquid is below pump center line, the $H_z$ is negative)
- $H_f =$ Friction losses in suction piping
- $H_a =$ Acceleration head at pump suction
- $P_{vp} =$ Absolute vapor pressure of liquid at pumping temperature

NOTES:
- In good practice, NPSHa should be 2 ft greater than NPSHr.
- All values must be expressed in feet of liquid.

Atmospheric Pressure at Various Altitudes

<table>
<thead>
<tr>
<th>Altitude (ft)</th>
<th>Pressure (ft of H2O)</th>
<th>Altitude (ft)</th>
<th>Pressure (ft of H2O)</th>
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<tbody>
<tr>
<td>0</td>
<td>33.9</td>
<td>1500</td>
<td>32.1</td>
</tr>
<tr>
<td>500</td>
<td>33.3</td>
<td>2000</td>
<td>31.5</td>
</tr>
<tr>
<td>1000</td>
<td>32.8</td>
<td>5000</td>
<td>28.2</td>
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DISCHARGE PIPING

Hose and Routing
Use the shortest, most-direct route for the discharge line. Select pipe or hose with a working pressure rating of at least 1.5 times the maximum system pressure. EXAMPLE: Select a 1500 psi W.P.-rated hose for systems to be operated at 1000 psi-gauge pressure. Use flexible hose between the pump and rigid piping to absorb vibration, expansion or contraction. Support the pump and piping independently. Size the discharge line so that the velocity of the fluid will not exceed 7-10 ft/sec (2-3 m/sec):

For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID2
For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID2

Pressure Relief
Install a pressure relief valve in the discharge line. Bypass pressure must not exceed the pressure limit of the pump. Size the relief valve so that, when fully open, it will be large enough to relieve the full capacity of the pump without overpressurizing the system. Locate the valve as close to the pump as possible and ahead of any other valves.

Adjust the pressure relief valve to no more than 10% over the maximum working pressure of the system. Do not exceed the manufacturer's pressure rating for the pump or relief valve.

Route the bypass line to the supply tank. See the diagram showing a typical installation at the beginning of the Installation Section.

If the pump may be run for a long time with the discharge closed and fluid bypassing, install a thermal protector in the bypass line (to prevent severe temperature buildup in the bypassed fluid).

CAUTION: Never install shutoff valves in the bypass line or between the pump and pressure relief valve.
Install a pressure gauge in the discharge line.

BEFORE INITIAL START-UP

Before you start the pump, be sure that:
- Pump is stored at a temperature between 40-180 F (4.4-82.2 C) for a minimum of 24 hours before start up.
- All shutoff valves are open, and the pump has an adequate supply of fluid.
- All connections are tight.
- The oil level is within the marking on the dipstick. Add oil as needed.
- The relief valve on the pump outlet is adjusted so the pump starts under minimum pressure.
- All shaft couplings or drive pulleys have adequate safety guards.

INITIAL START-UP

1. Pump must be at or above 40 F (4.4 C) for 24 hours prior to starting.
2. Open the bypass line start-up and capacity-control valve so the pump may be started against negligible discharge pressure.
3. Turn on power to the pump motor.
4. Check the inlet pressure or vacuum. To maintain maximum flow, inlet vacuum must not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). Inlet pressure must not exceed 250 psi (17 bar).
5. Listen for any erratic noise, and look for unsteady flow. If the pump does not clear, refer to the Troubleshooting Section.
6. If the system has an air lock and the pump fails to prime:
   a. Turn off the power.
   b. Remove the pressure gauge from the tee fitting at the pump.
   c. Jog the system on and off until the fluid coming from this port is air-free.
   d. Turn off the power.
   e. Remove the plumbing that was temporarily installed, and reinstall the pressure gauge or plug.
7. Adjust the bypass line valve to the desired operating pressure. Do not exceed the maximum pressure rating of the pump.
8. After the system pressure is adjusted, verify the safety relief valve setting by closing the bypass line valve until the relief valve opens.
   a. Take all safety precautions to assure safe handling of the fluid being pumped.
   b. Fluid may come out of this port when the plug is removed. Provide an adequate catch basin for fluid spillage, if required. Fluid will come out of this port when the pump is started, so we recommend that you attach adequate plumbing from this port so fluid will not be sprayed or lost. Use high-pressure-rated hose and fittings from this port. Take all safety precautions to assure safe handling of the fluid being pumped.
9. Reset the bypass line valve to obtain the desired system pressure.
10. Provide a return line from the relief valve to the supply tank, similar to the bypass line.

Kimray is an ISO 9001- certified manufacturer.
NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found in this manual and in the Parts Manual.

DAILY

Check the oil level and the condition of the oil with the pump turned off. The oil level should be within the marking on the dipstick. Add oil as needed. Use KIMZOIL EGP1 Electric Glycol Pump Oil (Kimray part no. 6928) for the application.

CAUTION: If you are losing oil but don’t see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (41) may be damaged. Refer to the Fluid-End Service Section. Do not operate the pump with a damaged diaphragm.

CAUTION: Do not turn the drive shaft while the oil reservoir is empty.

Check the inlet pressure or vacuum periodically with a gauge. If vacuum at the pump inlet exceeds 7 in. Hg (180 mm Hg), check the inlet piping system for blockages. If the pump inlet is located above the supply tank, check the fluid supply level and replenish if too low.

CAUTION: Protect the pump from freezing. Refer also to the “Shutdown Procedure”.

SHUTDOWN PROCEDURE DURING FREEZING TEMPERATURES

Take all safety precautions to assure safe handling of the fluid being pumped. Provide adequate catch basins for fluid drainage and use appropriate plumbing from drain ports, etc., when flushing the pump and system with a compatible anti-freeze.

PUMP STORAGE

CAUTION: If the pump is to be stored more than six months take the following steps to protect against corrosion:
1. Change crankcase oil.
2. Change oil behind diaphragms.
3. Remove suction and discharge valves and drain pump of all liquids. Use compressed air to dry inside passageways of manifold.
4. Apply light film of clean oil or corrosion inhibitor to all inside passageways of manifold.
5. Clean and dry valves and seats. Apply light film of clean oil or corrosion inhibitor to valves and seats.
6. Reinstall valves with new o-rings.
7. Plug suction and discharge ports to protect against dirt and moisture.
8. Store pump in clean and dry location.
9. Every month of storage rotate crankshaft 4 to 6 times.

NOTE: Minimum oil viscosity for proper hydraulic end lubrication is 16-20 cST (80-100 SSU) at 212°F (100°C).

PERIODICALLY

Change the oil after the first 500 hours of operation, and then according to the guidelines below.

<table>
<thead>
<tr>
<th>Pressure (psi)</th>
<th>RPM (32°C)</th>
<th>RPM (60°C)</th>
<th>RPM (82°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000 psi</td>
<td>&lt;800</td>
<td>4,000</td>
<td>3,000</td>
</tr>
<tr>
<td>&lt;1200 psi</td>
<td>&lt;800</td>
<td>4,000</td>
<td>3,000</td>
</tr>
<tr>
<td>&lt;1500 psi</td>
<td>&lt;800</td>
<td>4,000</td>
<td>3,000</td>
</tr>
<tr>
<td>&lt;1200 psi</td>
<td>&lt;800</td>
<td>4,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

NOTE: Use of an oil cooler is recommended when process fluid and/or hydraulic end oil exceeds 200°F (93°C).

When changing oil, remove both drain plugs (13) at the bottom of the pump so all oil and accumulated sediment will drain out.

CAUTION: Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil.

NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found in this manual and in the Parts Manual.

Glycol Pumps
Electric Pumps
Maintenance

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G:25.3
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GLYCOL PUMPS

ELECTRIC PUMPS
TROUBLESHOOTING

CAVITATION

• Inadequate fluid supply because:
  — Inlet line collapsed or clogged
  — Clogged line strainer
  — Inlet line too small or too long
  — Air leak in inlet line
  — Worn or damaged inlet hose
  — Suction line too long
  — Too many valves and elbows in inlet line
• Fluid too hot for inlet suction piping system
• Air entrained in fluid piping system
• Aeration and turbulence in supply tank
• Inlet vacuum too high (refer to “Inlet Calculations” paragraph)

Symptoms of Cavitation
• Excessive pump valve noise
• Premature failure of spring or retainer
• Volume or pressure drop
• Rough-running pump
• Premature failure

DROP IN VOLUME OR PRESSURE

A drop in volume or pressure can be caused by one or more of the following:
• Air leak in suction piping
• Clogged suction line or suction strainer
• Suction line inlet above fluid level in tank
• Inadequate fluid supply
• Pump not operating at proper RPM
• Relief valve bypassing fluid
• Worn pump valve parts
• Foreign material in inlet or outlet valves
• Loss of oil prime in cells because of low oil level
• Ruptured diaphragm
• Cavitation
• Warped manifold from overpressurized system
• O-rings forced out of their grooves from overpressurization
• Air leak in suction line strainer or gasket
• Cracked suction hose
• Empty supply tank
• Excessive aeration and turbulence in supply tank
• Worn and slipping drive belt(s)
• Worn spray nozzle(s)
• Cracked cylinder

PUMP RUNS ROUGH

• Worn pump valves
• Air lock in outlet system
• Oil level low
• Wrong weight of oil for cold operating temperatures (change to lighter weight)
• Cavitation
• Air in suction line
• Restriction in inlet/suction line
• Hydraulic cells not primed after changing diaphragm
• Foreign material in inlet or outlet valve
• Damaged diaphragm
• Fatigued or broken valve spring

PREMATURE FAILURE OF DIAPHRAGM

• Frozen pump
• Puncture by a foreign object
• Elastomer incompatible with fluid being pumped
• Pump running too fast
• Excess pressure
• Cavitation
• Aeration or turbulence in supply tank

VALVE WEAR

• Normal wear from high-speed operation
• Cavitation
• Abrasives in the fluid
• Valve incompatible with corrosives in the fluid
• Pump running too fast

LOSS OF OIL

• External seepage
• Rupture of diaphragm
• Frozen pump
• Worn shaft seal
• Oil drain plug or fill cap loose
• Valve plate and manifold bolts loose

PREMATURE FAILURE OF VALVE SPRING OR RETAINER

• Cavitation
• Foreign object in the pump
• Pump running too fast
• Spring/retainer material incompatible with fluid being pumped
• Excessive inlet pressure