

BSM PUMP CORPORATION

**INSTALLATION AND OPERATION
MANUAL**

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I. INTRODUCTION

Properly selected, installed, and maintained, BSM Pumps will provide many years of trouble-free service. Improper selection and installation account for more pump failures than all other causes combined.

II. SAFETY PRECAUTIONS

DO NOT operate BSM pumps in excess of their rated capacity, pressure, speed, or temperature.

DO NOT operate BSM pumps without proper safety guards in place.

DO NOT attempt to work on the pump while it is in operation.

DO NOT place hands, feet, or any part of the body in any pump opening while the pump is in operation.

DO NOT perform maintenance or repair on this pump unless the power source is de-energized.

DO NOT wear loose fitting clothing or dangling jewelry near the pump while it is in operation.

DO NOT operate a BSM gear pump in any system not equipped with a pressure relief valve capable of handling the full flow of the pump. **FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT AND/OR SERIOUS INJURY TO PERSONNEL.**

DO NOT operated BSM gear pumps with the discharge line closed or obstructed. **FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO EQUIPMENT AND/OR PERSONNEL.**

III. NAMEPLATE DATA

Each gear pump manufactured by BSM Pump Corp. is identified by a model number cast or stamped into the cap end of the pump. Further, all special engineered gear pumps are stamped with a serial number which is located on the machine pad on top of the pump housing. The serial number sequence is one or two letters of the alphabet followed by one, two, or three numerical digits.

IV. FOUNDATION

o the pump should be located as close as practical to the liquid source, this will minimize inlet losses. Improper location of the pump may result in decreased pump performance.

o The foundation should be designed to hold the pump assembly rigid and to absorb any vibration or external strain that may be encountered. A concrete foundation on a solid base should be adequate.

o Pump and driver should be accessible for inspection and maintenance.

o On permanent installations, it is recommended that the pumping assembly be secured to the foundation by anchor bolts.

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V. ALIGNMENT OF PUMP AND DRIVER

The pump, drive, and/or motor were properly aligned if fabricated at the factory. During shipping or upon mounting and tightening onto the foundation this alignment is often disturbed. Therefore it is imperative that the alignment between the pump and the driver be **CHECKED** after assembly, after mounting to the foundation, and after all piping is in place. The following procedure should be followed to ensure proper alignment of the assembly.

Step No. 1. Place the assembly on the foundation and level by using shims at the foundation bolts. Ensure that all foundation bolts are tight.

Step No. 2. If the suction and discharge piping is already in place inspect to ensure that the piping is square to the pump ports and independently supported as close as possible to the pump. It is important that no strain is transmitted to the pump housing from the piping. Shim and align the pump as required. Tighten all pump mounting bolts. If the suction and discharge piping has not been installed, refer to Step No. 8.

NOTE: From this point on all alignment should be accomplished without disturbing the pump.

Step No. 3. Remove coupling guards and covers. If the pump is driven through a gear reducer proceed to the next step. If the pump is connected directly to the motor proceed to Step No. 7.

Step No. 4. Check the parallel and angular alignment of the coupling between the gear reducer and the pump as described in Figure (1). Realignment, if required, should be accomplished by moving and or shimming the gear reducer. Tighten gear reducer mounting bolts.

Step No. 5. Check the parallel and angular alignment of the coupling between the gear reducer and the motor as described in Figure (1). Realignment, if required, should be accomplished by moving and/or shimming the motor. Tighten the motor mounting bolts.

Step No. 6 Recheck the coupling alignment between the pump and the gear reducer to make sure the alignment hasn't changed.

Step No 7. Check the parallel and angular coupling alignment between the pump and motor as described in Figure (1). Alignment should be accomplished by moving and/or shimming the motor.

Step No. 8. Alignment of the pump and driver must be checked after the suction and discharge piping is connected to the pump, follow the procedure outlined in Figure (1).

Step No. 9. Replace all coupling guards and covers.

Step No. 10. After the pump has been in service for one or two weeks, completely recheck alignment of all couplings.

VI. PIPING INSTALLATION

- o Piping must be installed allowing for expansion and contraction.
- o Piping must be supported independently of the pump.

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VI. PIPING INSTALLATION (Con'd.)

- o Piping must be sized and arranged to ensure that the inlet and outlet pressure are within pump specifications. Conditions such as liquid viscosity, length of pipe run, suction lift, and discharge head will influence the size of the piping.
- o Friction losses should be calculated carefully and compared to the pump ratings before installation.
- o If valves are used, gate, ball, or butterfly are preferred.
- o Long 90 degree or 45 degree elbows are preferred to the short radius elbows.
- o Flush the piping thoroughly before connecting to the pump.

VII. THREADED PORT CONNECTIONS

- o BSM pump ports are American National Standard taper pipe threads (NPT)
- o Use of a thread sealant is recommended for a pressure tight joint.
- o DO NOT USE teflon tape to seal the pipe threads. Use of teflon tape may cause damage to the pump or fittings.
- o Failure to use a thread sealant when assembling NPT connections may cause galling of threads resulting in damaged components.

VIII. PRE-OPERATION CHECKS (PERFORM WITH PUMP DRIVER DE-ENERGIZED)

Check parallel and angular alignment of the pump and driver coupling to ensure compliance to manufacturers requirements. (Refer to procedure discussed earlier in this manual.)

Check rotation of driver to ensure that the pump will be operating in the desired direction. Pump rotation is designated by an arrow stamped on the top of the flange or stand or a printed tag affixed to the pump.

Check to ensure the pump's integral relief valve, if so equipped, is positioned and adjusted properly. The pump relief valve setting should be higher than the required system pressure and must not exceed the pumps maximum operating pressure.

Check to ensure that the pump and motor shafts operate freely without binding: (rotate by hand).

Check the pump and driver mounting bolts to ensure that they are properly tightened.

Check to ensure that the suction and discharge piping is square to the pump ports and independently supported as close as possible to the pump so that no strain is transmitted to the pump housing.

Check to ensure all pipe connections are tight.

Check to ensure that the inlet and discharge valves are opened and that the lines are unobstructed.

Check to ensure the motor is wired properly.

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IX. OPERATIONAL CHECKS (PERFORM WITH PUMP DRIVER ENERGIZED)

Check to ensure that the pump is delivery liquid; if not **STOP THE DRIVER IMMEDIATELY**, determine cause.

Check the pump for excessive vibration, localized heating of components, noise, and leakage. If any of the conditions exist, stop the pump and investigate and take correct action.

Check the pump discharge pressure and intake vacuum to manufacture's specifications. If not to specification investigate and take corrective action.

BSM rotary gear pumps are not designed to run dry. **THE PUMP MUST BE FILLED WITH LIQUID DURING ALL PHASES OF OPERATION.**

X. PUMP DISASSEMBLY PROCEDURE

- o Turn off the pump and lock out the energy source to the driver.
- o Close suction and discharge lines.
- o Drain suction and discharge lines disconnect lines from the pump suction and discharge ports.
- o The pump should be disassembled in a clean environment.
- o Match mark all components (flange, stand, housing, cap, wear plates, etc.) to ensure proper reassembly.
- o Remove the mechanical seal, lip seal, or compression packing. When removing the mechanical seal it is suggested that the components be arranged on a clean surface in the order that they are removed. (Gland screws, gland, carbon seal ring, o ring, seal cup, spring). It may be necessary to tap the gland lightly to break the seal. The carbon ring is fragile, handle with care.
- o Remove stand screws.
- o Tap keyway end of driving gear with a lead or brass hammer to separate components. The seal spring, and seal stop will move axially along the shaft. Remove the cap carefully to avoid damage to the dowel pins. The dowel pins, two between the cap and housing and two between the housing and the flange or stand, should be removed carefully. If the dowel pins are damaged, they may be replaced with steel dowel pins of the same diameter or slightly larger. When larger dowel pins are used, the holes should be reamed approximately .001 inch smaller than the dowel pins.
- o Remove driven gear and housing.
- o Remove driving gear from flange or stand.
- o Slide the seal spring and seal stop off the shaft.
- o Check the cap, flange or stand surfaces, that assemble to the housing, for scoring at the gear contact area. Grind if necessary maintaining the squareness of the surface to the bearing bores.

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X. PUMP DISASSEMBLY PROCEDURE (CONT'D).

- o Check the bearing bores for wear.
- o Check gears for wear at the outside diameter, bearing areas, seal area, and face width.
- o It is recommended that a new seal be installed when reassembling the pump.

XI. PUMP RE-ASSEMBLY PROCEDURE

- o Clean all components. The mating surfaces of the cap, housing, and flange or stand must be free of grease and oil to achieve leakproof joints.
- o Place pump flange or stand in a vise with soft jaws, bearing holes facing upward.
- o Apply a small amount of oil to bearing holes.
- o Insert the driving and driven gears into the bearing holes. The driving shaft should protrude through the seal chamber.
- o Apply a small amount of shellac to both flat surfaces of the housing, the shellac should be applied to the outer edge using a brush to spread beyond screw holes toward the center of the housing. The mating surfaces of the cap, housing, and flange or stand must be free of grease and oil to achieve leakproof joints.
- o Assemble housing over the gears aligning the match marks from the disassembly operation.
- o Apply a small amount of oil to the visible gear faces and gear shafts.
- o Assemble cap over gears aligning the match marks from the disassembly operation.
- o Dip the six stand screws in oil or grease to the length of the threads. Install screws and tighten to approximately 55 inch pounds. Rotate the driving shaft to ensure that the gears are rotating freely.
- o Install dowel pins.
- o Install a new mechanical seal. Components should be installed in the following sequence..seal stop (consult booklet that came with the mechanical seal for proper depth), seal spring (small end first), seal cup (open side facing out), o ring (careful not to damage when sliding over keyway), carbon ring (align indents in carbon ring with detents in seal cup), gland gasket, and gland.
- o Dip the two gland screws in oil and install tightening firmly.
- o The pump is now assembled. Rotate the driving shaft to ensure that the gears are rotating freely.

XII. INTEGRAL RELIEF VALVE

- o Several BSM pump models are available with an integral relief valve. The purpose of this valve is to relieve pressure in the pump when the discharge line is blocked.
- o the integral relief valve is located in the pump cap and is always positioned on the discharge side of the pump.
- o Unless otherwise specified, the integral relief valve is not pre-set at the factory.

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XIII. INTEGRAL RELIEF VALVE ADJUSTMENTS

- o The relief valve must be adjusted under actual operating conditions.
- o Connect a pressure gage as close as possible to the discharge port, between the pump and the point where the discharge line will be closed.
- o Remove adjusting screw cap.
- o Start the pump and close the discharge line slowly while monitoring the pressure gage. DO NOT exceed the pressure rating of the pump or other equipment. If the pressure is reached while closing the discharge line valve, STOP. DO NOT close any further.
- o turn the relief valve adjusting screw clockwise or counter clockwise until the desired setting is achieved.
- o Open discharge line valve and turn pump off.

XIV. RELIEF VALVE DISASSEMBLE (PERFORM WITH PUMP DRIVER DE-ENERGIZED)

- o The pump must be shut off and the system pressure released before attempting to disassemble the relief valve.
- o Take precautions to ensure that liquid does not escape from the valve during disassembly.
- o Shut off pump and close the suction and discharge lines.
- o Remove the adjusting screw cap and copper gasket.
- o remove adjusting screw.
- o Remove spring and plunger.
- o Visually inspect all components, replacing those that are worn or damaged.

XV. RELIEF VALVE ASSEMBLY

- o Install plunger.
- o Install spring, centering on the plunger.
- o Install adjusting screw.
- o Install copper gasket.
- o Install adjusting screw cap.
- o The relief valve may now be set according to the procedure outlined in Section XIII.