BLACKMER POWER PUMPS
MODELS: XL(S)2-N, XL(S)3-N

960260
INSTRUCTION NO. 185/KK

Section	100
Effective	February 1984
Replaces	November 1982

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

INSTALLATION

LOCATION
Performance is related to the distance between the pump and the source of fluid. This suction line should be as short and straight as possible to decrease entrance losses and cavitation. The pump will operate satisfactorily in any position, but should be as low as possible.

FOUNDATION
A solid foundation reduces vibration and noise and improves the pump performance. On permanent installations it is recommended that the pumping units be securely bolted to a concrete foundation.

When new pump foundations are to be cast in concrete, it is suggested that anchor bolts of the type shown in Fig. 1 be set into the concrete.

This type of anchor bolt allows for slight shifting of position to better line up with mounting holes in the base plate. When pumps are to be located on existing concrete floors, holes should be drilled into the concrete and foundation bolts anchored therein.

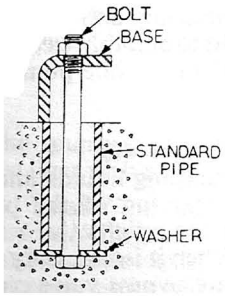

Fig. 1—Pipe Type Anchor Bolt Box

When installing units built on channel or structural steel type bases, care should be taken that the base is not twisted out of shape when anchor bolts are tightened. Shims should be used under the edges of the base prior to tightening of the anchor bolts to prevent distortion.

PIPING
Before piping is attached to a pump, a complete piping diagram should be made, and pipe friction, suction lift, discharge head, vacuum and total pressure on the pump should be computed. These calculations can be made by following procedures outlined in the Blackmer Engineering supplements. Without these computations it is almost impossible to determine beforehand whether a pumping installation will work properly.

Restrictions in the pipe line should be avoided, such as elbows, sharp bends, globe valves, certain restricted type plug valves, and undersized strainers. Suction lines in particular must be as straight and short as possible.

It is very important that there be no air leaks in the intake line. If practical to do so, apply air pressure to the completed pipe line to check for leaks.

When pipes are subject to wide variations in temperature, provision should also be made to compensate for pipe expansion and contraction.

Piping should be well supported so as not to impart any strain to the pump body. Piping should not be suspended on loose, strap-like supports, but should be well anchored to solid supports at frequent intervals to prevent vibration.

The use of check valves or foot valves in the supply tank is generally not recommended with a self-priming, positive displacement pump, and can often cause considerable trouble. If a valve in the discharge line is closed while the pump is operating it causes liquid to recirculate through the pressure relief valve, the liquid heats up and expands. A check valve in the suction line prevents the expanding liquid from returning to the supply tank, causing a build-up of pressure on the pump and in the piping system. The result can be excessive leakage at the pump or at pipe joints.

STRAINER
A strainer is recommended to protect the pump from damage by foreign particles. The strainer should have a net open area of at least four times the size of the pump suction. For viscosities over 1,000 SSU, use a strainer one or two sizes larger than normal for greater area. It should be inspected and cleaned at regular intervals.

LUBRICATION
Before starting, put oil in the gear reducer. Couplings with rubber inserts do not require lubrication. Other couplings are pre-lubricated at the factory, but require frequent lubrication to prevent excessive wear.

CHECKING ALIGNMENT
The alignment of motor, gear reducer, and pump is often disturbed in transit and must be checked before the unit is put into operation.

On those units on which flexible couplings are used, the coupling cover should be removed and a straight edge laid across the two hubs of the coupling as shown in Fig. 2. The maximum offset should be less than .015. With a feeler gauge, or piece of flat stock, check the angular misalignment of the coupling halves. Check in four places at 90° increments about the periphery of the coupling. Maximum variation in this spacing should not exceed .020". Misalignment is not desirable. If it does exist, it should not exceed the above limits.

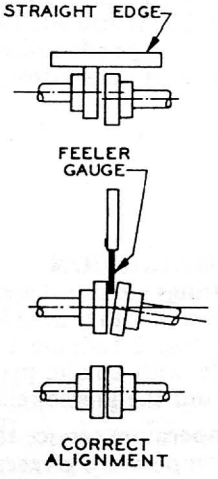

Fig. 2—Alignment Check

Check alignment of pipes to pump to avoid strains which might later cause misalignment. Unbolt flanges or break union joints. Pipes should not spring away or drop down. After pumps have been in operation for a week or two, completely recheck alignment. See Fig. 3.

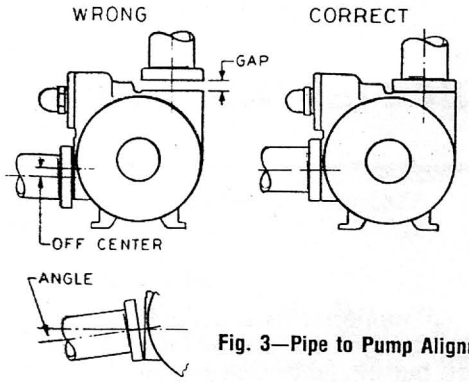

Fig. 3—Pipe to Pump Alignment

TO REVERSE PUMP ROTATION

Remove bearing covers from both heads, and the head from the shaft side. Reverse the rotor and shaft so that the shaft protrudes through the head still on the cylinder. The vanes must be reversed in the slots so that the pressure relief grooves face in the direction of rotation. The rounded, or wearing edge of the vanes must be outward to contact the bore of the liner. See "Maintenance" for removal and replacement of heads and rotor.

CLEANING PRECAUTIONS

New tanks require careful cleaning to remove weld splatter, slag, scale and other foreign matter before filling with liquid. Suction pipes from the tank to the pump should be flushed before attaching to pump. Foreign matter entering a pump can cause extensive damage.

OPERATION

PUMP PERFORMANCE CHECK

It is usually desirable to make a running check of a pumping system before putting it into operation. The main points to check are general operation of the system, leakage from piping and equipment, direction of pump rotation, proper pump speed, noise level of the pump, pumping rate, and shut-off pressure.

Whenever a new pump is first started, it should be watched carefully for several hours and checked for signs of malfunction.

If the pump is abnormally noisy, follow the checking procedures outlined under "Pump Troubles and their Cures."

ROTATION

A right-hand pump rotates clockwise with the intake on the right side when viewed from the shaft end.

RUNNING PUMP IN REVERSE

It is sometimes desirable to reverse the pump for draining a line. The pump is satisfactory for this type of operation if a separate pressure relief valve is provided to protect the pump from excessive pressures when pumping backwards against a possible closed valve.

FLUSHING THE PUMP

Liquids which solidify when cold or which might otherwise damage the pump after prolonged contact or would contaminate other loads should be flushed out.

Drain the pump and lines by pumping air. Then pump flushing liquid to suitably clean the pump. Close the discharge line for 3 minutes while pumping. This will flush out the relief valve.

RELIEF VALVE

When pumping liquids under a high suction lift and cavitation or starving of the pump exists, partial recirculation through the relief valve will result in excessive noise in the valve. When it is necessary to operate under these conditions, a separate bypass valve piped back into the storage tank is recommended.

RELIEF VALVE SETTING

The pressure at which the relief valve was set at the factory is marked on a metal tag attached to the relief valve cover. The relief valve should normally be set at about 10-15 psi higher than the operating pressure.

MAINTENANCE

MAINTENANCE AND TROUBLE SHOOTING MUST BE DONE BY AN INDIVIDUAL EXPERIENCED WITH PUMP MAINTENANCE AND THE TYPE OF SYSTEM INVOLVED.

PUMP LUBRICATION

The ball-bearings are sealed and protected from the pumpage. For average service, they need lubrication every three months. Use a light, No. 2 Lithium base, ball-bearing type grease. Apply slowly with a hand pressure gun until grease begins to escape from the grease-relief fitting.

For low temperature service the pump should be lubricated with a low temperature grease. Listed below are some of the low temperature greases which are suitable.

Shell Oil Company - B&B 70919
Mobil Oil Co. - Mobil Grease No. 28
Standard Oil Co. - Supermil Grease No. 1157
Exxon - Beacon 325

After lubrication a small amount of grease may escape from the drain holes under the bearing chamber on the pump head. It is normal and proper for a small amount to work past the sealed bearing for a short while after greasing.

PUMP DISASSEMBLY

Before work is started on a pump it must be drained and the pressure relieved.

The size 2" pumps have dirt shields on the shafts. These shields will slide off the shaft with the bearing cover after removing the bearing cover capscrews.

Bearings are locked to the shaft and serve as thrust bearings to position the rotor in the casing. It is necessary to remove

the lock collars before the head can be removed. Remove the bearing cover and loosen the set screw in the locking collar. Insert a punch in the drilled hole in the collar and tap firmly with a hammer, driving the collar in the direction opposite the pump rotation. When loosened, slide the collars off the shaft. Remove the head capscrews and slide the head assembly off the shaft. Shaft must be free of burrs and rough spots to avoid damage to seals.

The stationary seat of the seal and its "O" ring will come off the shaft as part of the head assembly. The remaining parts will slide off the shaft as a unit. If the seal has been leaking, it is advisable to replace the entire seal, including the stationary seat and its "O" ring. It is important to keep all parts of the seal clean. Before installing a new seal, remove all burrs and rough spots from the shaft with fine emery.

The outside diameter of the liner is machined undersize so that it is slip-fit into the pump body.

To remove the liner, remove one of the pump heads, insert the tip of a large screwdriver or metal bar into a port opening and pry against the rotor. A block between the bar and rotor will assist in bringing the liner all the way out.

NOTE: Place wooden wedges in vane slots to hold push rods in place.

If the liner cannot be removed in this manner, remove the remaining head, place a block of wood or piece of brass against the end of the liner and drive it out with a hammer.

PUMP ASSEMBLY

Before inserting a new liner, clean the pump casing thoroughly. Remove any burrs from the new liner with a file.

Replace the liner key. All liners are marked "Intake" on one side of the key seat. The liner must be inserted with this marking on the intake side of the pump. If installed backwards, the liner will restrict the port openings, and cause noise and loss of capacity.

If the rotor and shaft assembly have been removed, it will be necessary to install the bottom vanes and the push rods before reinstalling. This will prevent the push rods from falling down against the inner surface of the liner. The vanes must be held in place while making the installation. To install the remaining vanes, turn the shaft by hand until an empty slot comes to the 12 o'clock position, insert a vane, and move to the next slot.

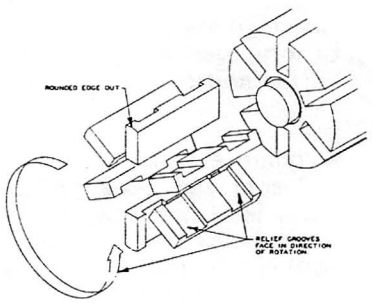

Fig. 6

Vanes must be installed with the rounded, or wearing edge, outward to contact the surface of the liner. The relief grooves in the vanes must face the leading, or pressure side. See Fig. 6.

Install the disc with the seal recess toward the outside. Position the relief hole as shown in Fig. 7.

Before installing the mechanical seal, remove all burrs and rough spots from the shaft which might cut or nick the rubber "O" rings. A small amount of oil applied to the shaft will help slide the parts in place.

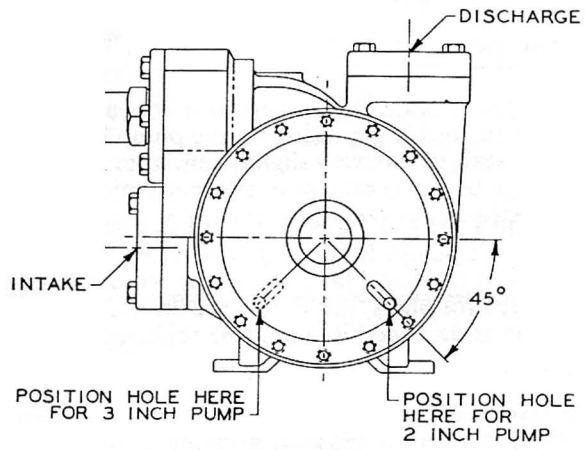

Fig. 7

Place the rotating half of the seal on the shaft and engage the two driving prongs on the seal jacket with the notches in the shaft shoulder. The polished face of the carbon should be outward and the "O" ring inward. Wipe all traces of dirt and dust from the face of the carbon. Place the stationary seat in the recess in the head with the polished face outward and the drive pin engaged in the slot in the head.

Place the bearing in the recess in the head. Avoid striking the polished face of the stationary seat against the end of the shaft when installing head on shaft. Tighten head capscrews on both heads before locking bearings to shaft.

Install the bearing lock-collar on the shaft with the recess inward to engage the shoulder on the bearing. Push the lock-collar and bearing inward while turning the lock-collar by hand in the direction the shaft will turn when pumping. The bearing must be seated firmly against the back wall of the recess when the collar is tightened.

Using a punch and hammer, lock the collar to the shaft as shown in Fig. 8, driving the collar in the direction of the shaft rotation. Rotate the shaft by hand to make sure it turns freely. If it binds or does not turn freely, loosen the bearing lock collars and the head capscrews and tap the edges of the heads with a lead hammer while rotating the shaft by hand. Retighten the head capscrews and then reset the lock collars.

Replace the bearing cover and its gasket.

Model XL(S)2 has a dirt shield at the inboard bearing cover. Grease the end of the bearing cover. Slide the dirt shield on the end of the shaft and push it firmly against the end of the bearing cover. If necessary, use a blunt instrument to slide the dirt shield over the shaft.

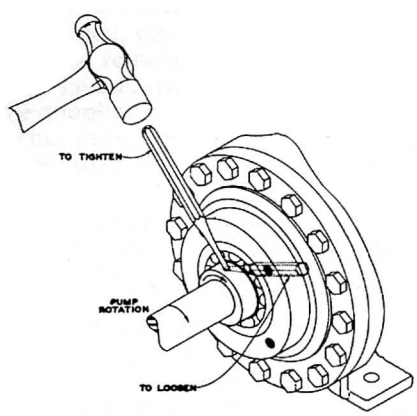

Fig. 8

PUMP TROUBLES AND THEIR CURES

LEAKAGE

If the mechanical seals leak, the leakage will appear at the drain holes under the bearing housing on the pump head. It is normal for new seals to leak very slightly until they are well worn in. If leakage becomes excessive, the mechanical seals should be replaced.

If, after rebuilding a pump, leakage appears from between the pump casing and head, the head should be removed and both faces inspected for burrs, dirt or surface imperfections. If the head gasket is damaged it should be replaced with a new one.

ESCAPING GREASE

On new pumps, and older pumps after greasing, it is normal for some grease to work out of the grease-relief fitting on the bearing cover, or out of the drain holes under the bearing housing. If grease continues to come from these places, the grease-relief fitting should be removed and inspected for damage or the bearing removed and its grease shield inspected for damage.

If grease escapes around the pump shaft the bearing cover should be removed and the grease seal examined. Reinstall the bearing cover with the grease seal centered on the shaft and properly greased.

NOISE

After a pump is completely drained and flooded with air, there may be some noise in the relief valve until the air is washed out of the system. This noise, although seldom present, is usually of short duration and can cause no damage.

Noise can be caused by excessive vacuum on the pump due to starved suction. A vacuum gauge applied to the gauge connection on the relief valve should register no more than 15 inches of mercury on Non-volatile Liquids. There are several possible causes of high vacuum on the pump. The strainer may be dirty, or plugged with a rag. The piping may be too small. Undersized or restricted fittings, such as plug valves or globe valves may have been used in the intake line. The suction lift may be too great. The viscosity of the liquid may be too high for the size of suction line used.

If the pump is run at speeds exceeding the recommended maximum, the noise will be abnormal.

If the pump is run for extended periods of time with closed discharge and liquid circulating through the relief valve, the liquid will begin to vaporize and cause increasing noise.

If the vacuum is not excessive and the pump is still noisy and does not deliver the rated GPM, the vanes should be examined for possible damage.

LOW DELIVERY RATE

Slow pumping rate may be caused by slow operating speed, low relief valve setting, restriction in the suction line, restriction in the discharge line, air leak in the suction line, or by damaged parts in the pump.

DAMAGED VANES

Vanes can be damaged by foreign objects entering the pump, pumping liquids of very high viscosity, excessive heat, vanes installed backwards, or by pumping liquids which chemically attack the vanes. (See "Limitations" on individual Parts Lists.)