960205
INSTRUCTIONS NO. 185/ZB

Section	100
Effective	October 1987
Replaces	September 1983

BLACKMER POWER PUMPS

MODELS: X(F)1¼A, XS(F)1¼A, X(F)1½A, XS(F)1½A

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

DISCONTINUED MODELS

INSTALLATION

LOCATION

Performance is related to the distance between the pump and the source of fluid. This distance should be as short and straight as possible to decrease entrance losses and cavitation.

FOUNDATION

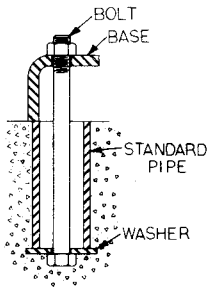

Fig. 1—Pipe Type Anchor Bolt Box

Proper installation is critical to efficient pump operation. It is recommended that the pumping unit be securely bolted to a concrete foundation for permanent installation to reduce noise and vibration.

If a new foundation is poured, it is suggested that anchor bolts be set into the concrete as shown in Fig. 1. They will allow for slight shifting for alignment with mounting holes of the unit base plate.

If the pumping unit is to be installed on an existing concrete floor, holes should be drilled in the concrete and anchor bolts installed.

Caution should be exercised with a unit built on a channel or a structural steel base that it is not distorted or misaligned when the anchor bolts are tightened. Shims should be used under the edges of the base to prevent this problem. Anchor bolts on flat roll steel bases should be tightened only lightly.

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 Bulletin No. 33. Without these computations it is difficult 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.

Unions and valves in the piping near the pump will facilitate maintenance. On the intake side, locate the nearest fitting at least six inches from the pump to permit the removal of the relief valve cover.

It is very important that there be no air leaks in the intake line to avoid cavitation.

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.

CHECK VALVES

Check valves in the discharge line are satisfactory.

The use of check valves or foot valves in the supply line is not recommended with a self-priming, positive displacement pump, and can often cause 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.

CHECKING ALIGNMENT

The alignment of motor and pump is often disturbed in transit or by installation on a foundation and must be checked before the unit is put into operation.

On those units where flexible couplings are used, remove the coupling cover and lay a straight edge across the two halves of the coupling as shown in Fig. 2. The maximum offset should be less than .015". With a feeler gage or piece of flat steel, of the proper thickness, check the space between the two coupling halves. Insert the gage at a point in the coupling, and at 90° increments about the coupling. The space should not vary more than .020".

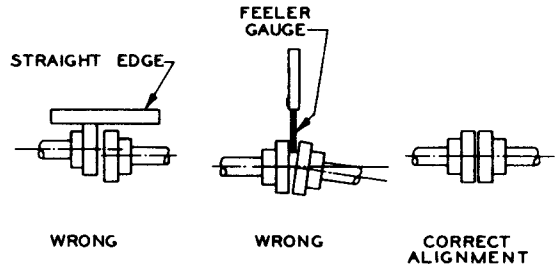

Fig. 2

Check alignment of pipes to pump to avoid strains which might later cause misalignment.

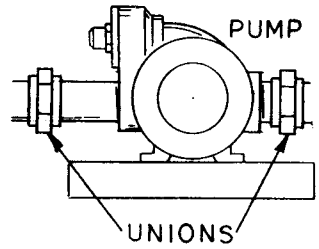

Fig. 3—Pipe to Pump Alignment

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.

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 the pump. Foreign matter entering a pump can cause extensive damage.

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 by removing the basket.

LUBRICATION

Before starting, put oil in the gear reducer using that grade oil stamped on the instruction plate attached to the gear case. Each reducer is provided with an oil pipe plug. Remove this plug and fill with oil until it runs out the hole. Check oil level at 3 month intervals. Couplings with rubber inserts do not require lubrication. Chain couplings are pre-lubricated at the factory and should be lubricated at 3 month intervals.

For average service the pump bearings need lubrication every three months. Use a light No. 2 lithium base, ballbearing type grease for temperatures up to 300°F. For temperature service above 300°F. a lubricant must be selected which will not melt. A few high temperature lubricants are:

Lubriplate No. 930 AA
Mobilplex No. 47
Alemite Special Hi Temp No. 2
Texaco Thermatex EP1

For extreme low temperature service the pump should be lubricated with a low temperature grease to prevent damage to bearing and mechanical seal. Following are some of the low temperature greases which may be used for this service:

Standard Oil—Super Mil #1157
Shell Oil—B & B 70919

Apply grease slowly with a hand gun to the grease fittings on each bearing cover until excess grease begins to appear from the relief fittings. It is normal for some grease to escape from the tell-tale holes under the bearing covers for a short period after lubrication. If this condition persists, the head should be removed and mechanical seal examined for wear or damage. A small amount of liquid may be leaking past the seal and gradually washing grease out of the bearing chamber. Where liquid is noticeably escaping from the tell-tale holes, the entire mechanical seal must be replaced.

TO REVERSE PUMP ROTATION

To reverse pump rotation, both heads must be removed and cylinder reversed. The vanes must be reversed in 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 cylinder. See "Maintenance" for removal and replacement of heads and rotor.

OPERATION

PERFORMANCE TEST

A performance test should be made on a pumping system before it is put into operation. All capscrews should be tightened the first time the pump is put into service. A routine check should be made for leakage of piping and equipment, correct pump speed, pumping rate, shut-off pressure and noise level. Check the rotation, the pump may be for right or left-hand service. A right-hand pump rotates clockwise with the intake on the right side as viewed from the shaft end. The pump shaft should be checked to assure that it rotates as indicated by the "rotation decal."

A complete performance test of the pump may be made by installing a pressure and vacuum gage in the pump at the plugged ports provided for this purpose. When pumping at full capacity the differential pressure should be at least 10 psi under the relief valve setting, or there may be a reduced flow due to partial bypassing. The differential pressure is equal to the difference between intake and discharge pressures measured in psi.

New pumps should be rechecked for signs of system problems after running several hours.

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 the closed relief valve.

FLUSHING THE PUMP

Liquids 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 three 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 range or setting is marked on a metal tag attached to the valve cover.

The relief valve should normally be set 10 psi higher than the operating pressure.

To increase the pressure setting, remove the cap from the adjusting screw, loosen the lock-nut, and turn the adjusting screw clockwise, or inward. To reduce the pressure setting, turn the screw counterclockwise, or outward. Springs for higher or lower pressure settings are available from the factory (see parts lists for spring ranges).

MAINTENANCE

DISASSEMBLY

XS1¼-1½

Remove the bearing cover capscrews and slide the bearing cover off the shaft.

These pumps use lock collars against the bearings to protect the pump from end thrust. On XS1¼—1½ loosen the lock collar setscrews and remove the collar.

On all pumps the shaft should be checked for burrs or roughness that could cut the mechanical seal "O" ring when it is removed. After the head capscrews are removed, loosen the head by prying with a screwdriver or tapping with a lead hammer, and slide the head assembly off the shaft.

When the head is removed, the stationary seat of the seal will come off with the head. The rest of the seal can then be slid off the shaft as a complete unit.

If the seal has been leaking, the entire seal, including the stationary seat and its "O" ring must be replaced. It is important to keep all parts of the seal clean.

ASSEMBLY

Before reassembling the pump, clean each part thoroughly and wash out seal and bearing recesses.

Install the disc with the seal recess toward the outside and the relief hole on the discharge side of the pump approximately 45° from the base of the pump. (See Fig. 4) Install the head "O" ring and the head.

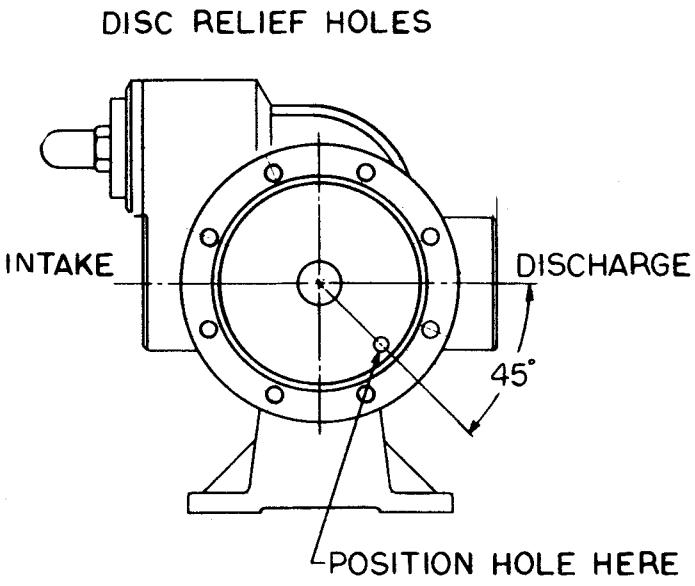

Fig. 4

On all pumps the head "O" ring should be replaced if it has swollen and will not lay flat in the groove. Wipe each "O" ring clean. Apply a small amount of grease to the "O" ring and around the recess in the head. Remove all burrs and rough spots from the shaft that might cut the seal "O" ring. Apply a little oil to the shaft so the seal will slide easily.

Place the rotating half of the seal on the shaft and engage the driving prong on the seal jacket with the notch in the shaft shoulder. The polished face will be in view. Both seal faces must be free of dust and dirt. Place the stationary seat of the seal in the head recess with the polished face in view, (see Fig. 5), the drive pin engaging the slot in the head.

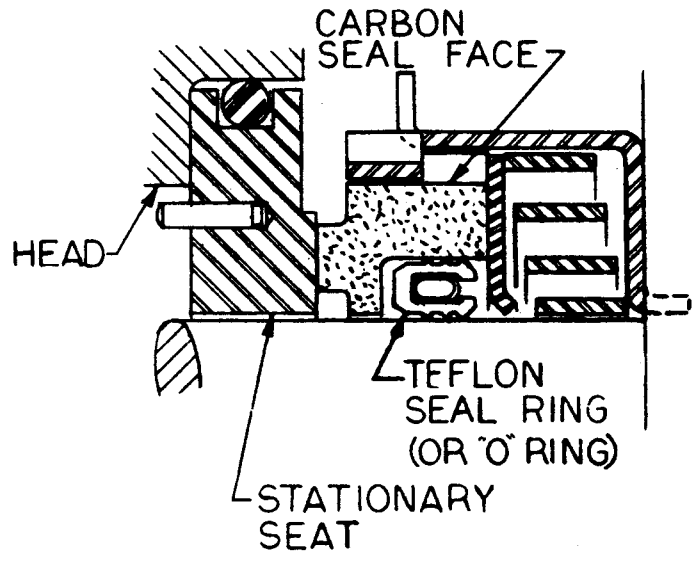

Fig. 5

Place the bearing in its recess with the grease shield inside so that the balls are visible.

Normally the "O" ring is smaller in diameter than the groove. To insert the "O" ring, lay it flat on the head and start in on one side of the groove. Slide thumbs over the ring in opposite directions while stretching it ahead with the fingers. (See Fig. 6.)

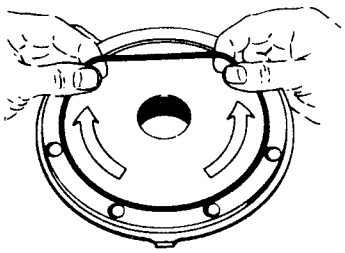

Fig. 6

Tighten head capscrews on both heads before locking bearing lock collars to the shaft. Rotate shaft by hand to test for binding.

It is very important that the bearing thrust collars be properly installed. Slide the collar onto the shaft with the counterbored, or enlarged side, toward the bearing. Tap collar against the bearing with a hammer to insure the bearing is properly sesated against the back of its recess. Push the collar forcibly against the bearing by hand while tightening the setscrews as tightly as possible. Check for binding once again by rotating shaft by hand. If it turns freely, replace bearing cover and its gasket.

Grease the lip of the grease seal and slip the bearing cover on the shaft. The lip of the grease seal faces toward the outside of the pump. Tighten the bearing cover capscrews only finger-tight.

VANES

Vanes can be removed or replaced by removing one head and sliding them in or out of the rotor slots. This should be done with each vane seated in the bottom of its slot, and can be accomplished by rotating each vane to the top of the rotor.

If the vanes are swollen or jammed in their slots, it may be necessary to remove the rotor and drive them out.

If the rotor-and-shaft has been withdrawn from the cylinder, install the bottom vanes and the push rod before reinserting it into the cylinder.

Install new vanes with the rounded, or beveled, edge outward to contact the bore of the cylinder and with relief grooves facing in direction of rotation. (See Fig. 7)

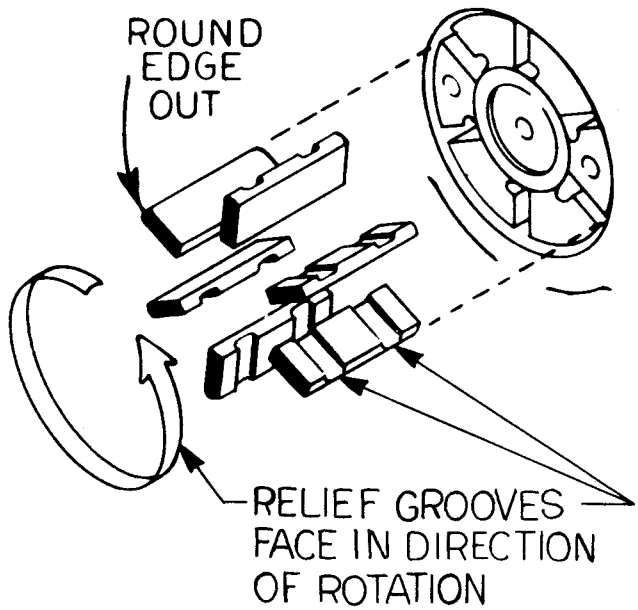

Fig. 7

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 must be replaced.

If, after rebuilding a pump, leakage appears from between the pump cylinder and head, the head should be removed and both faces inspected for burrs, dirt or surface imperfections. If the head "O" rings are damaged, they should be replaced with new ones.

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 seal examined. Reinstall the bearing cover with the seal centered on the shaft and properly greased.

NOISE AND VIBRATION

Pipe lines improperly supported will magnify vibrations due to slight pump pulsations. Entrained air or vapors in the liquid entering the pump is another cause. Pipe joints should be checked for leakage of air. Noise can be caused by excessive vacuum on the pump due to starved suction.

A vacuum gage applied to the gage connection should register less than limit shown under "Low Delivery Rate." There are several possible causes of high vacuum on the pump. The strainer may be dirty, or plugged. 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.

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.

DAMAGED VANES

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

COMMON CAUSES OF GEAR REDUCER NOISE AND VIBRATION

1. Faulty, noisy bearings—replace bearings.
2. Inadequate lubrication or use of wrong lubricant—The lubricant may not be getting to the contact areas of the gear teeth or the viscosity of the oil may be too low for the operating temperature.
3. Excessive overloading—overloading causes overheating, which may lower oil viscosity so oil film on gear tooth contact surfaces breaks down. The gears begin to "groan" as the oil loses its effectiveness.

   If the loading is not decreased, the teeth begin to bite into each other and wear out rapidly.
4. Impurities in lubricant—such as abrasive particles, etc. Replace with clean oil.

LOW DELIVERY RATE

When a new pump does not deliver its proper capacity, the trouble is usually in the piping. Install pressure and vacuum gages in the tapped holes on the pump. If the vacuum is too high, the suction line may be small, long, or may have many elbows and fittings. The strainer may be small or dirty. Air may be leaking into the suction line. The lower end of suction stub may not be submerged. Pump speed may be low, or the lift too great. The delivery rate reduces rapidly when the following conditions are exceeded:

Cold Gasoline (60°F.)—8 in. Hg to 10 in. Hg
Cold Fuel Oil (60°F.)—12 in. Hg
Cold Lube Oil (60°F.)—18 in. Hg

Check the relief valve setting by slowly closing the discharge valve and reading peak discharge pressure. The setting should be at least 10 psi higher than normal delivery pressure. If some of the liquid is recirculating through the valve, increase the setting by turning in the adjusting screw. In this case, power input to the motor should be checked to avoid overload.

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