BLACKMER TRUCK PUMPS

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

MODELS: ATX3½B, ATXS3½B (Aluminum Construction)

960288
INSTRUCTION NO. 285/D

Section	200
Effective	November 1988
Replaces	New

WARNING

THIS PRODUCT MUST ONLY BE INSTALLED IN SYSTEMS WHICH HAVE BEEN DESIGNED BY THOSE QUALIFIED TO ENGINEER SUCH SYSTEMS. THE SYSTEM MUST BE IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS AND SAFETY CODES AND WARN OF ANY HAZARDS UNIQUE TO THE PARTICULAR SYSTEM.

These models are obsolete. Parts availability will be limited.

INSTALLATION

TRUCK MOUNTING

The pump will operate satisfactorily in any position. It can be bolted to the frame or on a saddle hung below the frame. It must be securely fastened in a firm support.

The pump should be located as near the source of supply as possible to minimize pipe friction losses.

PUMP DRIVE

The pump may be driven by a power take-off through universal joints. When using universal joints, a splined slip joint must be used on the connecting jack-shaft to prevent end thrust on the pump shaft. Square slip joints should be avoided. The pump shaft and power take-off shaft should be parallel. The maximum recommended angle between the jack-shaft and pump shaft is 15°. The yoke of the universals at both ends of the jack-shaft should be parallel. If any of these rules are violated, the pump will not turn evenly, but rather may "gallop," causing pulsations and vibrations.

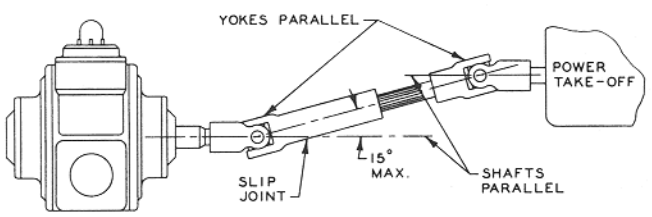

Fig. 1 — Pump Drive

ROTATION

Rotation is based on the following:

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

A left-hand pump rotates counterclockwise, with the intake on the left side, when viewed from the shaft end.

The pump must be built to operate in the same direction of rotation as the power take-off. For instance, when looking directly into the power take-off shaft, a clockwise or right-hand rotation of the power take-off requires a counterclockwise or left-hand pump.

NOTE: The intake port must always be located on the same side as the relief valve cover.

REVERSE PUMP ROTATION

To reverse pump rotation, first remove the bearing covers, locknuts and lockwashers from both ends. Next, remove 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 cylinder. Replace the head, bearing covers, locknuts and lockwashers. Refer to the "Maintenance" Section for more detailed assembly and disassembly instructions.

CLEANING PRECAUTION

Foreign matter entering the pump can cause extensive damage. New tank trucks require careful cleaning to remove weld splatter, slag, scale, and other foreign matter before filling with liquid. Suction piping leading from the tank to the pump should be flushed out before being attached to the pump.

STRAINER

A strainer should be installed in the intake line to protect the pump from foreign matter. The strainer should be large enough to minimize pressure drop at the maximum flow rate, and should be inspected and cleaned regularly.

OPERATION

PUMP PERFORMANCE CHECK

It is usually desirable to make a running check of a pump system before putting a new truck into service. The main points to check include: general operation of the system; leakage from piping and equipment; direction of pump rotation; proper engine speed for correct pump speed; noise level of the pump; pumping rate; and shut-off pressure.

The truck operator should acquaint himself with the proper engine speed for best operation of the pump. If the proper power take-off has been used, a medium idling speed, which can be gauged by the sound of the engine, should produce approximately the rated capacity of the pump. If the delivery is appreciably more than the pump rating, the engine should be operated slower. If the delivery is appreciably less than rated, check the probable causes listed under "Pump Troubles and Their Cures."

RUNNING PUMP IN REVERSE

It is sometimes desirable to use a reversing type power take-off to reverse the pump for draining a hose. 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 solidify when cold, or which might otherwise damage the pump after prolonged contact, should be flushed out.

To flush the pump, first drain the pump and lines by pumping air. Then pump flushing liquid to suitably clean the pump. Close the discharge line for 30 second intervals (maximum) while pumping. This should be done a few times to flush out the relief valve.

NOTE: The pump should not be run for extended periods of time with a closed discharge. Liquid circulating through the relief valve can heat up and/or vaporize which can cause pump or system problems.

RELIEF VALVE SETTING

The pressure setting or range at which the relief valve may be set is marked on a metal tag attached to the relief valve cover. The relief valve should normally be set at least 15 psi (100 kPa) higher than the operating pressure.

It is a good practice with all new pump installations to check relief valve settings relative to system pressure by use of inlet and discharge pressure gauges. During liquid transfer the discharge pressure gauge should provide a relatively constant measurement. If the pump is started and the discharge pressure gauge rapidly increases to a specific pressure level and then drops noticeably at the same time the pump suction pressure increases, the internal relief valve is opening prematurely, preventing the pump from providing full flow.

To increase the pressure setting, remove the cap from the adjusting screw, loosen the locknut, and turn the adjusting screw clockwise, or inward. To reduce the pressure setting, turn the screw counterclockwise, or outward.

MAINTENANCE

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

LUBRICATION

Pump bearings should be lubricated every three months at minimum.
Use Standard Oil — Amolith All Weather Grease, or an equivalent grease which is compatible with the elastomers and the application.

CAUTION: Excessive greasing pressure can cause grease to be pushed between the mechanical seal faces causing seal failure.

It is recommended that you remove the grease relief fitting, and with a hand gun, apply grease slowly to the grease fittings on both bearing covers until excess grease begins to come from the grease relief fitting port. Be sure to replace the grease relief fitting prior to start-up. It is normal for some grease to escape from the tell-tale holes under the bearing housing for a short period of time after lubrication.

PREVENTIVE MAINTENANCE AND INSPECTION

For average service, the inside of the pump should be inspected once a year at minimum.

The bearing cavities should also be inspected periodically to check for dilution of the grease from pumpage. Dilution of the grease indicates leaking seals which should be repaired or replaced immediately.

Increasing noise, after the pump has been in service for some time, may indicate worn bearings or vanes. Refer to "Pump Troubles and Their Cures" for other causes of noise.

PUMP DISASSEMBLY

Before work is started on the pump, be sure the liquid is drained and the pressure relieved.

Remove the bearing cover capscrews and slide the bearing cover from the shaft. The grease seal, located in the bearing cover cavity, will slide off with the bearing cover.

The ATX(S)3½B pump is protected from "end thrust" by a lockwasher and locknut installed outside the bearing on each end of the shaft. To remove the bearing locknut, bend up the engaged lockwasher tang and rotate the nut counterclockwise.

Before removing the head assembly, check for burrs or roughness on the shaft that could damage the mechanical seal O-rings.

Remove the head capscrews and carefully pry the head away from the cylinder with a screwdriver. The head assembly, consisting of the head, bearing, mechanical seal, head O-ring, and disc, can now be slid from the shaft. The bearing and seal are slip fit on the shaft and will slide off readily if the shaft is clean and smooth.

Remove the bearing from the bearing bore. To dismantle the head assembly, first remove the four (4) disc machine screws and lockwashers. Removal of the disc releases the head O-ring and the rotating half of the mechanical seal. The stationary half of the mechanical seal can be pushed from its recess in the head with the use of a screwdriver or other blunt instrument. Use care in handling the mechanical seal. Both seal faces should be kept clean, and free of scratches.

REPLACING VANES

Vanes can usually be replaced by removing only one head, and sliding them in or out of the rotor end. To prevent push rods from dropping down and jamming in the porting slots, a vane should only be removed when it is in the bottom of its slot in the rotor (at the 12 o'clock position). To achieve this, turn the shaft by hand until a vane comes to the 12 o'clock (top) position. Remove and replace the vane, then rotate to the next slot. Continue this procedure until all new vanes are in place. Be sure to install the new vanes with the rounded or wearing edge outward to contact the surface of the cylinder, and with the relief grooves facing in the direction of rotation (see Figure 2).

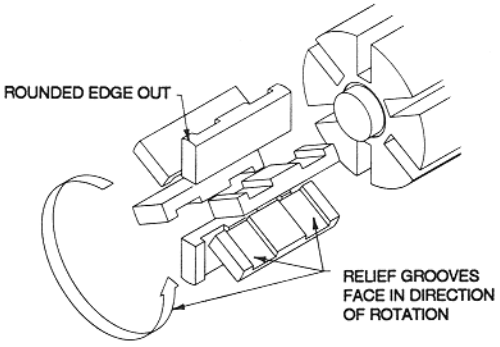

Fig. 2 — Vane Installation

NOTE: For replacement of other pump parts, refer to the separate subheadings in the following "Pump Assembly" section.

PUMP ASSEMBLY

Before reassembling the pump, clean each part thoroughly. Wash out the seal and bearing recesses in both heads.

MECHANICAL SEAL

If the mechanical seal has been leaking, it is recommended a complete new seal assembly be installed.

It is important that both seal faces be kept free of all traces of dirt, dust, or grease. A clean tissue and alcohol may be used to clean the seal faces.

Place the stationary seat and its O-ring in the head so that the pin on the seat engages in either slot in the head recess. The polished face of the seal will be in view.

Install the rotating O-ring in the rotating seal face. Place the polished face of the rotating seal face against the polished face of the stationary seat. With the drive tangs of the seal jacket assembly upward, align the drive notches and place the seal jacket over the rotating unit.

DISC

Place the disc in its recess in the head with the countersunk screw holes face up. The disc should be positioned such that when the head is mounted, the disc relief hole will be on the intake side of the pump. The Blackmer name should be in an upright position, with the tell-tale hole at the bottom of the pump (See Figure 3).

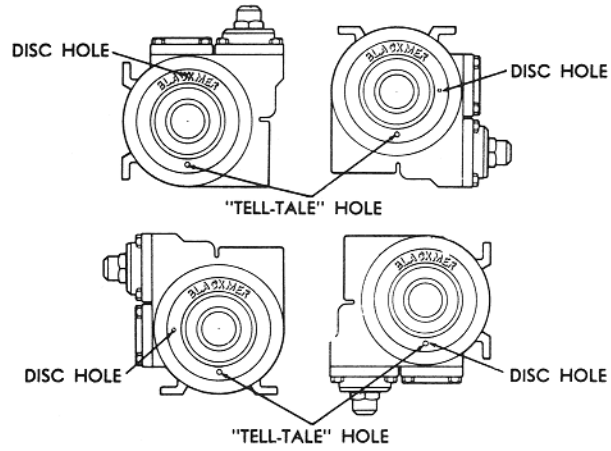

Fig. 3

Install the four (4) lockwashers (tangs outward) and machine screws. The driving tangs of the rotating seal should protrude through the center hole of the disc.

BEARINGS

Install the bearing into the bearing bore in the head with the grease shield toward the inside, such that the balls are visible after installation.

HEAD O-RING

The head O-ring should be replaced if it is swollen, nicked or cut. The O-ring is normally smaller in diameter than the groove. To install, lay the ring 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, as shown in Figure 4.

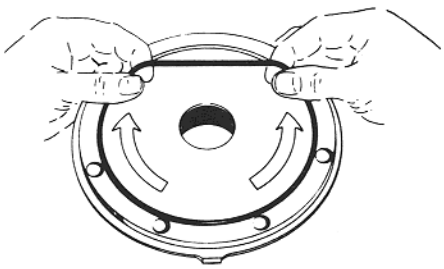

Fig. 4 — Installing Head O-Ring

ROTOR AND SHAFT

Before installing the rotor and shaft, make sure the shaft is free of burrs which might cut or nick the mechanical seal O-rings.

If the rotor and shaft has been withdrawn from the cylinder, it will be necessary to install the three bottom vanes and push rods before replacing it. The vanes must be held in place while making the installation (see Figure 5).

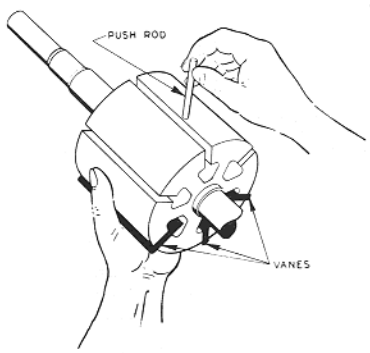

Fig. 5 — Inserting Push Rods

VANES

When installing the vanes, be sure the rounded or beveled edge is outward to contact the surface of the cylinder, with the relief grooves facing the direction of rotation (refer back to Figure 2). 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 rotate to the next slot.

HEAD ASSEMBLY

Before installing the head assembly, check the shaft for burrs or roughness which could damage the mechanical seal O-rings. A small amount of oil applied to the shaft will help slide the parts in place.

Place the head assembly on the shaft with the Blackmer name in an upright position, and with the tell-tale hole at the bottom. Check again to make sure the disc relief hole is adjacent to the intake side of the pump. Slide the head against the cylinder.

Install and partially tighten four (4) head capscrews, 90° apart, on each end of the pump. The capscrews should be tightened enough to squeeze the head O-ring and allow metal to metal contact between the head and cylinder. Rotate the shaft by hand to test for binding or tight spots. If the rotor does not turn freely, lightly tap the rim of the heads with a lead hammer to better center the rotor. Recheck for binding. When the correct position is found, install the remaining head capscrews and fully tighten all capscrews.

LOCKNUT ADJUSTMENT

The pump must be free turning with all head capscrews tight before making an adjustment on the locknuts. The purpose of locknut adjustment is to center and maintain the pump rotor between the heads.

It is very important that the bearing locknuts and lockwashers are installed properly. Overtightening locknuts will cause bearing failure and/or a broken lockwasher inner tang "A" (see Fig. 6). Loose locknuts will allow the rotor to shift against the discs, causing wear.

The following is the proper method of installation:

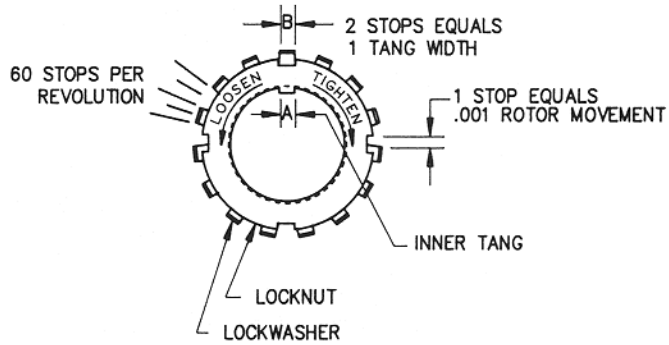

Fig. 6 — Locknut Assembly

1. Install the lockwashers with the tangs facing outward, and the locknuts with the tapered face inward. Be sure the inner tang "A" (see Fig. 6) does not slip out of the tang slot. Bend the tang toward the slot if necessary.
2. Using a spanner wrench, tighten both locknuts to be sure that the bearings are bottomed in the head recess. CAUTION: Overtightening will bend or shear the inner tang.
3. Loosen both locknuts one complete turn.
4. Tighten one locknut until a slight rotor drag is felt when turning the shaft by hand.
5. Back off the nut the width of one lockwasher tang "B" (see Fig. 6) or two stops. Secure the locknut by bending the closest aligned lockwasher tang into the locknut slot. The pump should now turn freely when rotated by hand.
6. Tighten the other locknut by hand until it is snug against the bearing and the bearing is firmly seated in the head recess. With a spanner wrench, tighten the nut the width of one lockwasher tang "B" (see Fig. 6) or two stops. Secure the locknut by bending the aligned lockwasher tang into the groove in the locknut. The pump should continue to turn as freely as before adjustment.
7. A check of adjustment may be made by grasping the nut and washer with finger pressure and rotating back and forth. If this cannot be done, one or both nuts are too tight and the nuts alternately should be loosened one stop, or 0.001" (0.025mm) at a time until the washer can be moved, starting with the last adjusted nut.

GREASE SEAL

If the grease seal has been removed from the bearing cover it must be replaced prior to attaching the bearing cover to the pump. Apply a small amount of grease to the outside diameter of the grease seal and push it into the bearing cover cavity with the lip of the seal pointing inwards, towards the cavity.

BEARING COVER

Slide the bearing cover gasket and the bearing cover onto the shaft. Install and tighten the bearing cover capscrews. Make certain the inside diameter of the cover is centered on the shaft.

PUMP TROUBLES AND THEIR CURES

LEAKAGE

New mechanical seals may leak slightly until the mating surfaces have had an opportunity to seat properly. If the leakage becomes excessive or continuous, the mechanical seal should be replaced. Leakage will appear at the tell-tale hole under the bearing housing.

If there is leakage between the pump head and cylinder, the head should be removed and checked for burrs or dirt. Also, check the face of the cylinder to make sure it is clean and smooth. Gently file any burrs or rough spots. Head O-rings should be inspected for cuts or nicks, and replaced if found to be damaged. Be sure the O-ring has been correctly installed in the groove before reinstalling the head.

ESCAPING GREASE

Grease will appear at the grease relief fitting on the bearing cover after normal greasing of the pump. The amount should not become excessive nor continue for an extended period of time. If it continues, remove the grease relief fitting and examine for damage. Replace if necessary.

If excessive grease escapes around the pump shaft, remove the bearing cover and inspect the grease seal for damage. Reinstall the bearing cover with the grease seal centered on the shaft.

NOISE

If a pump has been drained and flooded with air there may be some noise in the relief valve when the pump is next started. It is usually of short duration, and will not damage the pump.

Pumping liquids under cavitation conditions with partial recirculation through the relief valve will result in excessive valve noise. A separate bypass valve piped back to the supply vessel is recommended under these conditions.

Excessive vacuum on the pump due to restricted suction can cause cavitation noise. There are several possible causes of excessive vacuum.

- Piping too small.
- Strainer plugged or dirty.
- Undersized or restricted fittings, such as globe valves, or partially closed valves.
- Check valve on ''jumper hose'' improperly adjusted.

If the pump is run for extended periods with a closed discharge, causing the liquid to circulate through the relief valve, vaporization will occur and create excessive noise.

Exceeding the recommended maximum speed can also cause noise in the pump.

If all of the above have been checked, and the pump is still noisy and not delivering the rated capacity, the vanes should be examined for possible damage.

DAMAGED VANES

Vanes can be damaged by the following:

- Pumping abrasive liquids.
- Pumping liquids which chemically attack the vane material.
- Foreign objects entering the pump.
- Pumping liquids of too high viscosity.
- Excessive heat.
- Incorrect vane installation (see ''Replacing Vanes'').
- Cavitation.
- Excessive vibration.
- Overspeeding.

It is advisable to replace the vanes if they indicate push rod penetration, are worn unevenly, or have raised projections on the wearing edge.

If the damaged vanes are swollen or jammed in their slots, it may be necessary to remove the rotor and shaft in order to drive them out. Refer to ''Replacing Vanes'' for installation instructions.

LOW DELIVERY RATE

Low delivery rate may be caused by:

- Relief valve set too low.
- Too much restriction in the suction line.
- Damaged parts in the pump.

ROTOR AND HEAD WEAR

Excessive end thrust on the pump shaft will cause the rotor to wear into the discs. Worn universal joints or a slip-joint that does not slip under load are the two most common causes for excessive end thrust on the pump shaft. The most effective slip-joint is a well lubricated close fitting splined slip-joint. These commercially manufactured slip-joints will move axially under a high torque (rotating load). If the slip joint is worn, dry or dirty, it will slip axially when the pump is not running; but will become rigid when under load with the pump running. This can result in severe end thrust and wear to the pump.

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