Z-Series Maintenance

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Z & PZ Series Pumps

Pumps all have suction and discharge pressure openings.

The following slides depict a Z4500, but all Z Series pumps are repaired the same. The PZ Series do not have a “cam” or liner, but otherwise are the same.

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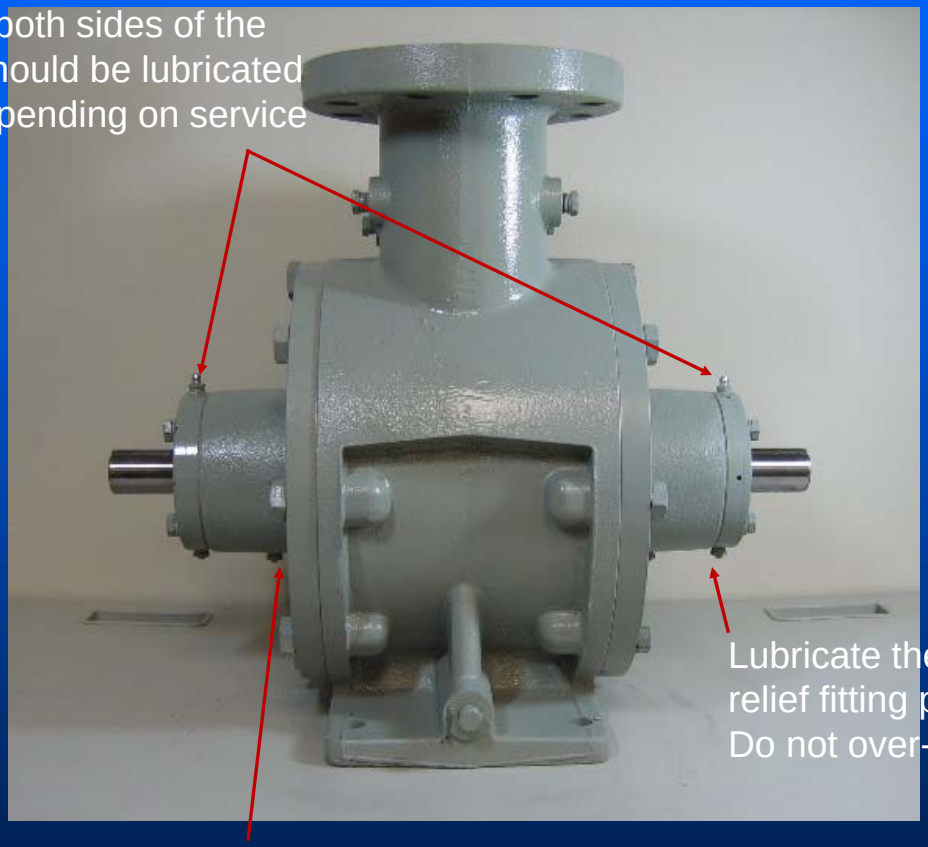
Grease fittings

Grease fittings are on both sides of the pump. Typical pump should be lubricated every 1 – 3 months depending on service



Lubricate the bearings only until the relief fitting pin moves.
Do not over-grease!

A seal vent is located on the bottom of each head.

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Head Removal

Remove the head bolts. There are threaded holes that may be used if needed to “push” the head off of the casing. If just changing a seal be sure to hold in on the shaft during the removal of the head. This maintains it in the opposite seal assembly.

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Seal Change

To change a seal assembly, this is as far as is needed to disassemble the pump.

The seal needs to be removed from the head and spring and carbon removed from the shaft and replaced.

The head O-ring and inner grease seal comes with the seal assembly and may also be changed.

The inside of the head and the shaft should be cleaned before installing a new seal. The seal may be lubricated with a light oil or spray lubricant during assembly. Seals are precision parts and care must be taken during handling. **KEEP HANDS CLEAN!**

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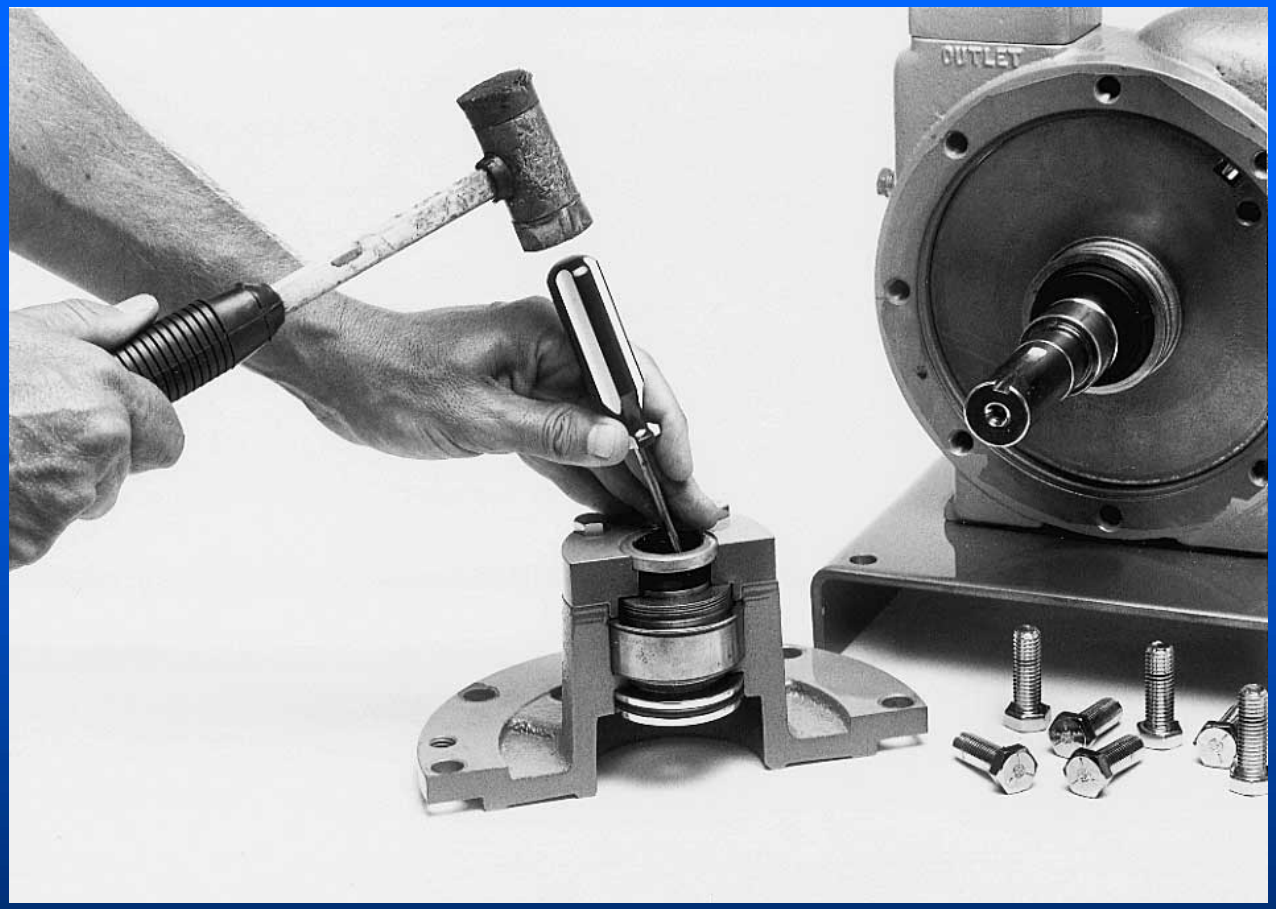
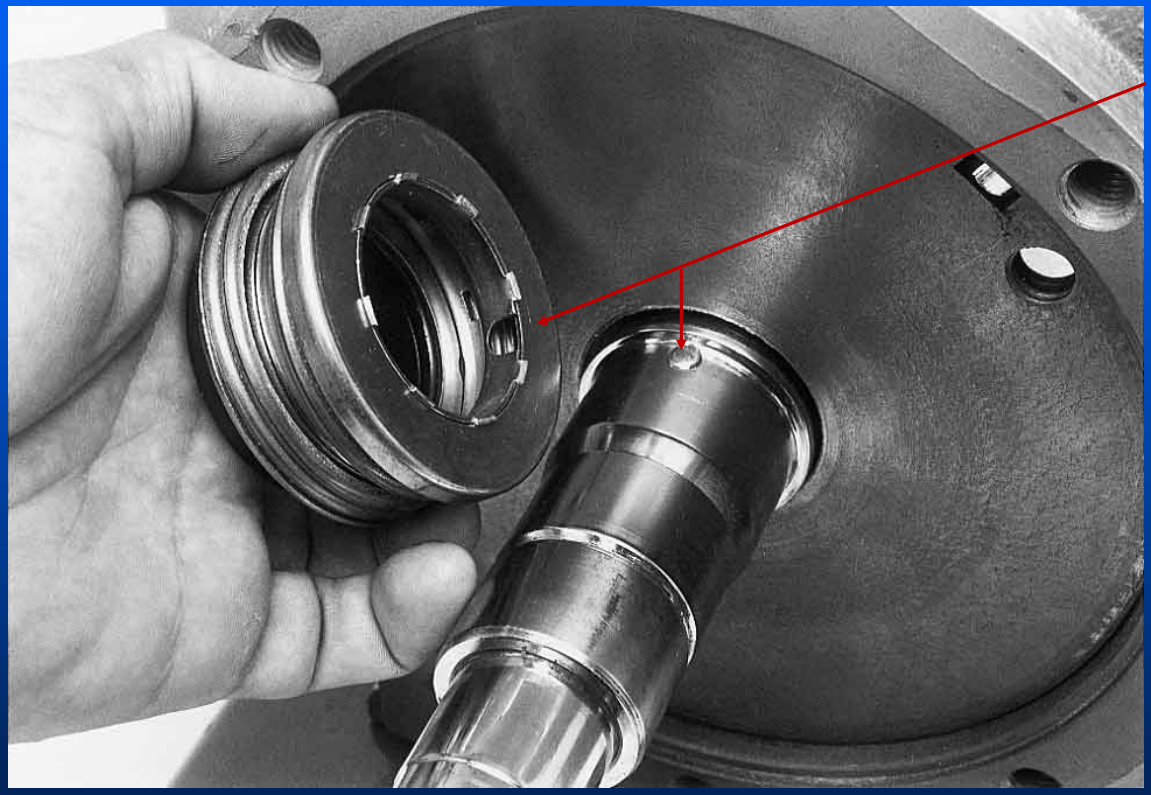


Lightly tap the seal seat out of the head with a long screwdriver by reaching through the bearing or bearing cap. Inspect the inner lip seal and remove, if necessary, using the same process. The inner lip seal comes with a seal assembly.

Seal Spring Alignment



The seal spring has a notch that must align with the pin on the shaft. It is best to install the spring first, then install the carbon and O-ring.

The seal may be lubricated with light oil or a spray lubricant.
Seal are precision parts.
Care should be taken handling the seal faces.
KEEP HANDS CLEAN!

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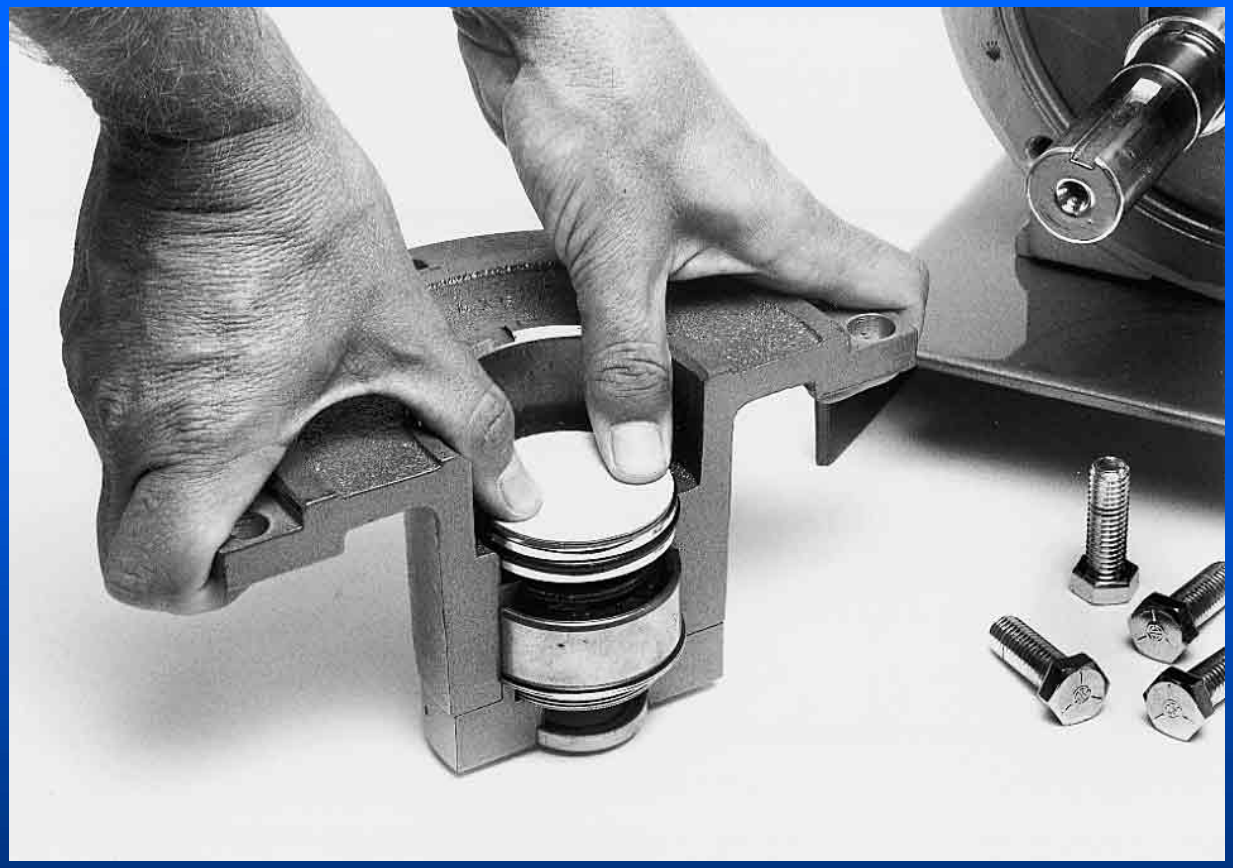
Z4200/Z4500 pin and notch

The seal “vent” is drilled through the head. On a Z4200 and Z4500 there is a pin installed to lock the seat into position. On the smaller Z and PZ pumps the seat is held in position by the O-ring pressure. There is a notch on the seat of the Z4200/Z4500 that must be aligned with the pin during assembly.



Install the new inner grease seal face down by pressing it into the bore behind the main bearing. This can best be accomplished using the old seal seat with the O-ring removed. Apply a generous amount of light oil to the new seal seat. Using the protective disc, gently press the seat into place.

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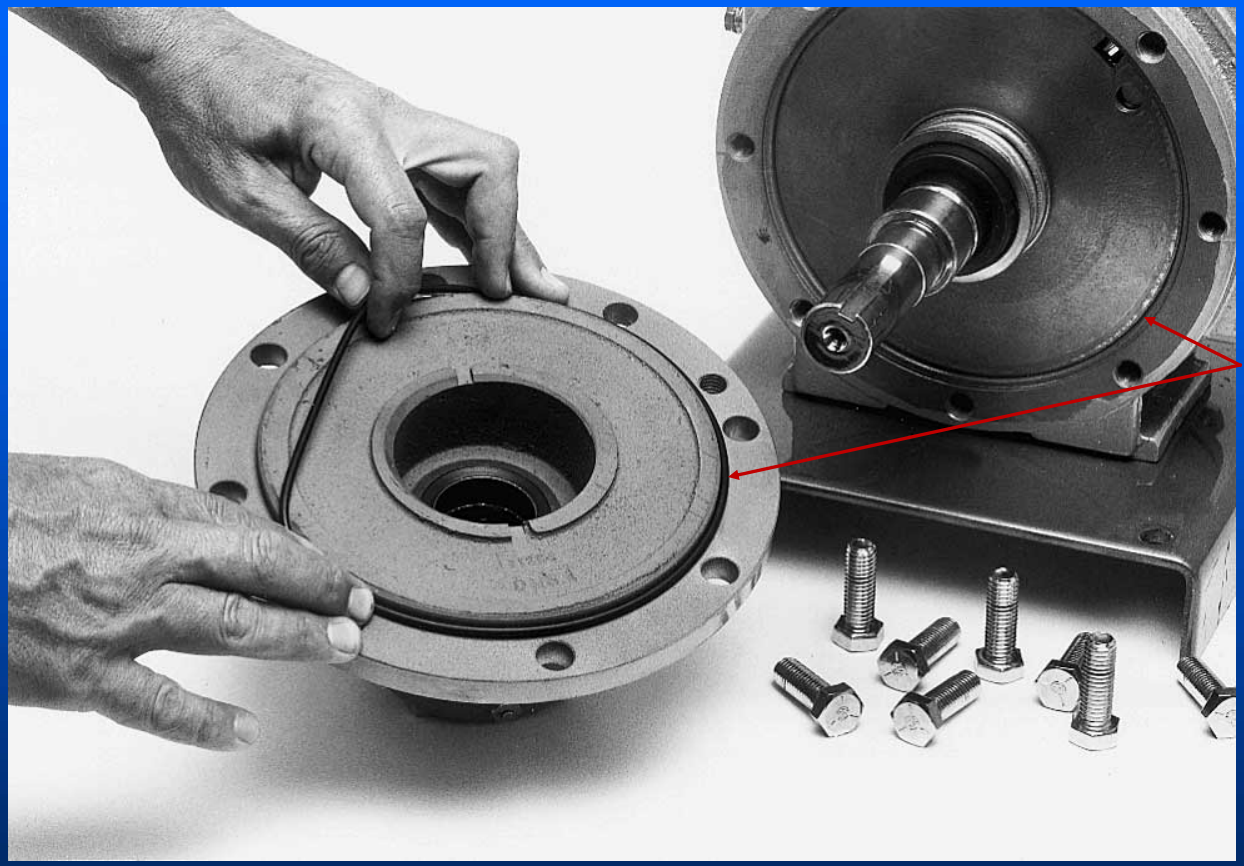

Clean the corner of the head and the case before installing the new O-ring.
O-rings should be lubricated with a light oil or grease.
The seal faces may be “rinsed” just prior to installing the head assembly using a spray lubricant. This will remove any small particles that may be on the surfaces.

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Seal Assembly

The seal assembly includes the seal parts along with the head O-ring and inner grease seal

<<<< This is as far as one needs to go if only changing the seal assembly! >>>>

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Bearing Cap Removal

The main bearings should be checked for clearance before disassembling the pump. This is done by grabbing the shaft by hand and attempting to move it up and down in the head. The bearing cap and shims may be removed for bearing inspection and replacement. Normally the same shims are used in rebuilding, but must stay on the same side of the pump along with the head and other parts. Shim adjustment is discussed in another slide.

Bearing Removal

The main bearing can be removed by removing the spiral retainer ring and pressing the bearing out from the back side. Both the inner and outer bearing should be changed together. The bearings may be “pre-packed” with grease during assembly, but it is not required.

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Thrust Bearing & Shims

The thrust bearing has three parts, two washers and a bearing. The bearing can be pre-packed during assembly.

The amount of shims vary. The thicknesses are: Red = 0.002”, Brown = 0.010” and Yellow = 0.020”. Usually installing the same shims is correct unless a case, head or rotor shaft assembly is changed.

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Main and Thrust Bearings

Bearings should be lubricated a minimum of every three(3) months, and suggested to be monthly. It is recommended that the pump bearings along with the PTO shaft bearings and U-Joints all be lubricated when the truck chassis is being lubricated. Lack of lubrication is the normal cause of bearing failures. Use a “low temperature” bearing grease such as CITGO Mystik LT-200, Mobil Mobiltemp SHC 32 or similar.

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The sideplate can now be removed using a head bolt to assist. This allows access to the inside of the pump for inspection of the blades and cam. Note the pins will fall if the lower blades are removed.

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Sideplates

Scoring on sideplates may be caused by foreign materials such as rust, welding slag and other materials being pumped. Light scoring will not typically reduce pumping performance. Sideplates may be reversed or “flipped over” on all Z and PZ pumps.

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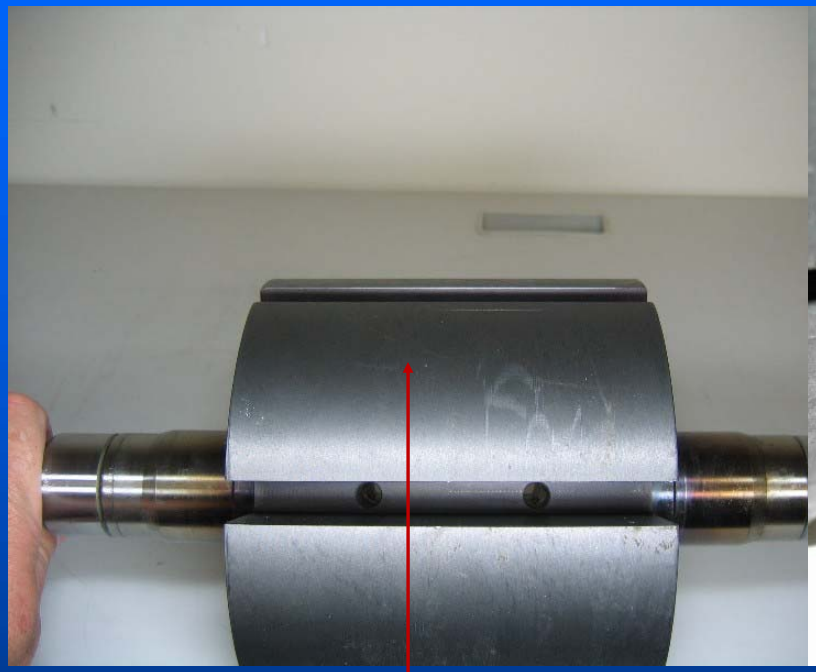
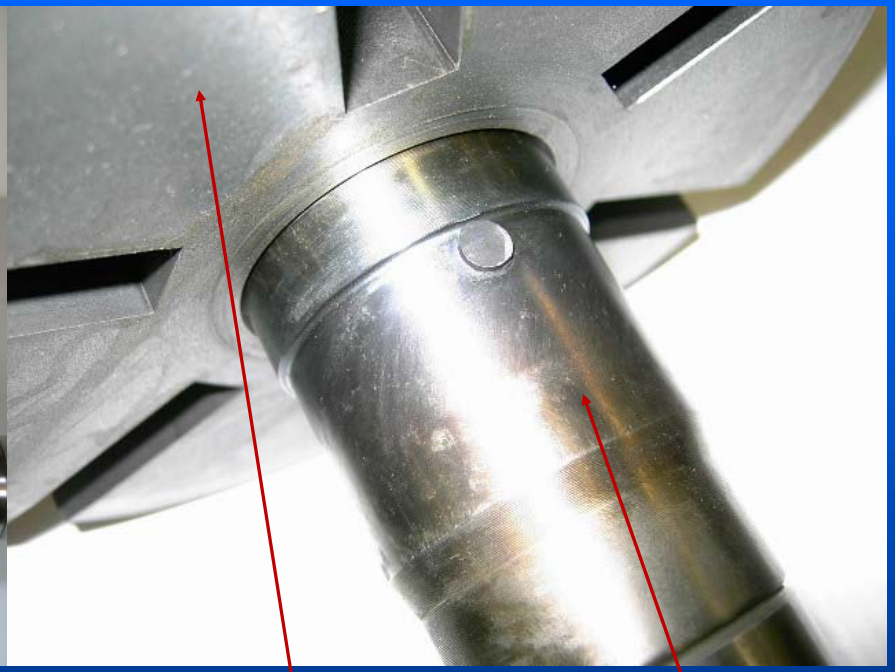


Inspect rotor outside diameter for scoring and wear. Wear in this area is typically caused by foreign material such as rust welding slag, etc.



Inspect the side of the rotor and the shaft OD where the seal O-ring rests for scoring and pitting. The shaft can be polished if needed. A file should be used to remove any burrs.

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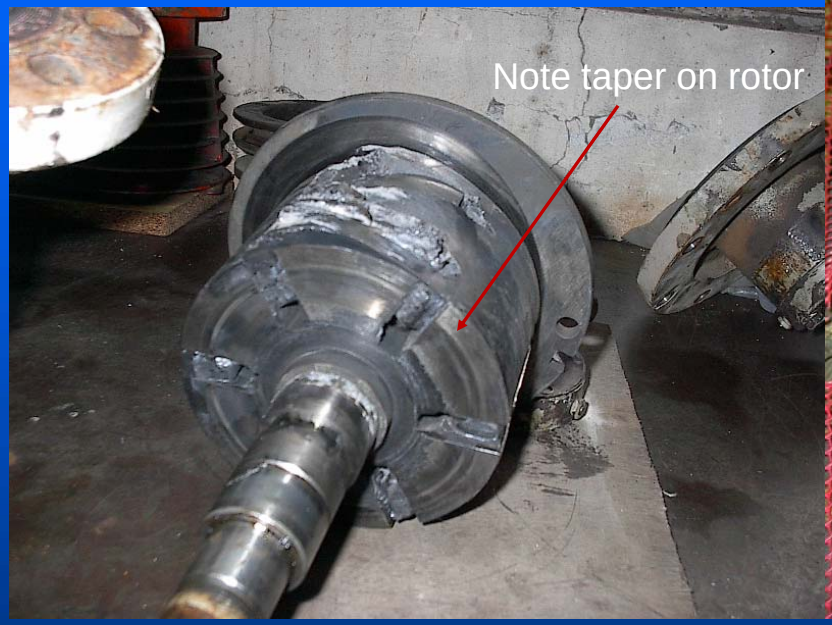
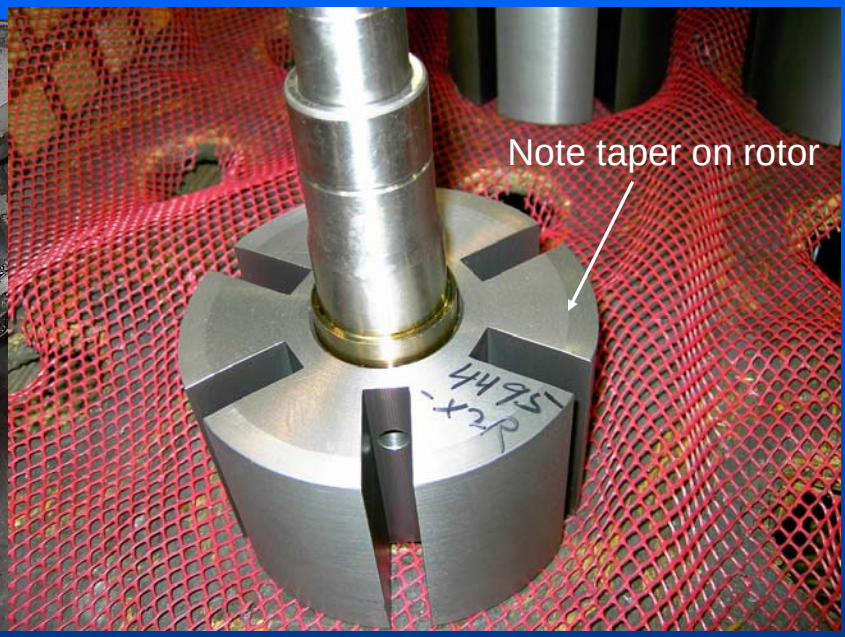
Rotor Shaft





The Rotor/Shaft assembly normally does not need to be changed. It usually is only damaged if foreign material is ran through the pump or if the bearings are not maintained. The rotor has a “taper” towards the outside diameter. If the taper can still be seen, the shaft is probably re-usable.

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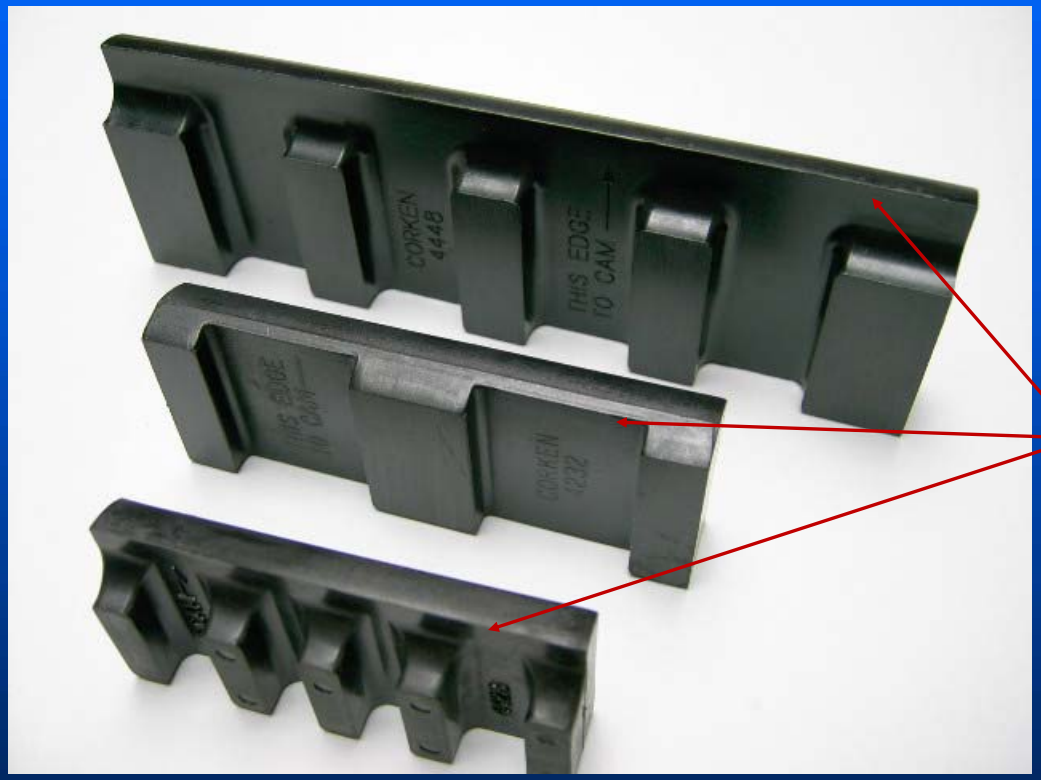
Z/PZ Blades



The leading edge of the blades must be toward the direction of rotation.

Z/PZ Blades vary in design of the leading edges and notches.

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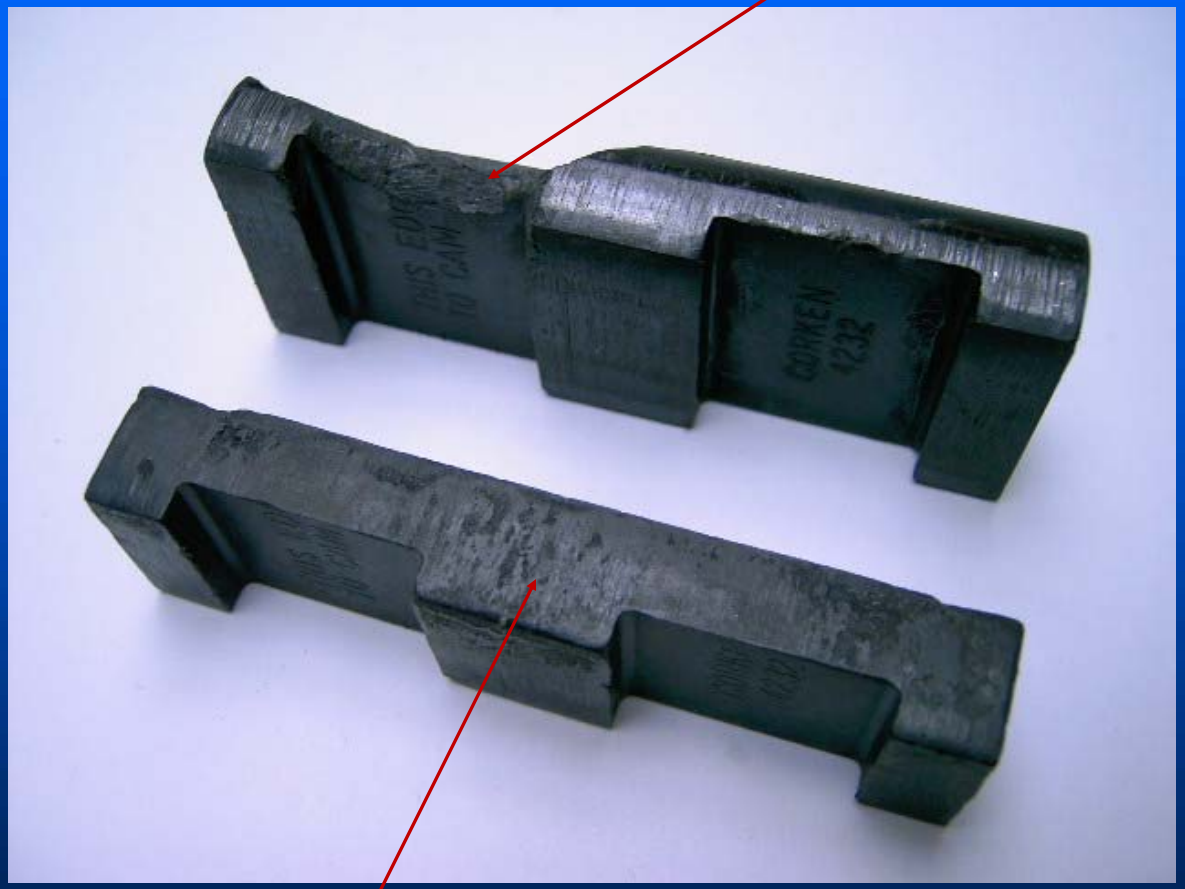
Blade damaged from foreign material



Blade damaged from “dry” running, and melted.

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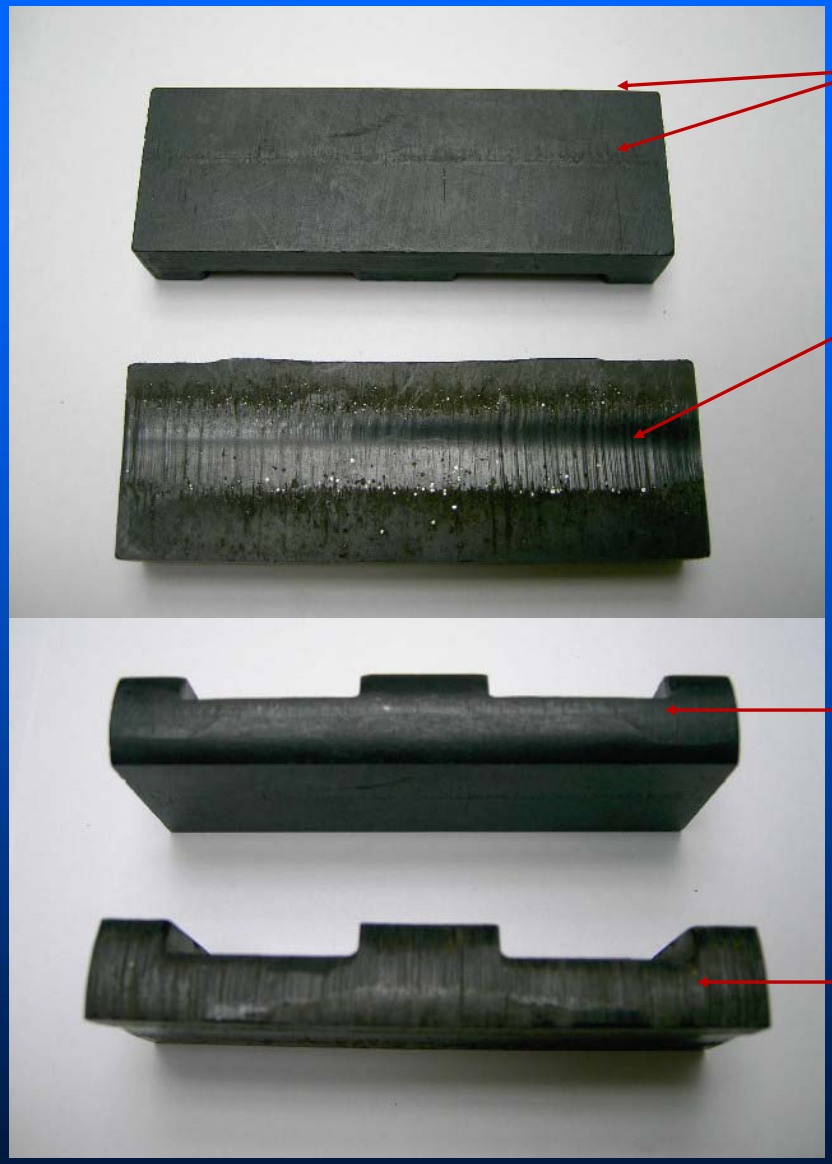

Blades should be inspected on both the back and the top that wears on the cam.

The higher the differential the more the “back” wear on the blade. Note the foreign material embedded in the blade. It appears to have had welding slag or other material go through the pump

Normal wear, operating with clean liquid.

Excessive wear from dry running and foreign material.

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Drivers/Pins

Corken pins are designed with a softer material than the blades. This is to have the pins fail before major damage occurs in the pump.

Typically pins are damaged from operating at excessive RPM or in a “dry” condition.

Pump RPM is many times controlled by electronic throttles, but pumps frequently operate dry on trucks at the end of the tank load.

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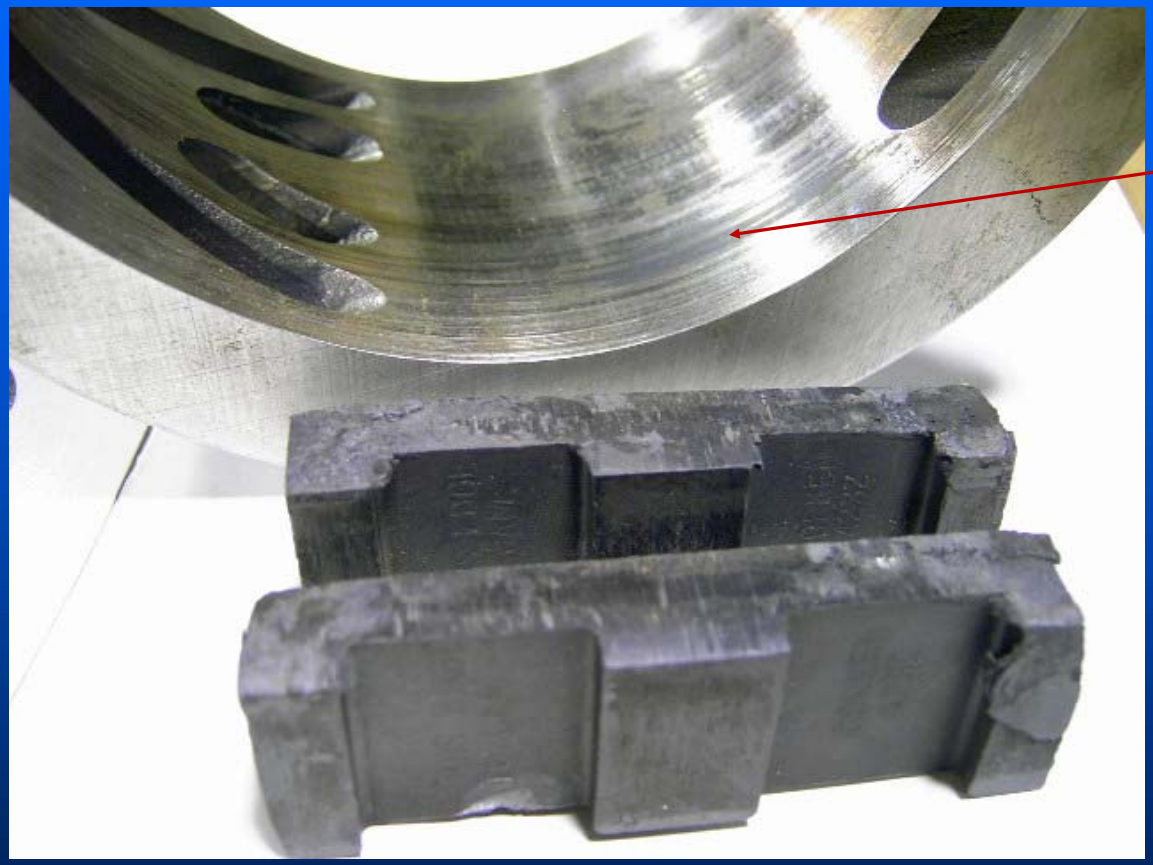
Melted blades – Dry Running



Melted blade material in cam Inside diameter.

If a pump operates “dry” for very long it is possible to melt the blades.

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Cam/Liner

Cams or liners are marked for inlet and outlet or suction and discharge. They must be installed correctly or there will be a decrease in capacity and and increase in noise and wear. Typically the inlet will have more or larger openings.

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The PZ pumps do not have a replaceable cam.

The cam may be removed by using a pieces of hardwood and tapping around the outer edge of the casting. The cam should be inspected for wear and scoring on the inside diameter. Small scratches seldom reduce pump efficiency, but if deep grooves are present the cam should be changed. “Washboard” type wear is usually caused by cavitation and the cam should be replaced.

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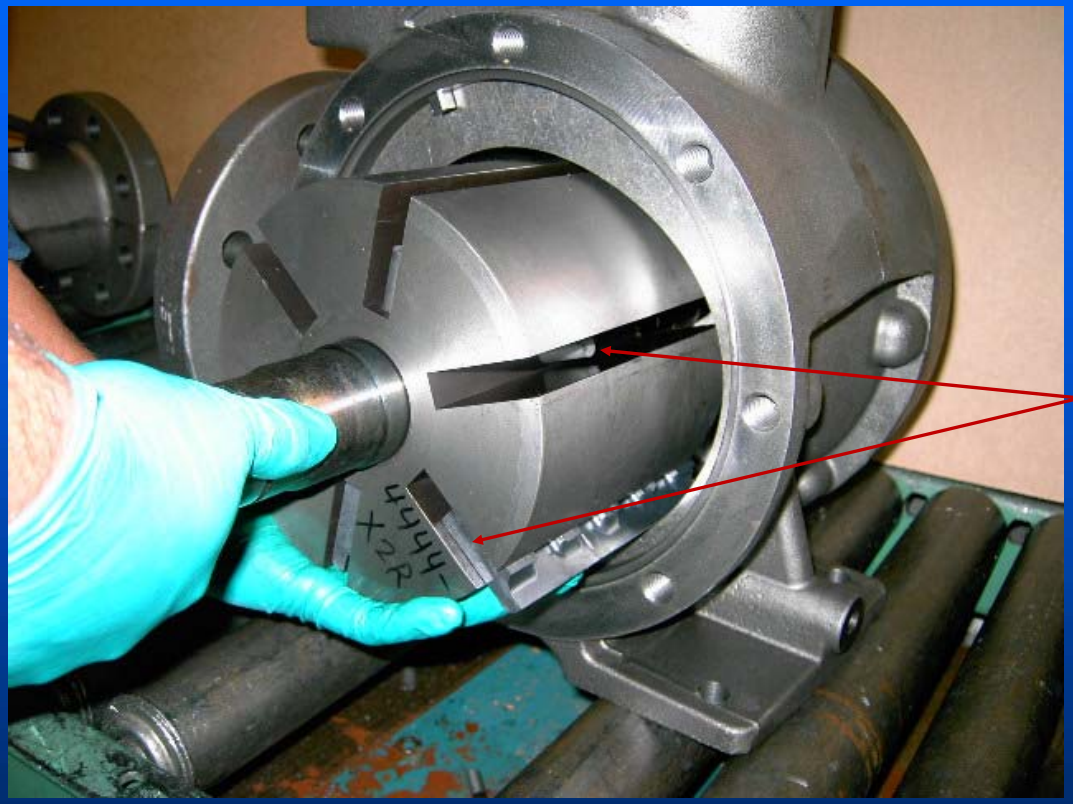
Installing Rotor



Insert the lower three blades and pins and support with lower hand during installation.

Install the opposite head with bearing and sideplate , but with out the seal. Support the rotor and shaft with one hand and guide with the other hand. Insert three blades and the pins, then with the supporting hand hold the blades and pins in position. Once shaft is installed insert the remaining blades.

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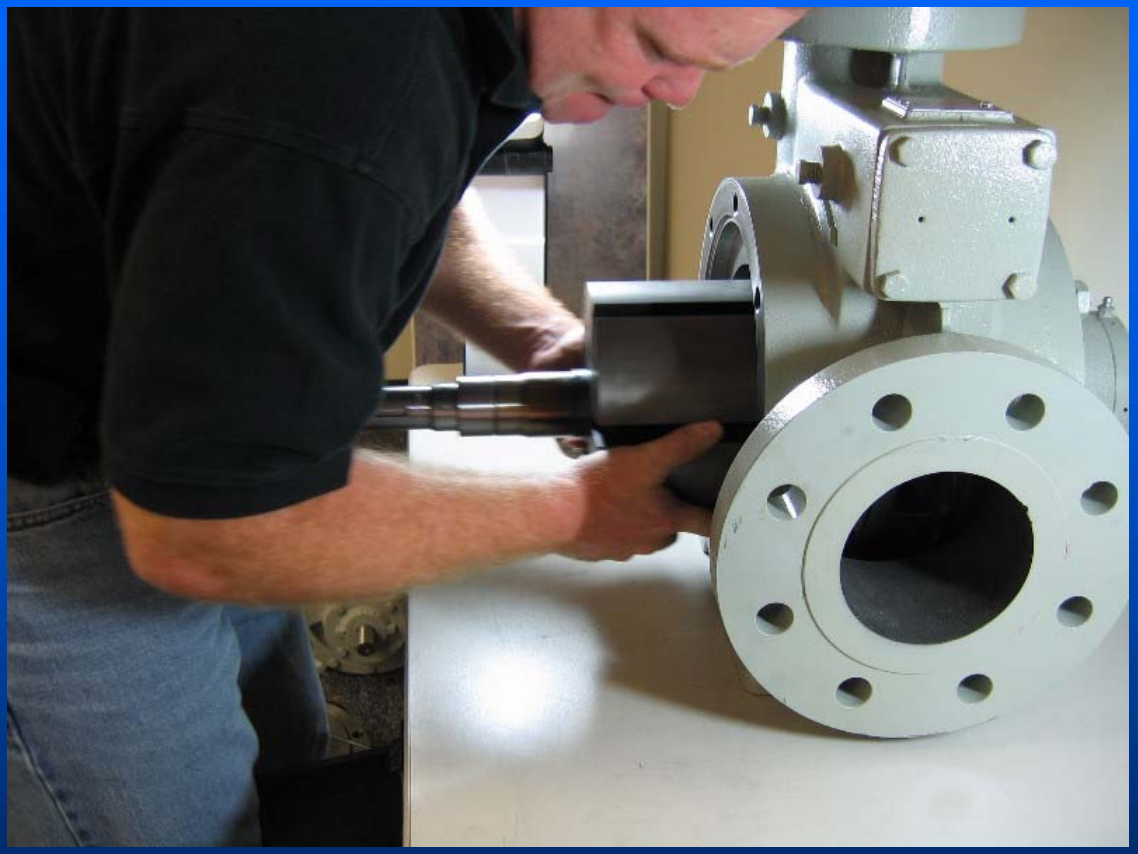

Install the sideplate and seal assembly before installing the second head assembly. Remove the first head and install the seal assembly on opposite side. Tighten all bolts and confirm the pump turns freely before checking the shimming.

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Shimming – First Side

Normally a pump is rebuilt using the same shims removed.

To shim a pump install the first thrust bearing with the mounting ring. Install the first bearing cap without shims, tightening the bolts by hand.

Using a thickness gauge check the clearance between the bearing cap and head. What ever the clearance is, add shims equal to the amount plus 0.006 inches. An example would be if the clearance was 0.024 inches, one would add 0.030 in shims and tighten the bearing cap bolts.

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Shimming – Second Side

Using a thickness gauge to confirm clearance between the bearing cap and head. Add 0.002 inches in shims more than the measured amount.

Follow the guides from the first side, but only add 0.002 inches more shims than the amount measured. An example would be if the clearance was 0.026 inches, one would install 0.028 inches in shims and tighten the bearing cap bolts. Confirm the pump rotates freely, if not add 0.002 more shims in the second side and re-check.

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Relief valve – Z Series

The internal relief valve is a “safety relief”. It is not a “bypass valve” and should only open if excess pressure is created. This valve is pre-set from the factory at around 150 PSI differential. The pressure can be increased by adding shims. The valve should be inspected for wear or rust if the pump is rebuilt. If wear is noted, the “external” bypass setting should be checked. This valve should not open during normal operation.

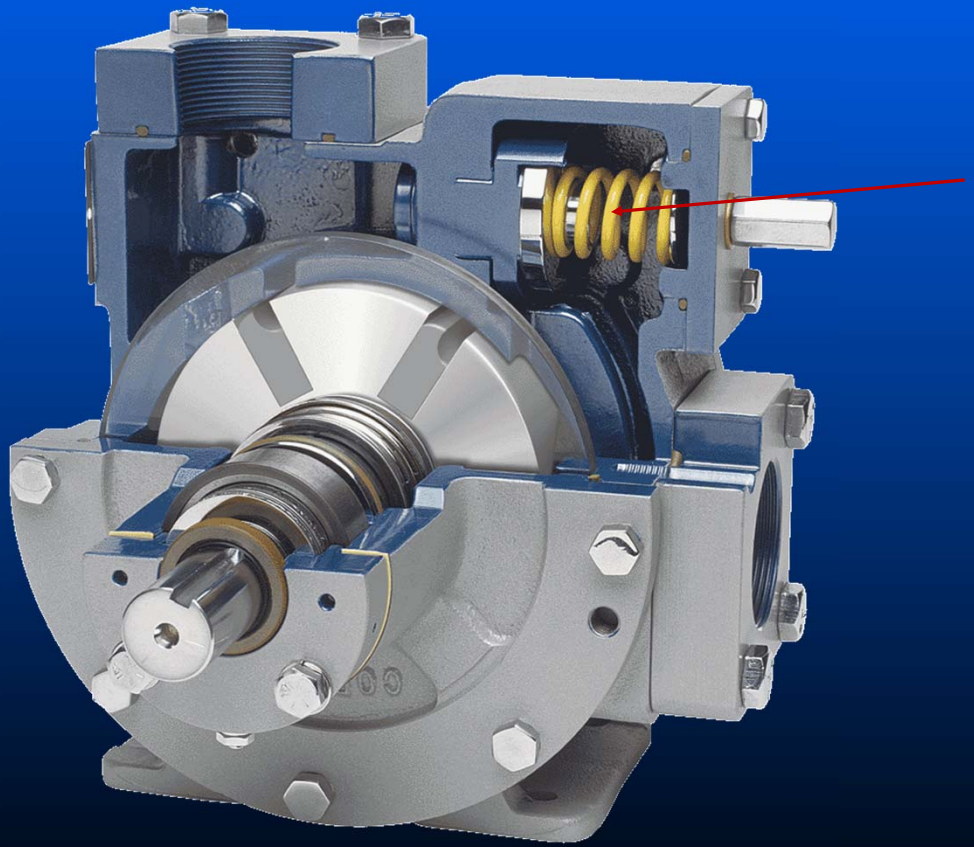
These areas should not be worn. If wear is noted, the pump has been operated at excessive pressures.

Z3200

Z2000/Z4200/Z4500

PZ Series Bypass

The internal bypass is available in either standard adjustable or “Air Operated Valve” (AOV). The bypass valve should have little wear. The seat area along with the outside diameter should be inspected for wear or damage, change if necessary. The adjustment set point depends on the application. Normal setting for a fuel truck is around 80 - 90 PSI. The “AOV” bypass will be set at two pressures, high and low. See pump, “Instruction, Operations & Maintenance Manual” (IOM) for directions and adjustments.



The internal bypass valve controls the pressure the pump puts out toward the hose. By increasing the pressure, you may increase flow, but you should never exceed the pressure rating on the system.

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Be sure to rotate the pump to assure it turns freely. Grease the pump before putting it into service. ALWAYS PRESSURIZE LIQUIFIED GAS PUMPS USING VAPOR!

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Thank you for your attention!

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