Replacement of V-pack or U-cup Seals With V-pack Seals

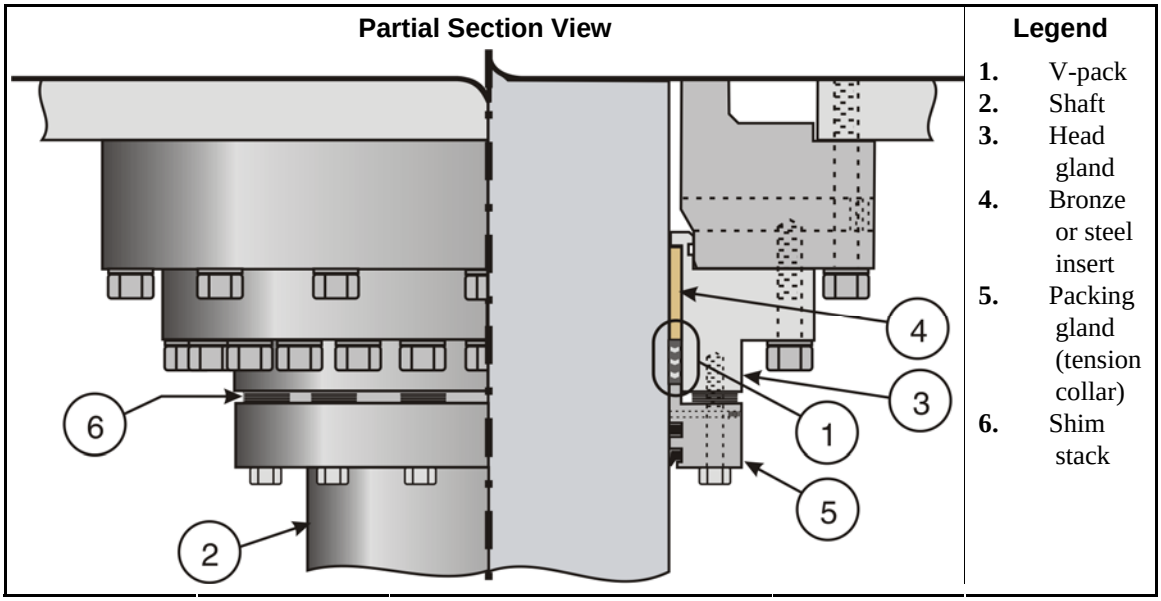
NOTICE P1: "Remove power from the machine" means use the necessary safety procedure for your location. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.

There are replaceable seals just above where the ram shaft comes out of the ram assembly. Usually a small quantity oil escapes past these seals. If the leakage becomes excessive, the seal(s) must be replaced. These seals can be either a V-pack or a single U-cup seal. Replacement with V-pack seals, explained here, is a relatively simple procedure because the seals are split to wrap around the shaft. V-pack kits are available from from the Milnor Parts department for each ram size. The U-cup seal is thought to be somewhat more effective, but it cannot be split for installation and requires removal of the platen from the shaft. This is a much more lengthy and difficult procedure. If you prefer to use a U-cup seal, speak to the Milnor Service department.

1. How the V-pack Works

Referring to Figure 1, the V-pack (1) is a stack of hard rubber seals that wrap around the shaft and fit together in a vee groove profile. Replacement seals can be split or endless. If they are endless, you can split them so that you can wrap them around the shaft. The V-pack fits into a cavity between the shaft (2) and the head gland (3). Most of this cavity is filled by a bronze or steel insert (4). The remaining space is for the seals. A packing gland (5), also called a tension collar, bolted to the head gland controls the V-pack fit. Shim stacks (6) at each bolt position between the head gland and the packing gland must hold the V-pack at a zero clearance fit. The nominal height of the shim stack for a new V-pack for 14, 16, and 18 inch rams is 1/2" (23 mm). The nominal height for the 13 inch ram is 3/8" (9.5 mm). However, V-packs have a large manufacturing tolerance. It is necessary to determine the actual shim stack height based on measurement of your V-pack. Milnor recommends against removal of shims from the shim stack as a way to reduce oil leaks after a V-pack becomes worn. This method risks compression of the V-pack.

Figure 1: V-pack Installed



2. Precautions

This instruction gives the concept of seal replacement, but not a step-by-step procedure. The maintenance can be somewhat different for different field conditions. You must understand hydraulic equipment and be able to apply this information to your specific condition.

WARNING 1: Crush hazard—You can be crushed by the falling ram.

- Do this maintenance with the ram and the container (the can) fully down. The diaphragm and the container must rest on the press bed.
- Do this maintenance with power removed (see Notice P1).

CAUTION 2: Injury to eyes and skin—Hot hydraulic oil can splash on you

- Wear eye protection and use care when you open hydraulic lines and remove old seals.

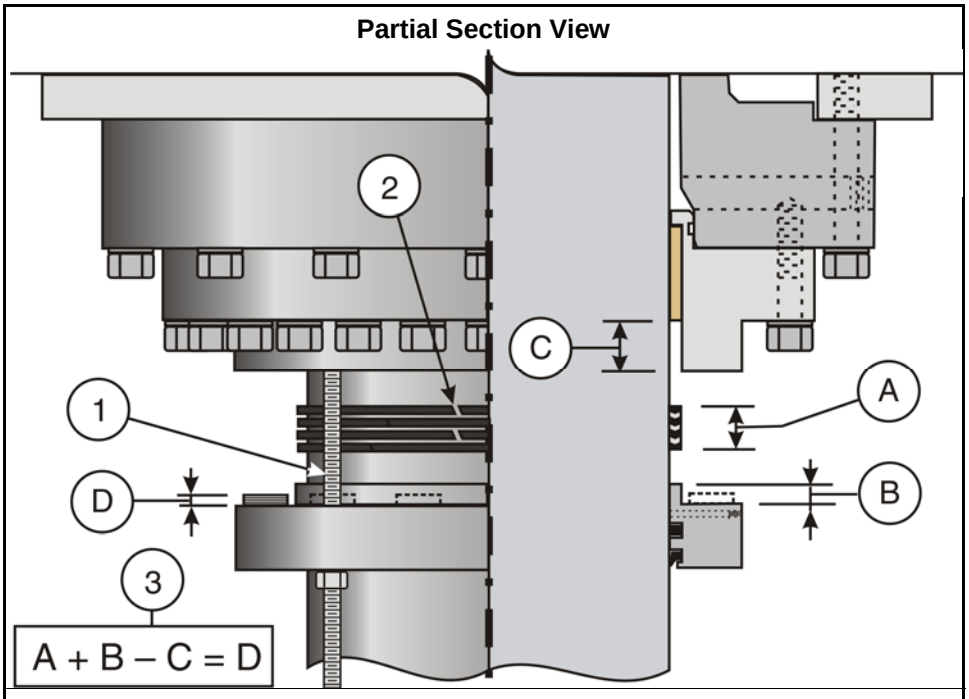
CAUTION 3: Risk of damage and hydraulic leaks—If the shaft is scored during, or as a result of this maintenance, costly repair or replacement of the ram shaft will be necessary.

- Avoid any procedure that can cause damage to the shaft surface.

3. Concept of V-pack Replacement

Study Figure 2 and the points given below the figure before you begin the maintenance.

Figure 2: V-pack Installation in Progress



Legend

1. One of two all-thread rods used to lower the packing gland (tension collar).
2. New V-pack wrapped around shaft. Stagger splits in adjacent seals 180° apart.
3. Formula to determine required height of shim stack. See A, B, C, and D, below.
A. Height of your V-pack.
B. Height of lip on packing gland.
C. Height of V-pack cavity.
D. Height of shim stack necessary for this V-pack to achieve a zero clearance fit.

Observe the following points when you do the maintenance:

- This maintenance is a two person job.
- Use two all-thread rods to lower the packing gland. On large rams, the packing gland weighs approximately 100 pounds (45 kg). Provide 8" (200 mm) minimum work clearance between the head gland and the packing gland.
- The safest way to remove the old seals is with air pressure. See Section 4.
- If the old seal is a U-cup, you will see a UHMW ring pushed out of the seal cavity with the U-cup seal above it. Cut the U-cup seal to remove it. The UHMW ring is already split.
- If the replacement seals are not pre-split, cut each one carefully at a 45 degree angle with a razor blade or similar tool to split it.
- Install the seals with the vee profile straight up, not inverted.
- Stagger the splits between adjacent seals 180 degrees apart to gain the longest oil path.
- Use the shim stack that gives the V-pack a zero clearance fit; that is, no gaps between seals and no seal compression. Gaps will permit excessive oil to leak. Compression can cause shaft damage and will inhibit ram free fall during operation. V-packs have a large manufacturing tolerance. Measure carefully, as shown in Figure 2, to determine the correct shim stack height to achieve a zero clearance fit. Table 1 gives the two shim sizes available from the Milnor Parts department.
- Some V-packs include a top-most plastic seal that has small protrusions (about 1/4" (6 mm) diameter by 1/4" (6 mm) tall) along the top surface. Include these protrusions in your measurement of the height of the V-pack.
- Push the new seals into the seal cavity slowly and carefully. Make sure that adjacent seals fit together correctly and that no portion of a seal becomes twisted.
- Use the same overall height (thickness) of shim stack at each bolt location to hold the V-pack uniformly around its entire circumference.
- When you re-attach the packing gland (tension collar), tighten the bolts using an alternating pattern. Tighten as specified in document BIUUUM04 “Fastener Torque Requirements” in the service manual.

Table 1: Shims Used on Shaft Seal Tension Collar

Type	Milnor Part Number	Thickness	
		Inch	Metric
Thick	15U314C	0.073	1.85 mm
Thin	07-10237	0.05	1.27 mm

4. Use air pressure to remove the old seals.

If you use tools to grab and pull the seals out, you risk costly damage to the ram shaft. It is much safer to push the seals out with air pressure. However, you must use care not to push the metal insert out also. In most presses, this insert is held in position by a thread-locker material that creates a bond between the insert and the head gland. But this bond can be broken. There is sufficient clearance between the insert and the shaft for air to pass. It takes more air pressure to push out the metal insert than to push out the seals, but not much more. The objective is to gradually increase the air pressure just until the seals come out.

When the ram was moved fully down (the diaphragm rests on the press bed), all but a small quantity of residual oil came out of the rod end of the ram cylinder. The cap shown in Figure 3 is on the rod end hydraulic line. Be prepared to catch residual oil in a bucket and remove this cap.

Although you can set up a more robust air connection if desired, you can simply use a clean rag to form a partial seal and hold an air nozzle tightly in the pipe as shown in Figure 4.

One person with suitable eye and skin protection observes the old seals as they come out. Another person applies air pressure. Start with low air pressure and gradually increase until the seals come out. As soon as the seals come out fully, some residual oil will spray out of the seal cavity. **Replace the cap as soon as the seals are pushed out.**

Figure 3: Cap to Remove from Hydraulic Line

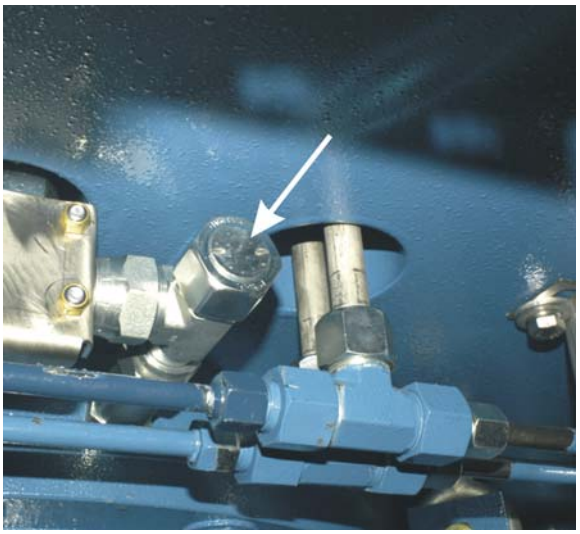


Figure 4: How To Apply Air Pressure to Seals

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