

## PUMP PACKING INSTALLATION AND ADJUSTMENT INSTRUCTIONS

The importance of packing the pump correctly cannot be overemphasized. Many packing failures are due to incorrect installation of the packing. Refer to the instructions below to ensure effective installation of packings in pumps.

1) **FOLLOW PLANT SAFETY REGULATIONS** in preparation for and during installation.

2) **REMOVE ALL OLD PACKING FROM THE STUFFING BOX** (see Figure 41). Packing extractors and water jets are suitable tools for removing packing without damaging the stuffing box. Clean the box and shaft or sleeve thoroughly and examine the shaft for wear and scoring. Replace the shaft or sleeve if wear is excessive. Make certain that the shaft is concentric to the bore of the stuffing box.

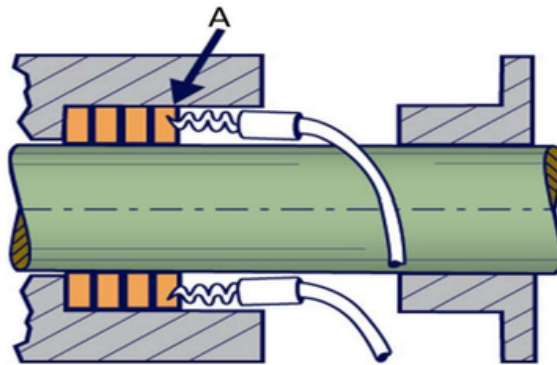


Figure 41. Packing Removal

A: Point away from shaft at 90°

3) **USE THE CORRECT CROSS-SECTION OF PACKING OR DIE-FORMED RINGS.** To determine the correct packing size, measure the diameter of the shaft or sleeve inside the stuffing box area, if possible, to determine the inner diameter (ID) of the ring. Then, measure the diameter of the stuffing box or bore to give the outer diameter (OD) of the ring. Subtract the ID measurement from the OD measurement and divide by two. The result is the cross-section size.

4) **WHEN USING COIL OR SPIRAL PACKING, ALWAYS CUT THE PACKING INTO SEPARATE RINGS.** Never wind a coil of packing into a stuffing box. Rings can be cut with butt (square) or skive (or diagonal) joints, depending on the method used for cutting (see Figures 42 and 43). Be sure the first ring is cut carefully and tested on the shaft for proper fit. The best way to cut packing rings is to cut them on a mandrel with the same diameter as the shaft in the stuffing box area.

Hold the packing tightly on the mandrel, but do not stretch. Although not recommended, rings can be cut on the shaft or sleeve outside the stuffing box; however, make sure that the shaft is not damaged. Cut the ring and insert it into the stuffing box, making certain it fits properly within the packing recess.

Each additional ring can be cut in the same manner, or the first ring can be used as a master from which the remainder of the rings are cut. If the butt cut rings are cut on a flat surface, be certain that the side of the master rings, not the OD or ID surface, is laid on the rings to be cut. This is necessary so that the end of the rings can be reproduced.

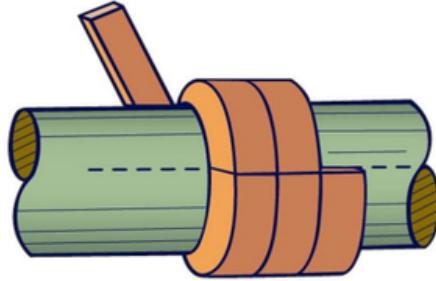


Figure 42. Butt Cut

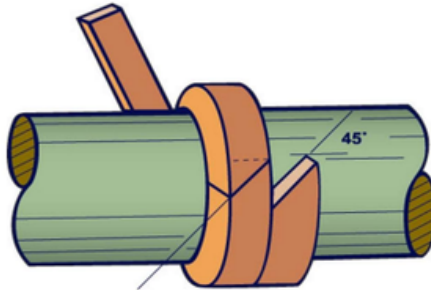
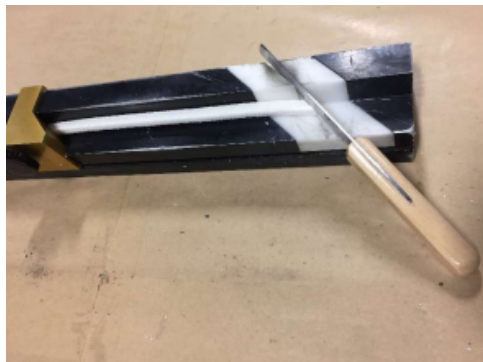


Figure 43. Skive Cut

When cutting diagonal joints, use a miter board so that each successive ring can be cut at the correct angle (Figure 44). It is necessary that the rings be cut to the correct size.

Otherwise, service life is reduced. This is where die-cut rings are of great advantage. They give you the exact size ring for the ID of the stem and the OD of the stuffing box with no waste due to incorrectly cut rings.



**5) INSTALL ONE RING AT A TIME.** See Figures 45 and 46 for installation of cut rings. For installation of die formed rings of flexible graphite, in order to prevent cracking and breaking of the material, do not spread apart the ring as shown in Figure 45. Form a helix with the die formed ring (see Figures 46). Make sure it is clean and has not picked up any dirt in handling. Seat rings firmly, except PTFE filament and graphite yarn packings which should be snugged up very gently and then tightened gradually after the pump is operating. Joints of successive rings should be staggered and kept at least 90 degrees apart. Each individual ring should be firmly seated with a tamping tool or, a suitable split bushing fitted to the stuffing box bore. When enough rings have been individually seated so that the nose of the gland will reach them, individual tamping should be done by the gland.

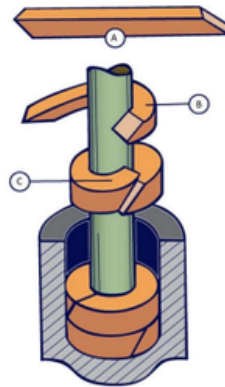


Figure 45. Spreading of Cut Sealing Rings

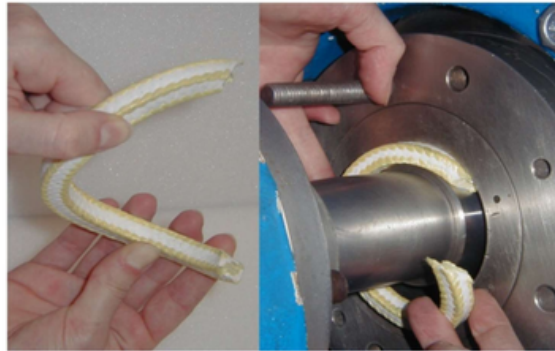
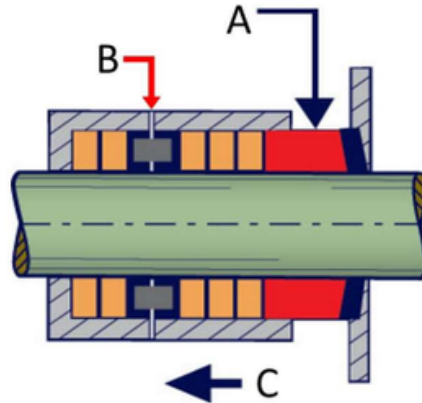


Figure 46 Spreading of ring and installation

**6) IF THE STUFFING BOX HAS A LANTERN RING (see Figure 47, )** make sure that the lantern ring is installed properly so it will remain under the inlet as gland pressure is applied.

**7) TAKE UP GLAND BOLTS AFTER THE LAST RING IS INSTALLED** finger tight or very slightly snugged up (see Figure 47). Do not jam the packing into place by excessive gland loading.



A: Gland Follower  
 B: Lantern Ring  
 C: Direction of Gland Compression

Figure 47 Compression Packing

**8) WHEN SPECIFIED BY THE PUMP MANUFACTURER, PROVIDE MEANS OF LUBRICATING THE SHAFT AND PACKING THROUGH THE LANTERN RING BY SUPPLYING WATER, OIL, GREASE, OR LIQUID HANDLED IN THE PUMP.** Fittings for this purpose are standard on many pumps. Flush pressure should be a minimum of 1 bar (14.5 psi) above stuffing box pressure. Refer to the section Stuffing Box Design and Pressure Distribution for a stuffing box pressure formula and to Flush Water in the Technical Reference of this manual.

**9) START PUMP AND TAKE UP GLAND BOLTS GRADUALLY.** Make sure gland bolts are taken up evenly.

**10) DO NOT STOP LEAKAGE ENTIRELY AT THIS POINT. THIS CAN CAUSE THE PACKING TO BURN, HARDEN, AND DAMAGE EQUIPMENT.**

**11) ALLOW PACKING TO LEAK FREELY WHEN STARTING UP A NEWLY PACKED PUMP.** Excessive leakage during the first hour of operation can result in a better packing job over a longer period of time. Contact the packing manufacturer for specific application recommendations.

**12) CONTINUE TO TAKE UP GRADUALLY ON THE GLAND TO SEAT THE PACKING** until leakage is decreased to a tolerable level, preferably 8-10 drops per minute, per inch of shaft diameter. Some packing can run virtually leak free. Contact your packing manufacturer for specific recommendations.

**13) REPLACE PACKING WHEN FREQUENCY OF ADJUSTMENT INCREASES OR LEAKAGE CANNOT BE CONTROLLED BY FURTHER TAKE-UP ON THE GLAND. DO NOT ADD MORE PACKING RINGS.**

**NOTE: ON BOTH CENTRIFUGAL AND RECIPROCATING PUMPS,** about 70% of wear is on the outer two packings nearest the gland; however, each additional ring does throttle some fluid pressure. On most pumps, there must be enough rings so if one fails, another does the sealing, and the pump need not be shut down.

The mechanical pressure curve in Figure 48 shows seven packing rings. The first four rings do the majority of the sealing. The bottom three do little sealing but are needed to fill the available space or recess. With high temperatures, high pressures, corrosive chemicals, or abrasive particles in the fluid, more rings may be the only solution for some services. In such cases, the bottom ring controlling the fluid may have the most wear from these severe service conditions.

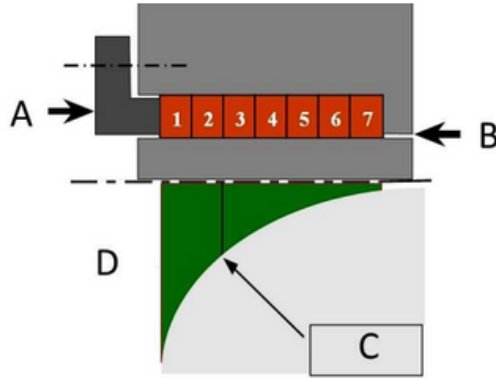


Figure 48. Stuffing Box and Radial Pressure Distribution

- A: Gland Pressure
- B: Media Pressure
- C: 70% of total sealing force comes from the first two rings of packing
- D: Radial Pressure

With deep stuffing boxes that would require large numbers of rings to fill the available space, metal bushings are sometimes recommended as spacers. The advantage of using fewer packing rings is less shaft or sleeve wear, less friction, lower power consumption and lower operating temperatures. Also, the stuffing box design is simpler and takes less material. The radial pressure distribution is also more uniform as is shown in Figure 49.

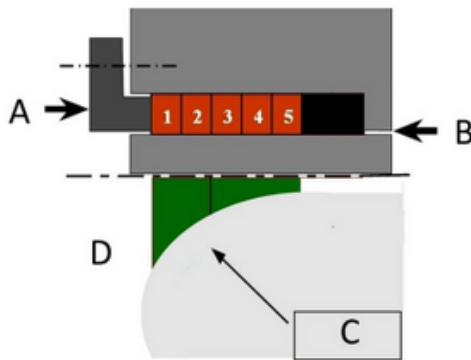


Figure 49 Optimizing the Number of Packing Rings

- A: Gland Pressure
- B: Media Pressure
- C: 70% of total sealing force comes from the first two rings of packing
- D: Radial Pressure

**CAUTION: ALL PACKINGS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.**

Note: Depending on the installation method, such as tamping or compressing each ring separately, the radial contact pressure of each ring will vary. Also, in the case of reciprocating applications, the shear forces of the axially sliding shaft on the packing rings can lead to a more uniform radial pressure distribution. See the illustration in Figure 50

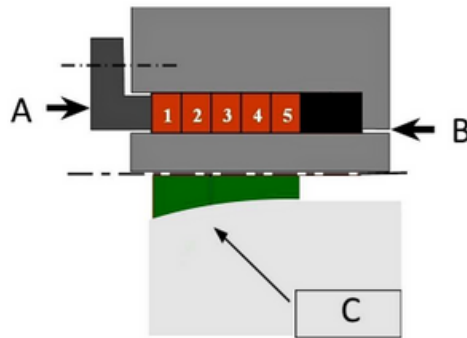


Figure 50 Optimizing Radial Contact Pressure

- A: Gland Pressure
- B: Media Pressure
- C: More uniform Radial pressure force
- D: Radial Pressure

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