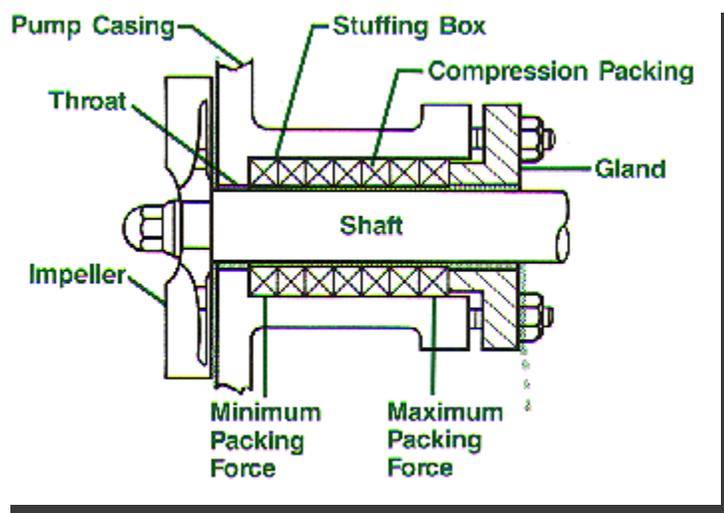


## Stuffing Boxes

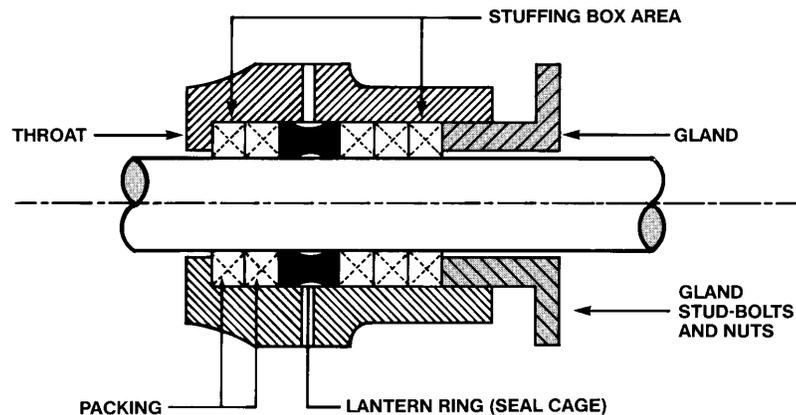
When you hear stuffing it usually means stuffing for turkeys, it may also suggest some misconceptions about stuffing boxes for pumps.

When centrifugal pumps were developed there was a need to prevent the pumpage from pouring out thru the open clearance between the pump casing back and the rotating shaft, which turns the impeller. This was accomplished by stuffing rope like material, called packing, into a cylindrical opening in the rear of the casing where the shaft passes through it. Packing is usually 1/4", 3/8", or 1/2" square cross sectional, the size to match the annular section between the shaft OD and the stuffing box ID. It comes in coils, and is cut to fit around the shaft OD. It is a soft material and usually has a lubricant in it. The opening, the stuffing box, has a shoulder at the bottom or "throat" (inboard end closest to impeller) and is fitted with a follower, called the gland, on the outboard end, which compresses the packing into the inner sides of the stuffing box against the shoulder in the bottom of the box, and against the rotating pump shaft. This effectively limits the leakage out of the pump. It will not completely prevent leakage. A small amount of pumpage must leak out of the pump in order to cool and lubricate the packing.



As leakage increases, the gland bolts are tightened up, crushing the packing further down into the box. If a stuffing box contains all packing, it's called "packed solid". Packing solid is usually reserved for clean, cool liquids with relatively good lubricity.

More often, a lantern ring (or sometimes called a seal cage) is used to separate two sets of packing. An external liquid or grease can be used to lubricate and cool the packing or to "seal" the box from air entering (if operating on a vacuum or a suction lift). This is injected into the stuffing box thru a tapped opening on the side of the box. Some will leak to the outboard while some will mix with the pumpage, so the "sealing" liquid or grease must be compatible with the pumpage.

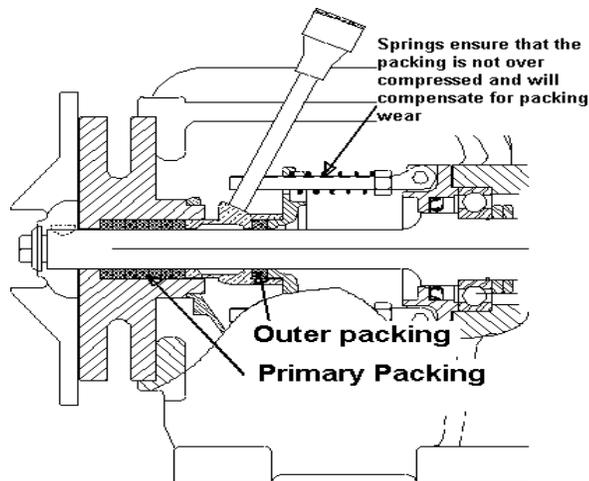


The disadvantage of this configuration is that as the packing wears, the lantern ring moves beyond the area for which it is designed and sealing water or lubricant can no longer enter the stuffing box. The unit needs to be taken out of service and re-packed with new packing.

Harry LaBour, the inventor of the Self Priming pump, was very proud of the stuffing box design (below) that has proven to be trouble-free with a minimum of maintenance. A very deep double compartment gland is provided, which has room for six rings of packing in the main part of the stuffing box, followed by a gland collar which incorporates an annular space close to the shaft which can be greased or liquid sealed to prevent air entering the pump or liquid leaking from the pump.

The gland collar is in effect an external lantern ring. Two rings of packing in the outer part of the gland collar and a gland follower with 2 sets of compression springs complete the seal. A conventional internal lantern ring has the disadvantage that over time it will move deeper into the stuffing box and eventually block the grease or liquid port in the stuffing box, resulting in packing and/or shaft failure.

The function of the springs and the adjusting nut is to keep the packing adjusted correctly without the requirement for weekly or monthly adjustments.



This is in effect a very simple way to operate a packed centrifual pump with minimum maintenance.

Packing glands are usually of a two piece (split) design with two bolts holding them to the casing back so that they can be removed from around the shaft to make it easy to remove old packing and to install new packing. If handling liquids near their vapor point (such as boiler feed water service), special glands called “smothering, or quenching” are used to direct an external liquid (usually water) around the shaft where it exits the gland to condense vapors coming out of the gland for good housekeeping and to help prevent vapors from getting into the nearby pump bearing housing. Usually there is a drain in the bottom of such glands which allow the quenching liquid to be piped or drained away.

Most pumps have a “flinger” on the shaft between the stuffing box and the bearing housing to prevent stuffing box leakoff from getting into the bearing housing and causing bearing failures. In addition, pump bearing housings are equipped with lip seals, as a minimum, to prevent this and other airbourn contamination

Almost all pumps are designed to have the bearing bracket act as a sump for stuffing box leakoff. This sump usually has a drain to allow the leakoff to be piped off or drained to the pump baseplate. Don't defeat it by allowing rags, debris or gunk to prevent its draining, since some pump designs will allow the backed up leakage to flood the bearings, bringing your pump to a sudden stop.

Since the packing “grips” the shaft to limit leakage, even though the pump shaft is rotating and the packing is stationary, this can cause wear to the pump shaft at this point. For this reason, most pumps have a sleeve which covers the shaft, protecting it where the shaft passes through the stuffing box. This way, if the packing was too tight, lacked lubricity, or had dirt, and scored something...it will be a less expensive shaft sleeve which needs replacement, not an expensive shaft.

Packing is an inexpensive method of sealling centrifugal pumps, and if properly installed and maintained, can offer trouble free, reliable service.

There are situations where mechanical seals offer a better option and we will discuss stuffing boxes for mechanical seals at a later date.

For additional information or help with stuffing boxes or pumps in general, contact Kriebel Engineered Equipment, LTD. ([www.kriebel-ltd.com](http://www.kriebel-ltd.com))

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