Pump and valve packing is a tried and true way to seal an application. But there are SO MANY styles of packing, choosing the correct braid configuration, fiber type, cross-section, etc., for your specific application can be extremely difficult.

Gallagher is here to help you along in the process. We represent numerous packing braiders, so we can find the best packing for you and your company, or even create a custom one. But where does the packing selection process start?

Lee Gillette, our GORE field sales representative, set out to answer that question in an article in Pumps and Systems magazine.

“The first step is to remember the ‘5 P’s of Packing Installation,’” Gillette writes.

They are:

1. **Proper selection**

“Several braid configurations, packing fibers and combinations of packing fiber materials are available,” Gillette says. “Choosing the correct one can be intimidating and confusing. If an equipment manufacturer has not provided guidance or a specification, how do you decide what to use? One acronym commonly used as a guideline when making a packing selection is STAMPS.”

In this case, STAMPS stands for:

- Size (What are the stuffing box dimensions?)
- Temperature (What is the temperature of the medium?)
- Application (What type of equipment is it?)
- Media (What medium is being sealed?)
- Pressure (What is the internal pressure being sealed?)
- Shaft speed (What is the surface speed of the shaft?)

“These attributes relate to the chemical compatibility of the packing material with the
sealed media, its functional shaft speed capability, operational temperature and pressure parameters, and equipment service (rotating, reciprocating or valves),” Gillette writes. “The compression packing manual provides a breakdown of the performance properties of different classes of materials and fits into the STAMPS selection process.”

2. Preparation for Installation

After choosing the appropriate packing material, make sure the pump and accessories are prepared for compression packing installation. This means the box must be clean and cleared of worn-out packing. Leftover packing debris can make for an uneven seating, which can cause leakage or plug the flush port line and lead to overheating problems.

Examine the condition of the stuffing box, and check the shaft or sleeve wear for corrosion, nicks, scoring or burrs. Make sure the gland followers and fasteners are in good condition.

“A heavily corroded stuffing box may prevent the packing from sealing because of deviations on the stuffing box’s sealing wall,” writes Gillette. “Corrosion can cause the outside diameter of the stuffing box to become slightly larger, resulting in a poor fit of the new rings. This can lead to the packing rings spinning within the stuffing box and a dramatic increase in leak rate.”

When a shaft or sleeve is damaged, it keeps the packing from sealing properly. No matter how high performing the packing material, it won’t function properly with a misaligned or damaged pump shaft, and will experienced a shortened operational life.

3. Product Form

The next step in compression packing installation involves determining whether packing rings were cut on-site from bulk spools, or preformed by the packing supplier and sold as individual ring sets customized for a specific pump or piece of equipment.

With rings that are cut on site, make sure the packing is properly sized. The packing rings need to reflect the size of the shaft.

“Avoid measuring a used packing ring as a reference to cut a new ring,” Gillette says. “Doing so can result in an improper cut length because the used ring may have been stretched during removal or it may have shrunk from loss of lubricant during use. Rings should be cut around a mandrel or a calibrated measuring tool equal to the shaft’s diameter. In some cases, the unworn area of a shaft sleeve may be an ideal measurement tool.”

If a ring is cut too short, it will leave gaps in the seal along the stuffing box wall and pump shaft. This will cause excessive, uncontrollable leakage. Rings that are cut too long will not fit in the stuffing box.
Use the square “Butt” cut or a diagonal “Skived” cut for the ends. When installing, stagger the cut ends of each so they are not all lined in a row (using 45-, 90- and 180-degree offsets). By offsetting the joints, you will eliminate a possible leak path, which could form if the joint ends are all in a straight line.

Take care to follow the recommendations from the packing or equipment maker. Preformed ring sets have become more popular in recent years due to their more precise and uniform sizing. This has resulted in improved sealing and time savings compared to cutting on-site.

4. Placement

Proper placement, or positioning, is another crucial part of compression packing installation.

“The first ring sets the stage for the alignment and positioning of subsequent rings. If the first ring is not seated and properly compressed, the remaining rings will be negatively affected for the following reasons,” Gillette writes.

- The required number of packing rings may not fit into the stuffing box.
- Excessive leakage can occur because of gaps in the packing behind the first ring.
- The lantern ring may not line up with the flush port. This can restrict the flow of cooling water.

Do not install a series of rings and try to compress them solely through the force of the gland follower. This will not properly seal the initial rings and could lead to incorrect positioning of the lantern ring in relation to the flush port. This in turn will cut off the packing from the lubricating fluid it needs for cooling and proper sealing.

In the figure below, we can see the comparative sealing forces applied by the sequence of rings, and how the load generated by the land follower is not enough to seal the rings closest to the pump impeller end of the stuffing box.

“Often, these rings are not properly seated because of reliance on the gland follower, compromising the packing set’s entire installation,” Gillette writes.

There are a number of major braiders and packing suppliers that provide installation guidelines and recommendations to help with this procedure. Some have even created specialized devices such as tamping tools, split bushings and other aids to allow proper seating of the first several rings.

Be patient when breaking in new packing material. The process takes time and often requires more than one adjustment to the gland follower.
Make sure the packing isn’t overtightened. Too much friction can result in overheating and damage to the packing, which leads to hardening or glazing and ultimately uncontrollable leakage.

“Allow a free flow of flush water for initial break-in, and follow procedures recommended by the packing manufacturer,” Gillette writes. “This will allow the packing to conform to the shaft, letting the seating and pressures of the system help define its sealing area. Liberal leakage during the first two hours of operation will result in an excellent packing job and help it function for a longer period of time.”

Gradual tightening of the gland follower will bring the system to an acceptable leakage rate. Use small incremental adjustments — one flat wrench turn at a time) on the gland nuts as the packing seals itself and leakage is reduced to the level needed for for the selected material class.

Leak-rate capabilities can vary, but rates of eight to 10 drops per minute per inch of shaft diameter are common. Lower leak rates can be achieved based on material and manufacturer selection, but take care to verify this prior to installation.

“Allow sufficient time between adjustments for the leak rates to stabilize. Check leak rates after a few hours of operation, and continue to make small gland adjustments to decrease the leak rate to the desired level,” Gillette says. “Keep checking the stuffing box temperature. A high temperature may indicate that the gland follower is overtightened. This can burn up the packing and damage the shaft or sleeve.”

Excessive gland load can lead to an increased loss in power due to friction, reduced life and/or a sudden premature service failure.

Contractors hired to repack pumps during major turnarounds are not always present when the shutdown is completed and pumps are started. Without their presence, it can be difficult to determine how the gland nuts were tightened. This is why startups require close monitoring to make sure the packing is properly broken in.

By following these guidelines, you can extend packing life, reduce downtime, and cut maintenance costs.