

# What are the key steps to cutting compression packing for optimum performance?

By Velin Kolev, ESA Member

Compression packing is a versatile sealing device and one of the best features of packing in length form is its flexibility and ease of use. In today's world of optimising plant efficiency with limited maintenance resources, some important steps to follow when installing packing are often overlooked. One of these is the correct way to cut the packing.

One of the most effective ways to enhance packing life is to focus on installation. Once a packing has been installed there are some techniques to prolong life when leakage becomes excessive, but it is much better to perform correct installation which is the key to long packing life. Cutting packing rings incorrectly can result in a low mean time between failure (MTBF) for valves and pumps and is easily preventable with some basic training. This article discusses some fundamental concepts to improve packing life by properly cutting the rings.

## Important Steps

The best way to cut packing accurately is to focus on a few simple steps:

- Use a mandrel to cut rings
- Use a sharp knife
- Use a forceful cutting motion

Sometimes, bad habits when cutting packing rings can start at a plant and can severely limit packing performance. Unacceptable practices can be handed down from technician to technician because it is hard to see the effect that they have on seal failure in the equipment.

Training and education will help to prevent bad maintenance practices and provide understanding of the importance of the task.

## Sizing

One of the more common bad practices is to use the old packing rings that were removed when unpacking a valve or a pump as a length guide for cutting the new rings. One problem is that the removed rings could have been incorrectly sized the last time so the error will just be repeated. Also, the rings that are unpacked might have been chemically or thermally attacked and may have shrunk or become deformed while in service.

The most accurate way to cut packing rings is to use a mandrel that is the exact size of the shaft or stem. By placing the

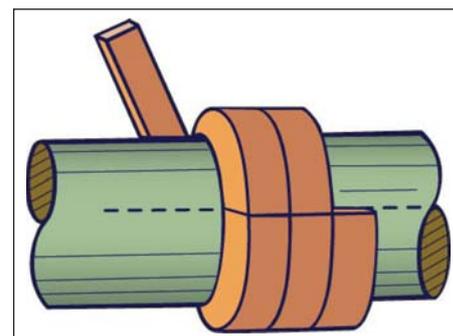


Cutting on a mandrel using "skive cut" 45° angle.

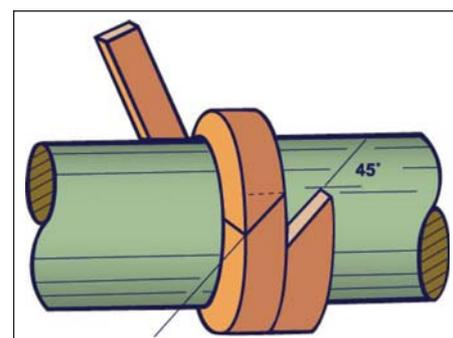
mandrel in a vice and wrapping the packing around it, an accurate length can be determined for the packing ring.

## Cutting

The rings should be cut on the mandrel at either a 45° angle for a skive cut or a 5°, almost-straight cut for a butt cut. Check the installation instructions of the



Straight 5° Cut.



45° Skive Cut.

packing manufacturer for the correct angle required by the application. Rings should be held tightly on the mandrel but not stretched. When cutting skive joints, a mitre board should be used so that each successive ring can be cut at the correct angle.

After each ring is cut, it should be wrapped around the mandrel as a double check to ensure that the ends adjoin with each other. This is similar to a "go/no-go" gauge. Skilfully cutting rings with a mandrel does take some practice of the wrapping technique. Focusing on the end result of the ring fitting on the mandrel with no gap will quickly provide a feedback loop to perfect the practice. Each style of packing will seat around the mandrel slightly differently.



Checking Ring size.

### Unravelling-Ends

Another issue to be wary of is trimming rings that have been cut long. Even cleanly cutting a small section off one end of the packing can result in the packing unravelling - a major failure point when it is installed. If this happens, the damaged ring should be scrapped, and another ring should be cut, concentrating on getting the size correct.

### Tools

The second component to an accurately cut packing ring is the tools that are used. A common poor practice is using a pocket or pen-knife to cut packing rings. A number of major issues can arise from using this type of cutting tool. The first problem is that most knives are not very sharp, and a dull knife will result in the technician using a back and forward cutting motion instead of a single clean slice through the packing. This sawing motion causes the packing ends to open up making correct installation more difficult and resulting in poor packing



Cutting tool (ruler on top and a bench for knife on right).

performance. A sharp knife makes a clean cut that keeps the strands together in the original shape. Cutting packing will dull any type of blade quickly, so make sure there is easy access to a sharpener.

The second issue with using a pen-knife is the lack of a good grip. When cutting packing, a considerable amount of force must be applied to cut in one stroke, and without a good handle, this is much harder to accomplish. It is very important that the tool used to cut packing is a straight edge blade and not serrated. This will also help reach the goal of a clean cut without deformed packing ends.

The correct way to cut packing is to have the knife at an angle to the packing with the handle higher and not parallel to it. This method results in better leverage on the packing resulting in a better cut. Many tutorials are available that highlight this method when cutting in the kitchen. Correctly cutting a piece of packing is very similar to cutting techniques used by professional chefs.

Some companies supply useful tools for cutting. Such tools typically consist of a rectangular wooden plate with a flat surface with a metering ruler on the longer side. At one end there is a movable slider with a 45° angled face, and at the other side a very sharp knife mounted on an axle at the same angle, thus providing two parallel borders positioned at an angle towards the ruler.

Having ascertained the correct packing length, the slider is positioned on the ruler so that it corresponds to the length. The packing is then positioned on the bed, just to be a bit outside of the ruler in order to make the first cut at 45°, the packing

is then turned to the opposite side, positioned on the bed so that the angle is adjacent to the slider, and the second cut made using a single forceful and fast motion.

### Excess Material

Cutting packing will always result in some waste. This could be rings that are too long or short but also can be rings whose ends have unravelled or frayed to the point at which they could result in a leak path. As detailed in a previous article in this series, one of the easiest ways to sidestep errors in cutting is to order cut or die-formed rings from the packing supplier. Besides no wastage, there is also a considerable time saving from not having to cut the rings. However one problem to using cut rings everywhere is the need to have good documentation of the actual size of the packing required to know what to order. This can be a bigger hurdle than it may appear as it requires a very accurate database of equipment dimensions.

The European Sealing Association (ESA) has produced this article as a guide towards Best Available Techniques for sealing systems and devices. These articles are published on a regular basis, as part of their commitment to users, contractors and OEM's, to help to find the best solutions for sealing challenges and to achieve maximum, safe performance during the lifetime of the seal. The ESA is the voice of the fluid sealing industry in Europe, collaborating closely with the Fluid Sealing Association (FSA) of the USA. This article is derived in part from an original FSA paper which first appeared as a Sealing Sense article in Pumps and Systems magazine. We are very grateful to our colleagues in the FSA for their assistance. For more information, please visit [www.eurosealing.com](http://www.eurosealing.com)