When should I use braided PTFE packing, and in what form?

Manufacturers of braided packings are often asked to simply supply “a PTFE packing.” Though this may seem a straightforward request, it generates questions that must be answered to ensure the correct PTFE packing for the application. A clear understanding of the differences between the various forms of PTFE braided packing will enable a selection of reliable sealing for the pump or valve.

Of the many forms of PTFE braided packing, the right choice takes advantage of its strengths and minimizes its limitations. If selected and applied incorrectly, poor performance and increased maintenance can result. To apply PTFE effectively, one must understand the properties of the material. A few unique properties of PTFE make it an excellent ingredient for braided packings:

- **Excellent chemical resistance.** A major reason for using PTFE in packing materials is that it is unaffected by a wide variety of aggressive fluids, including very strong acids, bases, and solvents. Perhaps most important is PTFE’s ability to withstand strong oxidizers such as nitric acid, chlorine dioxide, high concentration sulfuric acid (Oleum), and others. PTFE may be the only practical option for applications involving these media.
- **Low coefficient of friction in contact with most surfaces.** The non-wetting, slippery, low friction behavior of PTFE is well known. This can help to reduce power consumption and generation of heat at the packing-shaft interface.

While PTFE has its strengths, certain properties of PTFE are not so desirable in many pump packing applications. Problems encountered with PTFE packings are usually the result of its poor thermal and mechanical properties:

- **Cold flow, or creep, under pressure.** As temperature increases, creep also increases. When pressure is applied to a 100 percent PTFE packing over a period of time, the packing may become a dense solid mass requiring frequent adjustment to maintain a seal. It will also have a tendency to extrude into clearances at the top and bottom of the stuffing box.
- **Low thermal conductivity.** When frictional heat is generated by contact with a high speed rotary shaft, pure PTFE has a tendency to absorb the heat, not allowing it to dissipate to the surroundings. Higher leak rates across the packing-shaft surface are required to keep a PTFE packing from burning or charring.

### PTFE Fiber Packing

Many manufacturers produce packing styles that use PTFE as the base fiber. These styles may be supplied as dry fibers, fibers coated with PTFE dispersion, or fibers coated with various lubricants. Good practice uses these products only where there is no other PTFE alternative for the service, including applications with very aggressive chemicals, such as strong oxidizers, or those requiring materials suitable for use in food or pharmaceutical processes. Consult a packing manufacturer to determine what specific styles are suitable for these services.

With PTFE fiber packing it is particularly important to follow the manufacturer’s limits for temperature, speed, and pressure. When used in rotating equipment, these packings can be very sensitive to adjustment. Typically, lower gland pressure is needed and higher leak rates are experienced than with other packing styles.

### Expanded PTFE (ePTFE) Packings

ePTFE yarns are similar in appearance to a twisted PTFE tape. The most common form is an ePTFE impregnated with graphite to increase its thermal conductivity and speed rating. ePTFE braids are less sensitive to heat buildup than PTFE fiber packings.
packings. They tolerate higher speeds and provide lower leak rates. ePTFE packings may exhibit cold flow and extrusion under higher pressures.

PTFE Coated Packing
When the superior chemical resistance of pure PTFE is not required, many fiber materials can be coated with PTFE to improve packing performance and take advantage of PTFE’s strengths. These fibers can also help to reduce or eliminate some of the weaknesses of a pure PTFE braid.

Blended synthetic and fiberglass yarns can be coated with PTFE to produce economical, general service packings that exhibit higher resilience, greater extrusion resistance, and less sensitivity to adjustment than a PTFE fiber braid. They can also be coated with a dispersion mixture of PTFE and graphite to further increase the speed capability and heat dissipation characteristics of the braid.

Aramid fiber packings with a PTFE coating can be used in applications requiring extreme abrasion resistance. Novoloid fiber packings with PTFE coatings can be used in mild caustic services, and also exhibit better resilience and extrusion resistance than a PTFE fiber braid.

Carbon and graphite fiber braids with PTFE coatings are among the most versatile packing materials. They have excellent chemical resistance (with the exception of strong oxidizers), high speed capability, high temperature capability, and very good resilience. They are not prone to softening or extrusion at high temperature, and also exhibit good abrasion resistance.

By understanding the strengths and limitations of the various forms of braided PTFE packing, you can choose a product that will most effectively meet the pump or valve sealing demands of a process.

Next Month: What should I look for when choosing a high-performance elastomer for a specific application?

We invite your questions on sealing issues and will provide best efforts answers based on FSA publications. Please direct your questions to: sealingquestions@fluidsealing.com.

Fluid Sealing Association
Sealing Sense is produced by the Fluid Sealing Association as part of our commitment to industry consensus technical education for pump users, contractors, distributors, OEMs, and reps. As a source of technical information on sealing systems and devices, and in cooperation with the European Sealing Association, the FSA also supports development of harmonized standards in all areas of fluid sealing technology. The education is provided in the public interest to enable a balanced assessment of the most effective solutions to pump systems technology issues on rational Total Life Cycle Cost principles.

The Compression Packing division of the FSA is one of five with a specific product technology focus. As part of their mission they develop publications such as the joint FSA/ESA Guidelines for the Use of Compression Packings and Pump & the Valve Packing Installation Procedures pamphlet. These are primers intended to complement the more detailed manufacturer’s documents produced by the member companies. In addition to English they are available in a number of other languages, including Spanish and German.

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