New Liners for **Next-Gen** Catheters

Historically, two methods have been used to produce ultra-thin-walled PTFE liners: free-extrusion and film cast. While both film cast and free-extrusion can produce ultra-thin-walled PTFE liners, the different production processes result in somewhat differing performance and design considerations for the end catheter. Free-extruded and film cast liners, thus, have their areas of specialization, and choosing between flexibility or strength can present limitations in catheter design.

Introducing StreamLiner™ Over-The-Wire (OTW): With the combination of size, flexibility, and strength, StreamLiner™ OTW bridges the gap in performance between film cast and free-extruded liners. StreamLiner™ OTW liners provide the same thin walls and tight tolerances as free-extruded StreamLiner™, but with softer, more flexible mechanical performance enabling next-gen catheter designs to navigate the most tortuous vasculatures.

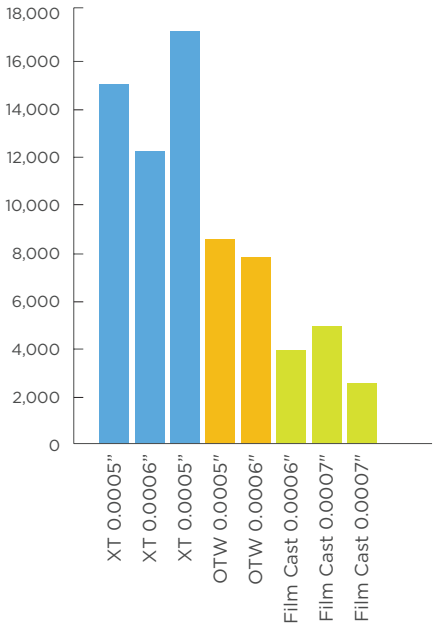
Free-Extruded StreamLiner™ and StreamLiner™ OTW

Comparing OTW, Free-Extruded, and Film Cast Catheter Liners

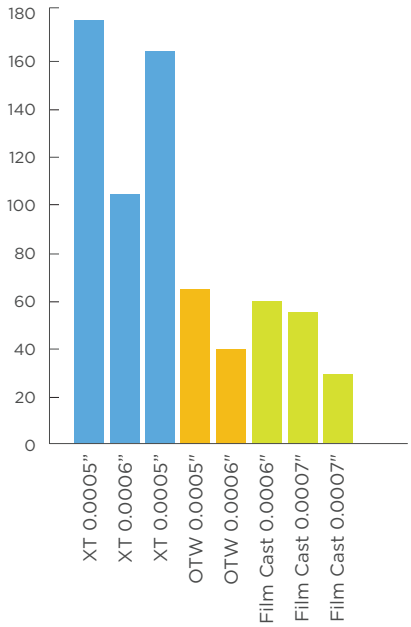
Tensile testing and dynamic mechanical analysis (DMA) were performed on three sets of PTFE catheter liners. Tensile testing was performed according to ASTM D638, Standard Test Method for Tensile Properties. DMA was performed using temperature sweeps from -100 °C to 300 °C. DMA samples were heated at a constant rate of 3 °C / minute while being displaced at a constant amplitude of 15 µm and fixed frequency of 1 Hz. Values are representative.

	StreamLiner™ XT (Free-Extruded)			**StreamLiner™ OTW**		**Film Cast**		
Inside Diameter (ID)	0.0205″ (0.521 mm)	0.0400″ (1.020 mm)	0.0684″ (1.737 mm)	0.0167″ (0.424 mm)	0.0705″ (1.791 mm)	0.0167″ (0.424 mm)	0.0169″ (0.429 mm)	0.0717″ (1.821 mm)
Wall Thickness	0.0005″ (0.013 mm)	0.0006″ (0.015 mm)	0.0005″ (0.013 mm)	0.0005″ (0.013 mm)	0.0006″ (0.015 mm)	0.0006″ (0.015 mm)	0.0007″ (0.017mm)	0.0007″ (0.017mm)
Tensile Modulus at 23°C (ksi)	189.0	189.5	242.5	43.9	65.1	52.0	42.8	68.8
Tensile Strength at Break (psi)	15,120	12,280	17,360	8,520	7,750	3,950	4,930	2,480
Elongation at Break (%)	361	277	379	438	345	314	544	138
Storage Modulus at 23°C (ksi)	289.8	178.8	291.5	90.1	58.4	99.5	81.6	68.3
Storage Modulus at 37°C (ksi)	176.0	106.9	167.5	66.2	41.2	60.8	56.6	29.8

Tensile Strength At Break (psi) by Wall Thickness



Storage Modulus at 37°C (ksi) by Wall Thickness



The Results

Strength - High tensile strength is needed for deploying vascular devices such as flow diverters, scaffolding, stents, and thrombectomy devices. Testing revealed StreamLiner™ OTW liners provided strength that is intermediate between free-extruded XT and film cast liners.

Flexibility - Storage modulus measures how much energy must be put into a material to deform it. The higher the storage modulus, the more rigid the material (and vice versa). Therefore, flexible catheter liners exhibit low storage moduli. Flexibility is an important consideration for catheters that must pass through vascular networks with complex twists and bends. Testing revealed that StreamLiner™ OTW liners can match the flexibility of film cast liners, but with superior strength. This is especially important for catheters that ultimately will be used at body temperature (37 °C) and remain strong enough to support intraluminal tools.

Request Your Free Samples

To aid your prototyping, order your free StreamLiner™ OTW samples at vsl.zeusinc.com

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