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Technical Bulletin 45: Rifled Cover® Technology

The process for manufacturing ropes has been known for hundreds of years. No matter if they are natural, synthetic, or wire, it essentially consists of taking parallel yarns or wires and helically winding them into larger strands, then helically winding those strands together into finished ropes. By making helically wound strands from smaller yarns or wires, the efficiency of the finished product is enhanced because tensions are equalized, resulting in a much higher breaking strength.

Roundslings are manufactured by running strands of core yarn, each with a known predetermined breaking strength, into a tube or protective cover. The number of revolutions, or total number of core yarns, determines the ultimate breaking strength of the sling. These core yarns are run in parallel and at random inside the tube.

Since the invention of the roundsling, engineers have tried to invent a method to helically twist the core yarns inside the protective covers or tubes. Every attempted process used some form of machinery either attached to, or in conjunction with, the roundsling machine itself. Typically, cones of core yarn were arranged on a turn table that rotated to form a larger strand as it was wound inside the cover on a roundsling machine. There were two significant problems with this method to form a helically wound core. The first was the rotation of the turntable had to be synchronized with the speed of the roundsling machine. The second was that it only worked when there were several cones of core yarn being utilized, meaning it only performed well when making higher capacity roundslings. For smaller capacity roundslings that used only one or two cones of core yarn, it was not effective.

Slingmax® developed the technology to helically twist our K-Spec® core yarns as they are pulled into the cover, and we call this process Rifled Cover Technology. This spinning or helical winding of the core yarn significantly improves the breaking strength of the Twin-Path roundsling and fortifies the sling's fatigue resistance, adding to the sling's longevity. The process works by utilizing three important features: our Slingmax roundsling machine, our K-Spec core yarns, and our Covermax® covers. As the core yarns are pulled into the cover, the weave of the internal sleeve of the Covermax cover interacts with the twist of the K-Spec core yarns, which causes the core yarns to twist; similar to the way a bullet spins as it leaves the muzzle of a rifle. This breakthrough enabled us to gain more strength, and more equal load sharing properties, using the same amount of core yarn.

We first tested this new technology by making identical roundslings side by side. The only difference was the cover. One sling was made using the Covermax cover and the other using a standard cover. Both slings had the same number of core yarns. The resultant breaking strength

of the two slings differed by 15%, a significant disparity. The sling with the Covermax cover yielded an ultimate failure at 139,000 lbs. while the sling with the standard cover failed at 118,000 lbs. In this test, the helically wound core strands added an additional 21,000 lbs. of ultimate strength to the sling.

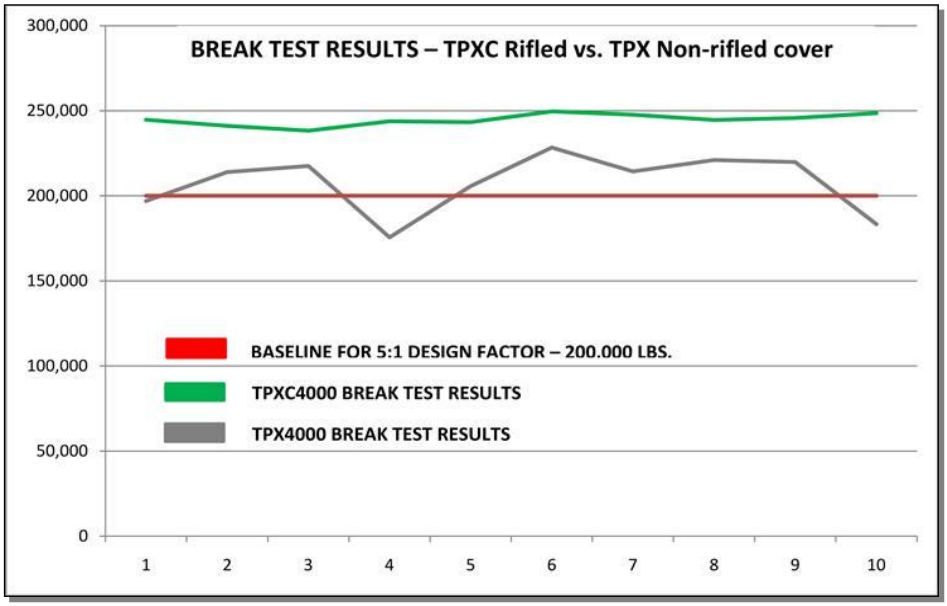
To further prove this process, additional testing was performed which further substantiated the benefits of Rifled Cover Technology. Twenty slings were fabricated with a cataloged breaking strength of 200,000 lbs. Ten slings were manufactured with standard covers, and another ten slings were manufactured using the Covermax covers. All slings utilized the same number of K-Spec core yarns and were fabricated on the same machinery, by the same fabricator. The slings with the standard cover yielded at an average of 208,000 lbs. at break, or a 5.2 Design Factor. The slings utilizing Rifled Cover Technology yielded at an average of 244,000 lbs., or a 6.1 Design Factor. This is an increase in strength of +17%, or +36,000 lbs. per sling.

Standard Cover

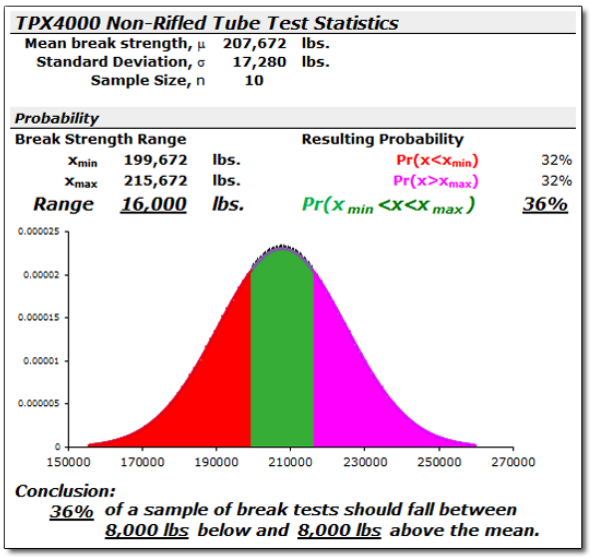
Rifled Cover® Technology

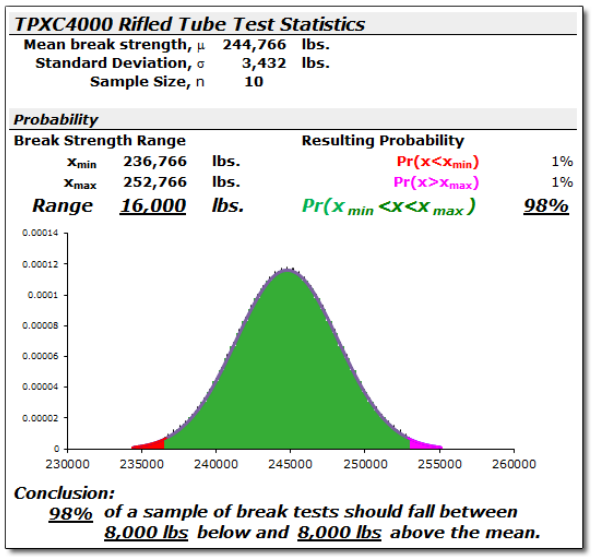
Random Length Core Strands →

← **Helically Wound Core Strands**



Another advantage of this new technology is the consistency of sling breaking strength. The ten slings made with standard covers had a deviation between high and low failure points of 50,000 lbs., from 178,000 to 228,000 lbs. The rifled Covermax slings had a deviation between high and low of only 11,000 lbs., or from 239,000 to 250,000 lbs. Furthermore, the lowest break of a sling with Rifled Cover Technology was still 11,000 lbs. higher than the strongest break of the slings using the standard cover.





CONCLUSIONS FROM TESTING:

Twin-Path High-Performance roundslings with patented Covermax tubes yield three major advantages:

1. Increased strength to weight ratio; 17% higher breaking strength using the same amount of core yarn.
2. More consistent and predictable breaking strength.
3. Repeatability in the manufacturing process, no matter how large the capacity.

In summary, roundslings made with parallel or random length strands do not develop the efficiency or breaking strength per pound of core fiber as roundslings made with our Slingmax patented Rifled Cover Technology, nor will they last as long in cyclical testing.