



Power Cable® Vs. Steel Cable

PA NOTE

We have discontinued the Steel Cable V-belt line [circa 1985] and replaced this line with a Power Cable belt using an aramid fiber tensile-DuPont Kevlar [aramid]. This PA Note will compare the differences between Kevlar and steel cable tensile belts.

Let's first explain some characteristics of belts having a high modulus or minimal elastic elongation. Kevlar or steel cable belts will exhibit a belt modulus of elasticity at least eight times greater than polyester tensile belts. This high modulus equates to the inelasticity of the belt. As such, Kevlar and steel cable belts exhibit low growth ideal for limited take-up drives. It is a well established fact that V-belts on industrial drives will satisfactorily operate over a fairly wide range of belt tensions. This characteristics would suggest minimal maintenance requirements which has been a prime factor in the success of V-belts over other power transmission methods. However, in certain abrasive environments, the inelastic characteristic of Kevlar or steel tensile belts can impact on tension maintenance if tension decay occurs too quickly.

Belt take-up on drives is a function of four factors: the amount of normal belt growth, belt sidewall wear, sheave groove wear and the difference between industry standard measuring tension and actual belt tensions experienced on the application. All these are factors on a limited take-up allowance drive. Generally belt and groove wear will not be dependent on tensile member so it should be the same for most any type belt in a given application. This gives the high modulus tensile belt a significant advantage with limited take-up drives. Note, we say limited take-up. Remember that belts and grooves wear thus requiring some take-up allowance for all drives.

Tension decay will occur in all V-belt drives. Although spring loaded tensioning mechanisms on some drives handle the retensioning procedure automatically, belt modulus can be a problem on the more common locked center drives. We can demonstrate the effect of modulus on tension decay using the examples of an extremely low modulus product and a higher modulus product, such as a rubber band and length of string. Place the rubber band over two shafts and separate the shafts until a known tension is applied to the rubber band. Now, decrease the shaft center distance a known slight amount. The degree of tension reduction in the rubber band is extremely small. Repeat this exercise with a length of string. When the shaft center distance is decreased this same slight amount, the tension in the string will decrease significantly. This illustrates the tension decay characteristics occurring as the effective belt length increases for those reasons discussed earlier. As such, a very high modulus belt might require more maintenance to yield the same overall drive performance - i.e., polyester vs. Kevlar or steel cable. This is especially true in drives subjected to an abrasive environment. However, Kevlar's tension decay characteristics would likely be an improvement over the steel cable.

Two other characteristic differences between Kevlar and steel cable involve bending modulus and fretting corrosion. Bending modulus is a measurement of the tensile resistances to bend. Kevlar bends far more easily than steel cable. Since the primary mode of belt failure is through flex fatigue, bending modulus is important. Kevlar has the distinct advantage over steel cable in this respect.



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Kevlar also has the advantage over steel cable in the area of fretting corrosion - corrosion occurring at the interface of two contacting surfaces as they rub against each other. While this action is normal to all belts, Kevlar resists fretting corrosion far better than steel cable.

What do all of these characteristics mean to the user? Improved belt life! Testing in the Gates Belt Test Lab on controlled, accelerated tests, reveal that Kevlar tensile belts yield an average of six times more life than steel cable in a "B" section and even a greater advantage with "C" section belts.

Power Cable® features give the user the benefits of long life, lower cost and reduced maintenance intervals for belt replacement (i.e., less downtime).