Tips on working with synchronous belt drives

Some of the newer belt designs require greater initial tension to achieve their performance claims. But these higher tensions may produce unwanted effects, such as tension excursion. Here's a closer look at what you can do to minimize these effects.

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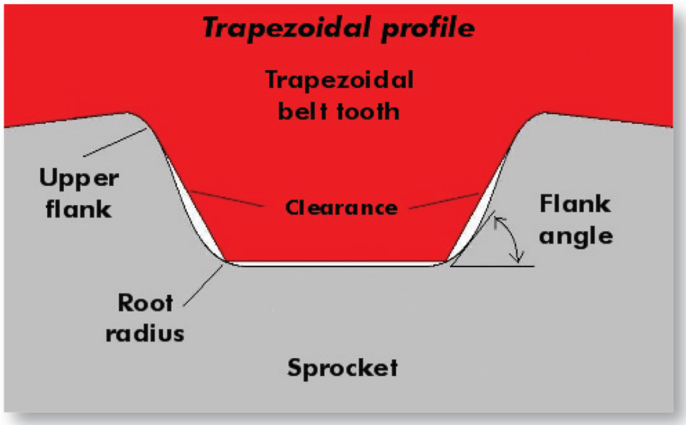
If you select the proper pitch, tooth profile, and component materials based on an application's torque capacity, drive speed, and positioning accuracy, you will probably have a reliable drive system that will yield millions of trouble free operational cycles. Selection, however, is only one step. Proper installation is necessary to avoid premature failure of the drive system or its components. Part of proper installation involves runout control. How you attach sprockets to the shaft can play a key role in reducing tension excursion and runout.

It's in the teeth

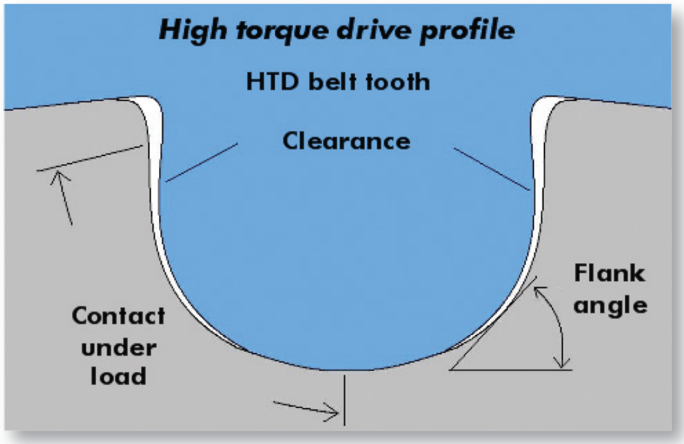
Synchronous belt drives with teeth arranged perpendicular to the belt's pitch line were first developed in the 1940's as a more efficient alternative to v-belt drives, which had a tendency to slip in operation due to several factors, including the fact that they stretch after initial installation and tensioning.

The first-generation synchronous-belt tooth profile had a trapezoidal tooth form, which is still a popular choice to this day, and provides positive drive and greater efficiency than v-belt drives. When under load, the belt's teeth mesh with the mating pulley teeth at two points, the pulley's tooth root radius and the upper flank of the pulley tooth on the tight side of the belt.

Clearances were designed into the mesh to ease entry and exit of belt tooth to pulley groove thus reducing noise, vibration, and wear. Some of the compromises of this design, though, include limited load-carrying capability due to the low flank angle; a tendency to ratchet or jump teeth when the tension is too low or the load is too high; and accelerated belt wear at the stress risers generated at the contact points between belt and pulley teeth.



First generation synchronous belts featured trapezoidal tooth forms and delivered positive drive and greater efficiency than v-belt drives. Under load, the teeth mesh with the mating pulley teeth at the pulley's tooth root radius and the upper flank of the pulley tooth on the tight side of the belt.



Second generation synchronous belt drives are dubbed 'high torque drive' and use a curvilinear profile for the belt and sprocket teeth.