Synchronous Belts Operating In Submerged Environments

Synchronous belt drives are sometimes used in applications that are submerged in water. Because water can have quite adverse effects on synchronous belts, the applications should be reviewed carefully.

Water is known to have the following effects on common belt materials:

Compounds:

Neoprene: Water causes slight swelling in neoprene compounds.

Poly Chain GT Urethane: Water has very little effect on this compound.

Small Pitch Urethane: Water causes this compound to swell significantly.

Tensile Cords:

Fiberglass: Water causes a significant decay in tensile strength.

Aramid: Water has little effect on tensile strength, but causes slight shrinkage.

Steel Cable: Water has little effect on stainless steel; stainless steel must be used.

Adhesion Systems: Water causes all internal adhesion systems to break down. Knowing what happens to each of the material components in a belt will allow some judgments about performance to be made. The following statements can be made:

Poly Chain® GT is the most resistant belt to water and submerged applications. So long as the operating speeds are low, the drive generally works quite well.

Rubber Synchronous Belts do not generally work well in submerged applications. Fiberglass cords lose strength as they become saturated while the adhesion system slowly deteriorates. The compound swelling causes belt tension to increase, sometimes causing the weak fiberglass cord to fail. Aramid cord maintains strength, but shrinks in the presence of water. This is not generally as significant of a concern as adhesion deterioration. Stainless steel cable generally works the best since strength is maintained and the adhesion system is not as critical.

Small Pitch Urethane Belts do not perform well when submerged. Polyester cord shrinks significantly causing tension to increase when installed on a drive. Compound swelling further increases belt tension. This typically results in tensile failure. While aramid belts maintain tensile strength, the gauge of the tensile cord is still small and is often not capable of withstanding tensile forces resulting from compound swelling, when added to the operating torque loads.