Installation Procedure for Synchronous Sprockets & Belts
PA NOTE

With the use of many high capacity synchronous belt drives in the Power Transmission Industry there are installation, alignment, tension and belt tracking issues to address. Maintenance personnel need to be aware of these drive characteristics for a successful installation or conversion. Although similar to V-belts, synchronous belt drives will require some greater attention to detail in order to optimize performance.

IMPORTANT: Insure all lock out and tag procedures are implemented prior to any belt or drive inspection, maintenance or installation!

‘QD’ BUSHED SPROCKET MOUNTING

1. To install the sprocket, first insure all parts are clean and devoid of any lubricants, coatings, or contaminants. Slide the bushing on the shaft, install the key and **hand tighten** the setscrew over the key. DO NOT USE EXCESSIVE FORCE!

Do not use lubricants or antiseize products on the sprocket taper bore or the bushing taper surface, as these products may cause excessive component forces using recommended cap screw torque values. The result could be cracked and broken sprocket hubs or bushings.

2. For a *conventional mount* slide the large end of the sprocket taper bore into position over the mating tapered bushing surface, aligning the unthreaded holes in the sprocket hub with the threaded holes in the flange of the bushing. Hand tighten the cap screws with lock washers installed.

Due to sprocket design or clearance on a particular drive, some sprocket assemblies will allow a *reverse mount* procedure by reversing the entire sprocket-bushing combination. This results in the bushing flange facing out but still allows the cap screws to be installed from the outside of the assembly; the cap screws are placed through the unthreaded holes of the bushing flange and into the threaded holes of the sprocket hub. These are typically threaded partially due to the long length of the hub.

3. Torque the bushing cap screws alternately and progressively. DO NOT USE EXTENSIONS on the torque wrench handle. ***Do not use impact wrenches!*** These procedures will prevent cracked or broken bushings and sprocket hubs. Finally, tighten they keyway set screw using a standard allen wrench. A gap should be present between the face of the sprocket hub and the face of the bushing flange to insure adequate grip on the shaft. No gap typically indicates a bore or shaft misfit.

Alternately and progressively tightening the cap screws is extremely important when installing a synchronous sprocket. A synchronous drive is not as forgiving as a V-belt drive and performance can be more adversely affected with a cocked bushing/sprocket.

DRIVE ALIGNMENT

4. After sprockets are installed, place the belt on the drive, take-up the slack, and check for proper alignment. Using a straight-edge or metal tape for long centers, you can easily check for misalignment. Heavy string can be used with care on short center distance drives.

5. Line the straight-edge along the face of both sprockets, checking the driveR and driveN sprockets separately. Misalignment will show up as a gap between the outside face and the straight-edge. Although recommended drive alignment allows for 1/16 inch misalignment per foot of center distance which equals 1/4 degree for angular or parallel values, try to keep any misalignment to a minimum to allow for optimum tooth engagement and belt performance. If flanges are damaged, missing or cause interference with alignment procedures, use 1/4 inch thick, flat ceramic magnets on the sprocket face for a helpful tool. They will provide a flat alignment surface, extend beyond the flange and are available from any hobby shop or hardware store.

BELT TENSION

6. Belt tensioning is the next step and the objective is to apply the least amount of static tension to handle actual belt load. Installation tension can be measured with a tension tester in conjunction with the appropriate deflection value and forces. This procedure will provide adequate static tension to prevent the belt teeth from ratcheting or jumping sprocket grooves under load. TOO MUCH OR TOO LITTLE TENSION REDUCES DRIVE COMPONENT LIFE.

7. Using the force deflection method of tensioning choose an accessible span and identify the span length from where the belt exits one sprocket and enters the other. The drive belt should be deflected midspan 1/64 inch of deflection for each inch of span length between adjacent shafts or pulleys. The range of force recommended to deflect the belt the appropriate distance is available from the belt manufacturer (contact Gates Product Application HELPLINE @ 303/744-5800 with drive details). Or, the range of force can be calculated for the exact drive from tension formulas in the Gates Drive Design Catalogs or the Design Flex ™ II computer program.

8. Using a deflection tension tester, place a straight-edge on the top of the belt so it rests on both sprockets. The belt must now be deflected midspan by the distance and force predetermined from Step 7.

The lower portion of a single shaft pencil tension tester has an o-ring which can be adjusted to fractional inch increments and should be set at 1/64 inch per inch of span length, or if span distance is 48 inches, the o-ring should be set at 48/64 or 3/4 inches.

The upper portion of a tester also has an o-ring which should be set to zero. When you apply the force equally to the belt midspan and the bottom o-ring reaches the same level as the reference surface of the straight edge, the top o-ring should have moved indicating the pounds force of deflection. You now compare this value with the value(s) from Step 7. On multiple shaft pencil tensioners, use the sum of all values to determine the total deflection force.

The single shaft tensioner allows a maximum deflection of 30 pounds, while the double barrel tensioner allows a maximum deflection of 66 pounds.

Beyond the 66 pound values, one may need to use a heavy duty spring scale (multiple scales for large deflection forces) or Gates Sonic Tension Meter which can measure actual static tension. A length of chain and short section of pipe used with the spring scale will help equalize deflection forces across the belt width.

If the measured deflection force reads lower than desired, the drive must be tightened; and if the value reads higher than desired, the drive must be loosened. Also remember lower tensions are the cause of belt ratcheting while higher tensions are also imposed on shafts, bearings and the drive structure. With tensioning at the proper value recheck the sprocket alignment and adjust or proceed as necessary. Belt manufacturers do recommend new drives or belts be tensioned at values approximately 25% higher than typical maintenance or used belt values to allow the new belt to seat in. This greater initial tension decreases quickly under load on a new belt due to seat in and should not seriously affect the belt, bearings and other components.

BELT TRACKING

9. Due to the manufacturing process of synchronous belts there is a normal tendency for the belt to track toward a flange. This can frustrate many people trying to track the belt in the middle of the sprockets. The sprocket is not crowned as in older flat belt pulley designs or conveyor applications.

The normal tendency of the belt is to track one direction or the other. If you are comfortable with sprocket alignment as explained above, this condition should not pose a problem. A belt that tracks immediately to a flange when the drive is hand rotated indicates alignment is good. Be careful, if hand rotation is possible, to keep away from rotating parts and prevent loose items from getting caught in drive components.

10. The static condition alignment procedure may not address drive alignment in a dynamic mode, particularly when loads on drive components can be variable and extreme. This load-induced misalignment can cause belts to track improperly and reduce belt tensions. Structural reinforcement of the drive framework may be required to address dynamic load drive misalignment. This condition should be investigated and addressed immediately upon discovery to prevent drive performance problems or premature drive failure.