TSB GEN 0007

TECHNICAL SERVICE BULLETIN

BELT DRIVE SYSTEM TENSIONING AND MAINTENANCE

INTRODUCTION

Proper tension in drive belts is extremely important. If the tension is lower than needed, the belts will slip below what the system is capable of delivering to the extrudate. Also, this can cause premature belt failure. If the tension is higher than needed, the pulley shaft bearings or motor bearings will experience a force greater than they were designed to handle. Abnormally hot bearings can be an indication of over-tensioned belts. For belt design guidelines for a given application, consult JCSS.

MOUNTING SHEAVES: ALIGNMENT METHODS

Misalignment of sheaves can lead to premature belt failure. There are two general types of misalignment: angular and parallel.

A. ANGULAR MISALIGNMENT

Angular misalignment leads to premature belt and sheave wear as well as belt stability problems. It can cause excessive belt edge cord wear, sidewall wear, and make it likely for the belts to escape from the sheave grooves.

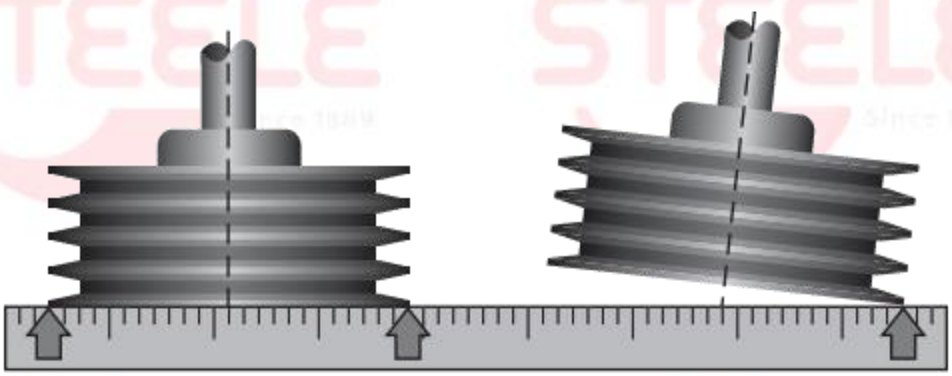

FIG 1: Angular sheave misalignment

To measure angular misalignment:

$$Angular\ Misalignment\ (A) = \arctan(\frac{(X_2 - X_1)}{D})$$

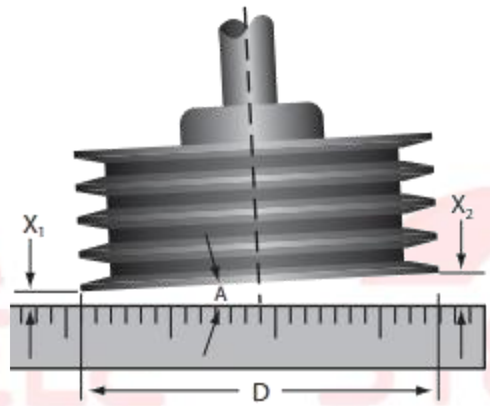

FIG 2: Angular sheave misalignment measurement

The tolerance for angular misalignment is ½°.

B. PARALLEL MISALIGNMENT

Parallel misalignment leads to accelerated belt and sheave wear and belt stability problems. This type of misalignment affects V-belts more than synchronous belts. Parallel misalignment can cause noise, tooth and sprocket wear, poor tracking, and excessive heat.

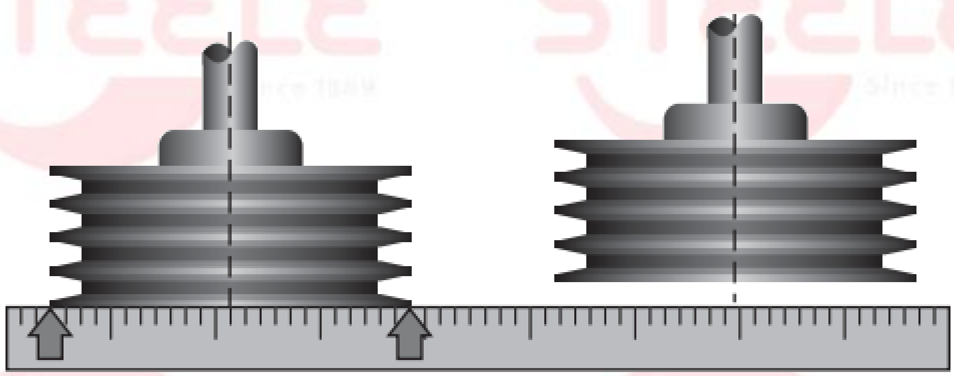

FIG 3: Parallel sheave misalignment

To measure parallel misalignment:

$$Parallel\ Misalignment\ (P) = \arctan(\frac{Y}{L})$$

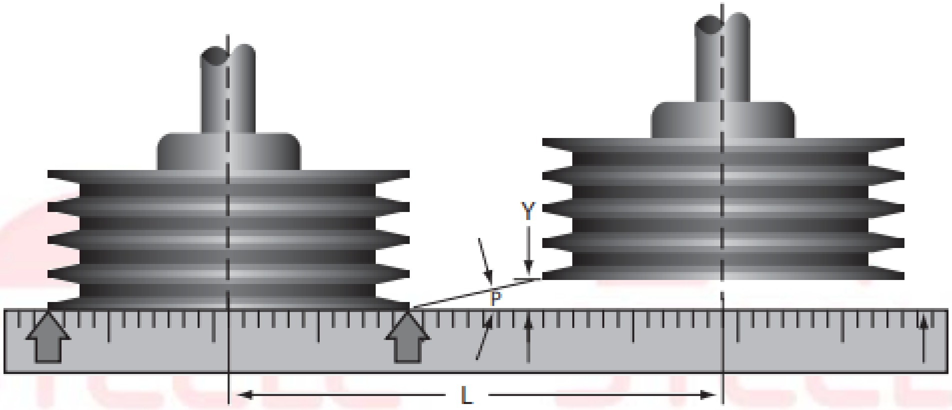

FIG 4: Parallel sheave misalignment measurement

C. CORRECTING MISALIGNMENT

- To correct angular misalignment, use a straight edge to measure the difference in angle, and then move one of the members in the drive train to adjust.
- To correct parallel misalignment, use a laser or straight edge to measure difference in clearance, and then adjust sheaves appropriately with respect to each other in a drive train.
- To ensure that sheaves are parallel to the ground (if the drive has vertical shafts), a bubble level can be used.

SETTING TENSION

1. Determine the force required for deflection.
   - Calculate the span length (t) of the drive using the following formula:

$$t = \sqrt{C^2(\frac{D-d^2}{2})}$$

Where C = center distance of drive

D = effective outside diameter of the large, flat pulley

d = outside diameter of the small sheave

   - Lay a steel bar or a narrow block of wood across the span length as a reference.
   - At the center of the span, measure the force required to deflect one belt $^1/_{64}$” per inch of span length from its resting position.
     - Be sure to apply the force perpendicular to the belt.

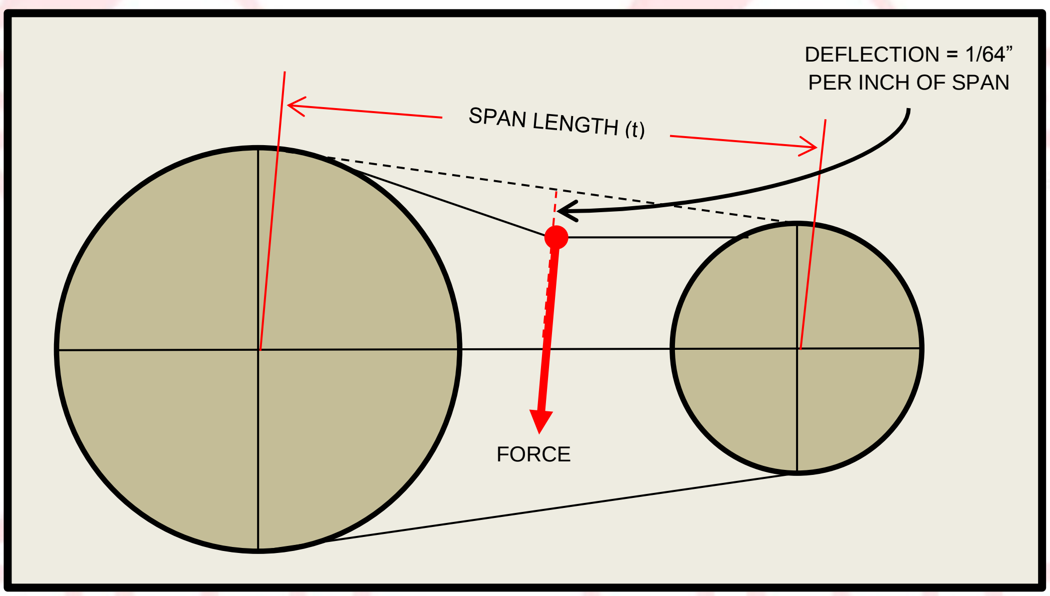

FIG 5: Measuring belt tension

2. Compare the measured force with the range of forces given in Table 1.
   - If the force is lesser than the minimum recommended force, the belts should be re-tensioned.
   - If the force is greater than the maximum recommended force, the drive is tighter than it should be.

V-BELT CROSS SECTION	SMALL SHEAVE DIAMETER RANGE (in)	SMALL SHEAVE DIAMETER RANGE (mm)	SMALL SHEAVE RPM RANGE	SPEED RATIO RANGE	RECOMMENDED DEFLECTION FORCE (LB)		RECOMMENDED DEFLECTION FORCE (N)	
					MIN	MAX	MIN	MAX
3VX	2.20	<55.88	1200-3600	2.00 TO 4.00	2.8	4.1	12	18
	2.35-2.50	59.69-63.50	1200-3600		3.2	4.7	14	21
	2.65-2.80	67.31-71.12	1200-3600		3.5	5.1	16	23
	3.00-3.15	76.20-80.01	1200-3600		3.8	5.5	17	24
	3.35-3.65	85.09-92.71	1200-3600		4.1	6.0	18	27
	4.12-5.00	104.65-127.00	900-3600		4.8	7.1	21	32
	5.30-6.90	134.62-175.26	900-3600		5.8	8.6	26	38
5VX	4.40-4.65	111.76-118.11	1200-3600	2.00 TO 4.00	9.0	13	40.	58
	4.90-5.50	124.46-139.70	1200-3600		10.	15	45	67
	5.90-6.70	149.86-170.18	1200-3600		11	17	49	76
	7.10-8.00	180.34-203.20	600-1800		13	19	58	85
	8.50-10.90	215.90-276.86	600-1800		14	20	62	89
	11.80-16.00	299.72-406.40	400-1200		15	23	67	100
5V	7.10-8.00	180.34-203.20	600-1800	2.00 TO 4.00	11	16	49	71
	8.50-10.90	215.90-276.86	600-1800		13	18	58	80.
	11.80-16.00	299.72-406.40	400-1200		14	21	62	93
8V	12.50-17.00	317.50-431.80	600-1200	2.00 TO 4.00	28	41	120	180
	18.00-24.00	457.20-609.6	400-900		32	48	140	214

TABLE 1: Recommended deflection force *per* belt strand

WHEN TO CHANGE OUT

The drives should be inspected at least once every six months. The following sections describe the most common types of premature belt failure or abnormal wear.

A. BROKEN BELTS

There are four common causes for broken belts:

1. The drive is under-designed. If this is the case, redesign to the manufacturer's recommendations.
2. The belt rolled or pried onto the sheave. If this occurred, be sure to use drive take-up during installation.
3. An object fell into the drive. To prevent this, be sure that the guard is adequate.
4. The belt experienced severe shock load. To prevent this from happening again, redesign the drive to accommodate shock load.

B. SIDEWALL WEAR

There are four common causes of belt sidewall wear:

1. Slipped belt. To fix this, re-tension the belt until it stops slipping.
2. Sheave misalignment. To fix this, realign the drive using the methods outlined in the sheave alignment section.
3. Worn sheaves. If this is the case, the sheaves need to be replaced.
4. Incorrect belt. If this is the case, the belt should be replaced with the correct size.

C. BOTTOM SURFACE WEAR

There are three common causes of belt bottom surface wear.

1. The belt has been bottoming against the sheave groove bottom. To solve this problem, ensure that you are using the correct belts for your sheave.
2. Worn sheaves. If this is the case, the sheaves need to be replaced.
3. Debris in sheaves. To fix this, clean the sheaves.