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Application Guidelines to Keep You Better Informed

BELT TENSION

BELT APPLICATIONS

Although the problems are far from an epidemic, it appears that a **high percentage of motor failures on belt-driven applications are bearing-related**, and a majority of these failures could be easily eliminated if care is taken with the specification and installation of these applications.

As the economically justifiable size of industrial plants grows, the individual equipment within these facilities has also increased in throughput and driven horsepower. As a result, we are seeing a growing number of “higher” horsepower motors being applied to V-belt loads. There are several obvious concerns with belt application on larger loads. One is the increased radial load. Larger inertia loads seem to have resulted in a substantial increase in over tensioning in the field. The methods of V-belt tensioning vary dramatically from site to site and sometimes within various areas of a single mill. One thing that consistently appears is that **the larger the load, the greater the tendency to over tighten.** This artificially high radial load results in reduced expected bearing and/or belt life.

Along with drastically increased radial loads comes the concern of motor sheave placement. Larger horsepower belt motors have longer shaft extensions and, as a result, placement of the motor sheave too far outboard on the shaft compounds the mechanical stresses. Some field installations had the motor sheave cantilevered over the end of a shaft that already had a shaft extension of 11.625 inches. Possible shaft flexing from such misplacement can lead to reduced bearing life due to an inconsistent roller bearing running surface.

As mechanical loading increases, it is obvious that the motor drive-end shaft must increase in diameter, which in turn, results in larger bearing diameters and an increased angular velocity of the rolling elements in the bearings. Increased roller velocity results in a reduction of expected grease life. Increased frequency of re-lubrication,

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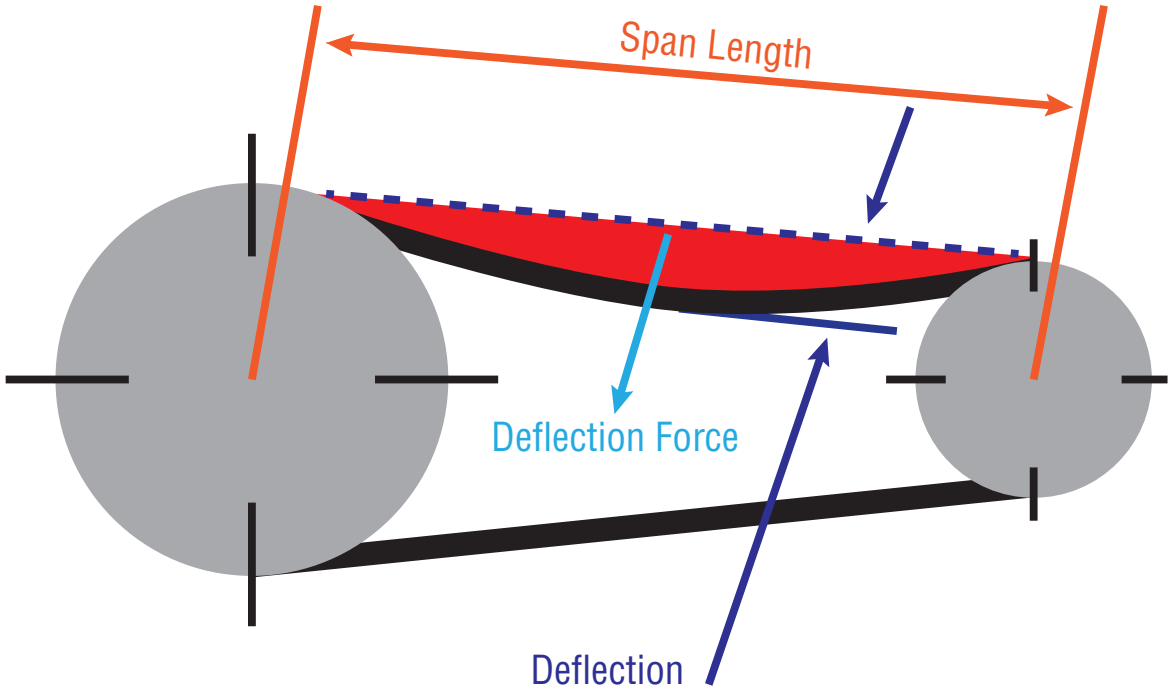
therefore, must be performed to maintain expected bearing life.

Site visits have revealed that more time and care is taken aligning direct couple loads than is taken with belt-driven applications. It is typically assumed that the sheave can be placed anywhere along the motor shaft to provide the belt alignment between the motor sheave and the load sheave. This is not a recommended practice. **Of equal importance to sheave placement along the shaft is alignment of the drive and driven sheaves. The same care in alignment that is taken with direct-coupled loads is required for belt drive applications.**



BELT APPLICATIONS

Belt manufacturers provide detailed information on how to tension their belts. As a quick reference, the following can be used for some common belt types.

Apply force in the center of the span, at right angles to the belt with sufficient force to deflect the belt 1/64th inch for each inch of span length. With properly tensioned belts, the force should fit into the ranges given. (The following information was compiled from several sources.) The format provides the minimum and maximum values plus the average value shown in brackets.

The above table shows the wide range of “normal” belt deflection force for properly adjusted V-belts of various makes installed under different conditions (new belts vs. old, or large diameter sheaves vs. small).

Tension typically should be increased to raise the force of new belts by 30%. After a few days, the tension should be adjusted to recommended values. This allows for the initial stretch of new belts.

Care should be taken to use belts that are properly matched so that all belts take their portion of the load. If some belts are longer than the others, they will not be tight enough and therefore not transmit the load properly. The shorter belts will probably be over-tensioned. If belts are running hot, it is most likely that they are not tensioned enough. Over-tensioning will reduce both belt and bearing life. ■

BELT DEFLECTION

BELT SIZE	BELT DEFLECTION FORCE PER 1/64” IN ‘LBS.’ (AVERAGE)	
	MINIMUM	**MAXIMUM**
3V	2.2 to 5.5 (3.9)	3.3 to 8.5 (5.9)
5V	7.7 to 18 (13.9)	10 to 21 (15.5)
8V	18 to 35 (26.6)	20 to 59 (39.5)
A	2.2 to 4.9 (3.6)	3.4 to 7.1 (5.3)
B	2.6 to 8.1 (5.4)	5.3 to 12 (8.7)
C	7.5 to 14 (10.8)	10.5 to 22 (16.3)
D	15 to 27 (21)	22 to 40 (31)
E	32 to 40 (36)	47 to 60 (53.5)

ASIDE: GENERAL MOUNTING GUIDELINES FOR MOTORS

1.) Mount the motor securely on a firm and flat base. All ball and roller bearing normal thrust motors through frame 447 are mechanically capable of being mounted in any position. Consult with TIC for frames larger than 447. Special drains, seals, or support construction may be required on all sizes, subject to the environment.

2.) Align the motor accurately. Ball bearings are recommended for direct coupled applications. Roller bearings may be used with flexible couplings — ensure proper alignment. Rigid couplings require extra allowance for thermal shaft growth toward the coupling. Skidding noise may result from the combination of internal bearing clearances and alignment tolerances. DO NOT RUN A ROLLER BEARING WITHOUT A LOAD CONNECTED.

3.) V-belt Sheave Pitch Diameters should not be less than the NEMA recommended values, or calculated formula for frames above 445T.

4.) Belt speed should not exceed 6500 ft. per minute, or consult belt/sheave supplier.

5.) Motors must not be subjected to vibration exceeding 0.5 G force. Motors are not to be mounted to shaker screens or vibrating equipment that exceeds 0.5 G force on the motor. Complete isolation is required.

NEXT MONTH'S ISSUE: NEMA UPDATE