Informative Application Guidelines, with respect to *Motors & Drives* to keep you better INFORMED.

APPLICATION GUIDELINE #02

(Belt Tension)

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BELT APPLICATIONS

Although the problems are far from epidemic, it appears that a high percentage of motor failures on belt drive 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 varies dramatically from site to site, and sometimes within various areas of a single mill. One thing that appears consistent 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.

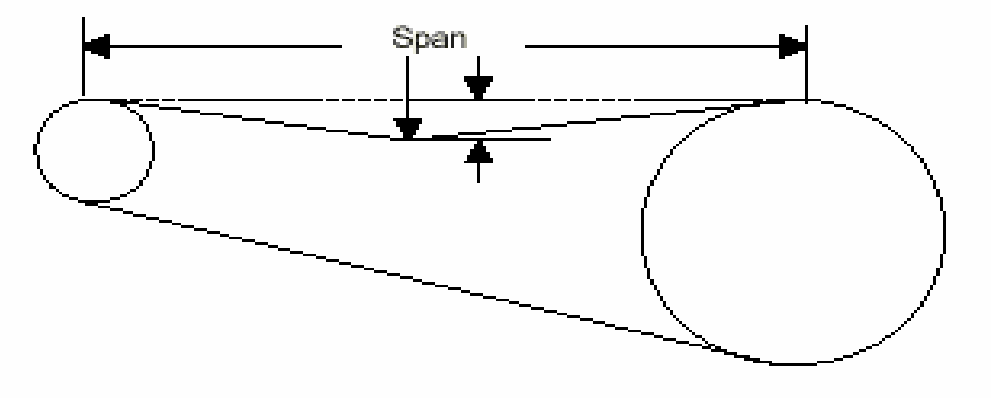
Along with drastically increased radial loads, comes the concern of motor sheave placement. Larger horsepower belt motors have longer shaft extensions and, as a result, placement of the motor sheave too far outboard on the shaft compounds the mechanical stresses. Some field installations viewed, had 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 finally, 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, 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 TENSIONING

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 1/64 th 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.

Belt size	**Belt deflection force per 1/64" in 'lbs.' (average)**	
	Minimum	*Maximum*
3V	2.2 – 5.5 (3.9)	3.3 – 8.5 (5.9)
5V	7.7 – 18 (13.9)	10 – 21 (15.5)
8V	18 – 35 (26.6)	20 – 59 (39.5)
A	2.2 – 4.9 (3.6)	3.4 – 7.1 (5.3)
B	2.6 – 8.1 (5.4)	5.3 – 12 (8.7)
C	7.5 – 14 (10.8)	10.5 – 22 (16.3)
D	15 – 27 (21)	22 – 40 (31)
E	32 – 40 (36)	47 – 60 (53.5)

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 versus small).

Usually tension 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.