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BELTS BY TIMKEN

TECHTIPS

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Effect of Heat on Belts

It is difficult to provide a quantitative definition of heat resistance in power transmission belts due to the wide variations encountered in various applications, type of belt used, and degree of maintenance provided. In addition, length of exposure, users' expectations regarding service life and the presence of other factors (such as chemicals) which might accelerate the effects of temperature, all add to the complexity of such a definition.

In many cases, heat resistant v-belts are specified when they are not required. A decision to use such a special belt is very often controlled by numerous considerations. The user should review the various type of belts available from stock, as well as requirements of the particular application, before resorting to special belts.

Some of the more influential factors to consider with regard to the statements above include:

1. Excessive heat, from any source, is the single biggest deterrent to any dynamic rubber product. It accelerates progressive curing which results in the rubber becoming hard and brittle. This, in turn, results in cracks arising from the components to relieve the stress of flexing.
2. Ozone added to heat accelerates deterioration still further.
3. Heat is generated both internally and externally when a belt is in motion. A high local ambient temperature adds to the heat exposure.
   (a) Internal heat is created by constant flexing of the components.
   (b) High ambient temperatures increase both internal and external heat.

Anything that can be done to reduce these factors will improve belt life and drive efficiency. Some methods for accomplishing this will be discussed later. All stock power transmission belts manufactured by members of the Association for Rubber Products Manufacturers (ARPM) are made of materials compounded for good resistance to heat. Following are some guidelines:

1. As a general rule, for every 35°F (20°C) increase in prolonged ambient temperature, above 85°F (30°C), belt life will be reduced by 50%. However, short periods of ambient temperature of above 85°F are not likely to cause a measurable reduction in belt life.
2. Belts of special constructions, to counter the effects of high temperatures, can be obtained on a made-to-order basis.
3. Each type of power transmission belt has its own characteristics of heat build up. An ambient temperature might exceed the range for one type of belt but be well within the range of others.
4. The amount of maintenance provided is extremely important – slippage, due to lack of tensioning, can generate substantial heat.
5. The operating temperature of all belt types will reach a level balanced by the airflow cooling effect. The temperature of all belt types will climb to a level where the increase is balanced by the airflow cooling effect. In other words, the belt will not continue to get hotter, but its temperature will eventually level off at a point where airflow will dissipate the additional heat build up.
6. Belt operating temperature is a function of:
   (a) sheave or pulley diameter
   (b) load being transmitted
   (c) belt flex rate
   (d) belt type/belt construction
   (e) maintenance procedures, including proper installation, initial and periodic re-tensioning
   (f) ambient temperature
   (g) airflow cooling effect
7. Methods of improvement:
   (a) Use the largest pulley possible consistent with space limitation and economics, as this:
      1. Reduces internal heat build-up due to small radius bending
      2. Reduces belt tension and bearing load
      3. Increases airflow cooling effect
   (b) Follow proper maintenance and installation procedures for the belt. V-belts and v-ribbed belts require a run-in period and re-tensioning to remove residual stretch and to ensure proper seating.
   (c) Readjust tension periodically.
   (d) Allow for ventilation in the guard design – use forced ventilation of finned sheaves if necessary.
8. Drives operating in ambient temperatures over 140°F (60°C) should be referred to Timken Belts for recommendations.

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The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance mechanical components, including bearings, belts, gears, chain, couplings and related mechanical power transmission products and services.

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