CAN YOU EXPLAIN WHY WORN SHEAVES (V-BELT PULLEYS) CONTRIBUTE TO ENERGY EFFICIENCY LOSS?

WORN SHEAVES
In a v-belt drive the wedging of the belt in a sheave groove creates friction when tensioned. This friction allows horsepower to be transmitted from the driver shaft (motor side) sheave to the driven side sheave when the drive is operated.

The groove of any given sheave is machined at a specific angle based on diameter and type of belt to be used. This is because a belt cross section actually changes as it wraps a radius. The size of the sheave and ultimately the radius determine what groove angle is required. For example, a sheave roughly 8” in diameter machined for “B” style belts will have a 38° groove angle. In contrast a 4” sheave machined for “B” style belts will have a 34° groove angle. This angle is designed to place the belt in an optimal position so that when the belt is tensioned the sidewalls expand and make contact with the sheave. This angle also ensures equal stress is placed on the belt tension cord members. A v-belt drive with sheaves in good condition using cogged or “notched” style v-belts with appropriate tension can be up to 98% efficient.

Over time friction between the sheave and the belt erodes sheave material no differently than water would erode a rock in a stream. When sheaves become worn the sides of the sheave angle start to cup and have a concave appearance and the belt has less area of contact with the sheave and slips (see figure 1). Energy efficiency is then quickly eroded. A 6% loss in efficiency due to belt slippage for a single 20HP drive operating 7 days a week 24/7 at 12.8 cents a kilowatt hour translates to an added $511.92 in added electricity charges.

Heavily worn sheaves are quite visible to the eye and even to the touch as you run a finger in the groove wall. However, many sheaves can appear acceptable, but actually are worn. When a straight edge or groove gauge is placed in them it becomes more apparent. In order to maintain efficiency sheaves should be replaced once 1/32” or more of wear is visible. (Typically after every 5-7 annual belt changes).
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CAPTURING ENERGY SAVINGS
Many service technicians do not realize the significant impacts a few points of efficiency in a v-belt drive can have on their customer. Replacing worn sheaves can have very rapid payback. In the example on page one, the added annual electricity use of $511.92 on just one unit could easily have paid for replacement sheaves in just a couple of months. Building owners, facility managers, and maintenance technicians need to be aware of the impacts of worn sheaves and the importance of maintaining drive efficiency. All preventive maintenance programs that utilize v-belt drives should incorporate a sheave inspection and replacement program to ensure electricity costs are minimized.

TOOLS TO HELP
We offer many tools to help customers maintain efficiency in their v-belt driven equipment. Some of the most popular items are listed below.

- **Belt Drive & Bearing Reference Guide** (Form #8932)
  - Offers basic product information, installation information, preventive maintenance, and troubleshooting tips in a pocket size format.
- **Save The Green Energy Responsibility Flyer**
  (Forms #MCF08073 and #MCF08024)
  - Offers energy responsibility in three easy steps.
- **Belt Efficiency Calculator**
  Available at www.RegalPTS.com. Allows user to quickly calculate the savings benefit of converting from wrapped style v-belts to cogged or “notched” style v-belts.

- **Belt Drive Maintenance** and Installation Video
  Available at www.RegalPTS.com or on CD by request.
- **Sheave Wear Technical Bulletin** (#1007)
  Offers explanation of groove gauge usage and sheave wear dynamics. Available from Application Engineering.

Future article ideas or questions can be Submitted to Don.Sullivan@regalbeloit.com