



V-Belt Mechanical Efficiency - Round 2

PA NOTE

Earlier we discussed the details of a competitor's (Dayco's) promotion of their molded cog belt and its "high mechanical efficiency". We continue to have concerned customers who are asking about the relative merit of the values portrayed in the various articles and trade advertisements.

To refresh your memory, Dayco has indicated that their molded notch belts have had measured efficiency increases of up to 4 ½ percent. As a "conservative" value, they are indicating that the molded notch belts provide an efficiency increase of 2 percent across the total application spectrum - this is the data on which their dollar savings are based.

The 4 ½ percent efficiency difference was developed on a test which used 3.4 inch pitch diameter "B" section sheaves. A review of the Gates Heavy Duty Drive Design Manual will indicate that these sheaves are the minimum recommended for our Tri-Power belts and are not even specified in the horsepower rating tables for the Hi-Power II™ belts. Indeed, the smallest sheave listed in the RMA Standard is 4.6 inches P.D. and Table 1 of this standard recommends a minimum diameter of 5.4 inches. This is as it should be, since Hi-Power II™ belts were never designed to be operated on sub-minimal sheaves. Under these extreme conditions, it is true the molded notch belts will provide significant efficiency benefits. However, our testing on both "B" and "C" section belts indicate that the efficiency of both molded and banded belts becomes nearly equal as the sheave diameters approach the minimum recommended for Hi-Power II belts. In other words, when the belts are properly applied, there is only a very slight efficiency difference between the two constructions.

We are not alone in our concern over Dayco's advertising campaign. Roy Semin (Chief Engineer-Development, the Goodyear Tire and Rubber Company) has written an excellent article on efficiency of belt drives. This article appeared in Machine Design (April 9, 1981). We would like to quote some of the contents of this article since it reinforces our beliefs on belt drive efficiency.

“Under the auspice of the Rubber Manufacturers Association (RMA), manufacturers of power transmission belting has investigated this matter. Their studies have shown that belts - when designed in accordance with RMA standards and when properly installed and maintained - transmit power with high efficiency, generally comparable to that of high grade chain or gears.

“The selection of belts according to recommended practice solely for the purpose of saving energy, usually will yield only a 1% to 1 ½% efficiency gain. Such an efficiency improvement can be easily lost through poor maintenance practices. For example, low belt tension not only creates slip and decreases belt life, but also increases energy losses by as much as 10%. Misalignment, worn sheaves, and debris in the sheave grooves also reduces efficiency and belt life. Because all of these effects exist to one degree or another in most drives, measurement in the field of actual energy savings - as a result of changes in belt types - are virtually impossible. Instead, such energy measurement must be performed in a laboratory with precision instruments under carefully controlled conditions.



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“Although cogging of the bottom surface improves belt flexibility and efficiency, it also increases costs. The greatest improvement in efficiency of cogged belts with respect to uncogged belts occurs for sheave sizes that are smaller than the minimum recommended diameter. Above the minimum recommended sheave diameter, the efficiency improvement of cogged V-belts over uncogged V-belt is less than 1%. To be sure, cogged belts can save a substantial amount of energy on certain drives, but their broad use for such purposes often proves to be ineffective and, in fact, increases the overall cost of the drive.”

Above all else, it is important to remember the following three items:

1. In the laboratory testing program, it was determined that the competitive belts have, within the accuracy of the test data, the same efficiency under the same conditions for the same construction belt. Our competitors have no advantage with their constructions when compared to the same Gates constructions.
2. A well designed Hi-Power II™ belt drive which is properly maintained will have essentially the same efficiency as a well designed Tri-Power® drive. (Remember that this includes the use of acceptable sheave sizes.)
3. If your customer is still convinced that the molded notch belt is more efficient on his drive, in spite of all of the above discussion, simply furnish him with Gates Tri-Power® belts.