



---

## Computerized V-Belt Drive Design

### PA NOTE

Over the last few years, the use of computers has increased by leaps and bounds. Advancement of computer technology increased at an exponential rate. Small, inexpensive hand-held calculators can make calculations which required a large and expensive computer only a few years ago.

The computers are no longer a luxury. They are a necessity in the business place. Many businesses are using computers to do much of their daily work, primarily in the area of record keeping. Many businesses in the rubber industry depend heavily on mathematical equations to solve problems. Gates uses a large number of equations to calculate the horsepower transmission capability of a belt as well as a variety of other drive design parameters.

With this move toward computers, Gates has had a number of requests to help customers program this data into their personal computers. Since there are so many types of computers and so many computer languages, we have created a flow chart. The flow chart is too long to include in this PA Note, but can be obtained from Product Application.

The flow chart is to help the customer program his own computer to design two point drives by calculating the horsepower per belt, number of belts needed, center distance, tensioning values, and shaft load. The information needed is the driveR and driveN sheave diameters, belt cross section and length, horsepower, service factor, and speed of the faster shaft.

Do not confuse this program with the Design Flexibility Analysis. Design Flex™ II takes the basic drive data, horsepower, driveR speed, driveN speed, center distance, and service factor and determines all possible drives for this set of conditions. The different drives can be compared and a best drive can be selected according to what the customer considers to be the most important; whether his emphasis is on obtaining the lowest cost drive, the drive with the lowest shaft load, etc. Design Flex™ II is a much more powerful tool than the program in this PA Note.

The sheave rim speed is one value this program will calculate, check, and should be clarified. Rim speed limitation on standard sheaves is 6000 feet per minute for classical cross section sheaves (Hi-Power®, Tri-Power®) and 6500 feet per minute for narrow cross section sheaves (Super HC®, Super HC® Molded Notch). This is a sheave limitation, not a belt limitation. When the sheave speed increases, the centrifugal forces in the sheave can become extremely large and the sheave will literally explode. If this limitation is exceeded, the sheaves must be made with special material (such as ductile iron or steel) and in many cases should be dynamically balanced. This program will display the rim speed if it exceeds this limitation and will not calculate the horsepower rating if over 10,000 feet per minute. A drive with a rim speed of over 10,000 feet per minute should be referred to Product Application.

Gates has been using computers to analyze drives for over 20 years. Computers can make repetitive calculations and save hours upon hours of time. However, computers only make calculations, common sense and experience are the most crucial factor to a good drive design.