



White Paper

Trends In Power Transmission: Synchronous Drive Systems

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Introduction

Synchronous belts do not slip, need retensioning or require lubrication. Offering 98% constant efficiency, these belts are now being used on all types of plant equipment and machinery. This Gates White Paper compares synchronous belt systems to roller chain, gear and traditional V-belt drives.

Case History

A design firm recently completed one of the largest automated conveyor projects in its 26-year history. The application required a wide variety of packaging systems, with conveyors varying in length from 10 to 200 feet. But, unlike typical systems that move pallets, boxes and assorted hard goods, this project required conveyors that would meet stringent USDA food handling requirements. For the drive systems, roller chains and V-belts were not options. The customer needed a drive that was clean, dependable, maintenance-free, and could handle daily washings with a caustic solution. The design firm needed a drive on conveyor equipment that was easy to build, and reassemble at the customer's site.

The firm's engineering staff specified Gates Poly Chain® GT® 2 belts and a stainless steel sprocket package because, "this drive system was the best choice for our production needs and the non-corrosive, food grade conveyor requirements of the customer."

Replacement features

Examples such as this from industries across the country are becoming common as synchronous belts are used to replace roller chains, V-Belts and even some gears.

Forecasters at Gates Corporation, the world's largest maker of belts and hoses, expect the synchronous belt market share to grow by 5% per year for the next five years – a 25% jump.

Why? Synchronous belts are versatile and dependable, and they provide positive, non-slip power transmission.



Synchronous belts operate by making positive tooth engagement with mating grooves on the sprockets much like chain and gear drives. Since they require minimum maintenance they are often used to replace V-belt and chain drives in hard-to-reach areas and critical applications where downtime must be minimized. Less attention from maintenance personnel translates to additional savings for the end user.

Synchronous belts also have an extremely high horsepower rating, size for size, when compared to V-Belts. Furthermore, new generations of synchronous belts are capable of matching the load carrying capacity of roller chain size for size while providing longer life due to reduced wear (no metal-on-metal contact) and minimal stretch. This allows for more compact drives, leading to reduced wear on other components due to lower overall loads.

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When compared to V-Belts, synchronous belts require less tension when equivalent diameters are used and additional tension is not necessary for applications with less than 180 degrees of wrap on the pulleys and or sprockets. This further reduces the overall stress seen by all components in the system.

No lubrication & no stretch

Synchronous belts require no lubrication. They do not give off the oil spray associated with roller chain drives. Clean operation makes them ideal for contamination-sensitive applications such as food handling and bottling. For drives requiring optimal clean operating conditions, synchronous belt and stainless steel sprocket drive systems are designed to carry extremely high power ratings, and they resist corrosion and caustic washdown solutions.

Synchronous belts do not stretch over time like V-belts and roller chains, so there is no change in speed due to stretch, creep or slippage. They rarely need retensioning, which can be an important consideration on drives with limited center distance adjustment.

Because of their construction, the belts are highly resistant to abrasion and many corrosive substances. There is little wear to the teeth in most applications.

Energy efficiency

Studies by Gates power transmission engineers reveal that synchronous belts may be the most efficient form of power transmission short of a direct drive. The average V-belt drive is about 97% efficient when installed, but can drop to 93% or less as the belts stretch and slip.

Synchronous belts, however, offer a near constant 98% efficiency over the life of the belt. This is due to their non-slip characteristic and lower bending stresses (thinner section) that result in minimum heat buildup. This means that the user can increase the efficiency of the drive by 5 to 10% and save significantly on energy costs.

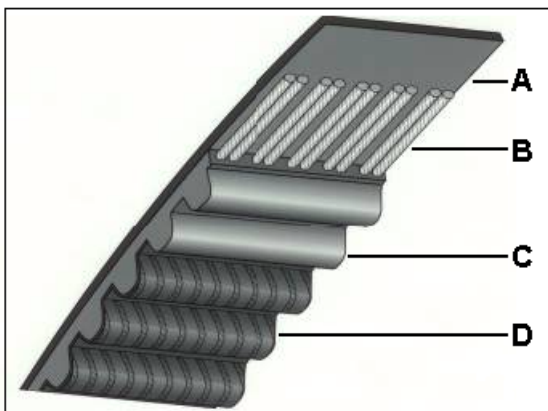
The primary drawbacks of synchronous belts are the higher initial cost of belts and sprockets, and the need for accurate initial alignment of drive components.

In most cases, the higher initial cost will be offset by savings from reduced maintenance and energy savings from higher drive efficiency.

Synchronous belts can be sensitive to misalignment and should not be used on power transmission systems where it is inherent to the drive operation. Misalignment leads to inconsistent belt wear and premature tensile failure due to unequal tensile member loading. Examples include applications where the framework (motor mount, structural support, etc.) flexes under load.

Synchronous belt anatomy

There are four parts that make up the standard synchronous belt:



A. Polyurethane or rubber body: The body protects the tensile member from oil, grease, moisture and other adverse environmental conditions.

B. Tensile Cords: The muscle of the belt, usually a high tensile strength fiberglass or aramid fiber cord that resists elongation, and shock and surge loads.

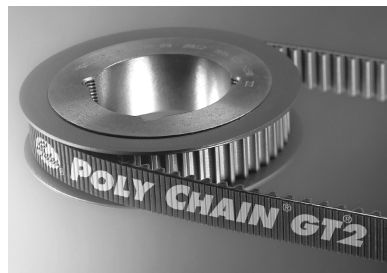
C. Teeth: Perform the function of positively engaging the grooves on the pulley or sprocket. They are precisely formed, spaced and compounded of a high modulus material.

D. Facing: A wear-resistant nylon fabric that acts as a wear surface, protecting the teeth. The facing also helps keep frictional loss to a minimum.

Conclusion

Synchronous belts are a growing factor in power transmission. They can solve tough drive problems. And, when properly installed, they provide space and weight savings, low maintenance and maximum energy efficiency.

In the food and beverage processing industry, synchronous belt drive systems are an ideal replacement for chain, gear and V-belt drives. In addition, synchronous belt drives are clean running systems that require no expensive oil baths or lubrication. When combined with stainless steel sprockets, a synchronous belt drive system has the added advantage of being able to resist chemicals, the build up of contaminants and caustic washdown solutions.



Additional resources

Gates Belt Preventive Maintenance and Safety program provides user tips ranging from inspection to installation of V-shaped and synchronous belts. Also included is information on reducing downtime, controlling parts replacement costs and increasing energy savings. To schedule a free belt preventive maintenance seminar at your facility, download a copy of Gates 48-page "Belt Drive Preventive Maintenance and Safety" manual, or sign up for Gates free weekly "Belt Tips" email service, go to www.gates.com/beltpm.

For additional information on Gates clean running Poly Chain GT2 stainless steel sprocket drive systems, and to obtain a copy of Gates "Belt Preventive Maintenance for Food & Beverage Processing Drives" manual, go to www.gates.com/stainless.

To locate a Gates power transmission distributor in your area, go to www.gates.com/distributors.

To schedule a visit with a Gates Industrial sales representative, call 1-800-777-6363.

For technical assistance from Gates Power Transmission Product Application engineers, call 303-744-5800, or email ptpasupport@gates.com.

