INSIGHTS™
Roller Performance
TECHNICAL SOLUTIONS FOR BELT CONVEYOR PRODUCTIVITY

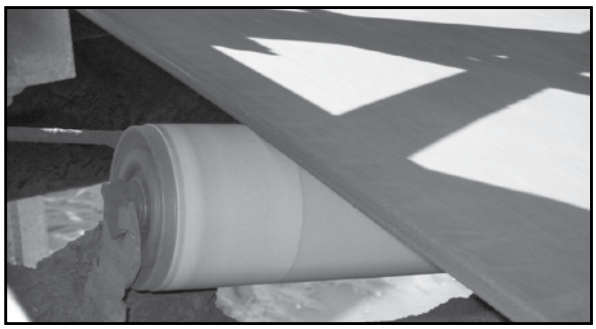
How Roller Selection Affects Power Consumption

What power consumption means to you

It costs money to operate a business – whether you're buying materials, paying employees, or simply moving material. Any time you can save money, it is a victory. Depending on your workload, your conveyor systems may be operating 24/7, so making sure your rollers are running as efficiently as possible can only add dollars to your bottom line. While the power to rotate a single idler roller is small, it accumulates along the length of a conveyor.

Power consumption and breakaway energy

Two factors contribute to the energy consumption required to operate a large number of rollers on a system. The first is breakaway energy — the power required to get the conveyor and all the rollers supporting the belt started. Breakaway energy is a function of the rolling resistance generated by seals and bearings and overcoming the moment of inertia, which is a function of the weight and geometry of the rollers. Conveyor start-up can utilize as much as 13% of available power. Electric motors are typically designed with the ability to operate at peak horsepower, three times as much as their operating rating, specifically to provide the needed energy at start-up.



Conveyor start-up can utilize as much as 13% of available power, contributing to energy consumption numbers.

The power required to get a belt conveyor up and running is largely dependent on the effort (or energy) required to get the system running. The design of the rollers plays a big part in this calculation because of the large number of rollers in the system and the rolling resistance they have in a stationary state.

Two things contribute to rolling resistance. First is the seal design. A roller using a very tight seal to prevent ingress of water and fine materials will have much greater rolling resistance than a roller using a non-contact labyrinth or centrifugal seal. Labyrinth seals rely on a complex path and often a grease chamber to make dirt and water ingress more difficult. Centrifugal seals use the churning effect created by the rotating motion of the roller to constantly move materials away from the bearing to prevent internal corrosion. Using a seal with lower rolling resistance can significantly reduce the energy required to get the roller moving and to keep it moving.

Second is the moment of inertia. Moment of inertia is used to determine how difficult it is to change the motion of a rotating object around an axis. In this case, it is used to determine how difficult is it to get a roller to turn around the shaft. With rollers, this is almost entirely a function of the weight of the shell, since the shaft remains stationary.

Rollers made of lightweight materials will have a significantly reduced moment of inertia, which can translate to large savings in the energy required to get the conveyor system running. As long as the roller does not lack performance in other areas, going with a lightweight material can be a very effective way to significantly reduce energy consumption from belt conveyor systems. Rollers with composite sleeves over a steel core will often weigh nearly as much as a steel roller and will not provide the reduced moment of inertia that can be achieved with a roller made with a full composite shell.

Power consumption and running energy

In addition to requiring enormous amounts of energy to begin rotating, steel rollers also generate substantial friction. Once the belt is moving, significant energy is required to keep the rollers running. This is a function of the friction caused by the bearings and seals, in addition to the "running friction" of the rollers on the belt. Steel rollers tend to have much greater running friction than composite rollers, making them more costly to operate in terms of power consumption.

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Choosing the correct rollers for your application

The first rule of thumb when choosing rollers that will last is to consider your environment, the application in which they will be used, the belt speed, and the size of your material load. These factors, as well as the size of your rollers and the number of rollers you need, should be a good starting point when choosing your rollers.

The CEMA (Conveyor Equipment Manufacturers Association) manual contains detailed information on proper roller selection. Once you define the requirements and the appropriate CEMA rating, you should then make sure the product selected meets the overall requirements of your operation.

The best choice for power consumption

When it comes to energy savings, engineered Nylon or HDPE rollers are a smart choice. They can weigh 40-50 percent less than steel rollers and many designs have lower running friction values, which, depending on the application, can decrease power bills by up to 30 percent a year. Installing rollers with non-contact seals is also wise if you are looking to save money on power because they require less breakaway energy. However, not all non-contact seals are the same. A centrifugal flinger seal will deter moisture, fines, and other contaminants from entering the inside of the shell while protecting the bearing. Other non-contact seals are packed with grease to create a barrier, which contributes to low breakaway energy and running friction numbers.

CoreTech™ Rollers from Flexco

CoreTech™ rollers typically require much less energy to create rotation and maintain a given RPM than standard steel rollers. With no contact points internally or on the shaft, the CoreTech seal does not allow contaminants inside the roller, but still allows free rotation without creating the drag associated with a tight contact seal. The CoreTech seal requires no grease barrier, further reducing breakaway energy and running friction.

CoreTech™

CoreTech™ Verified Solution

To get a grasp of the true effect of seal design and weight on power consumption, CoreTech rollers replaced existing rollers on a belt conveyor in an underground coal mine. The results were staggering.

Conveyor Specifications	6,320 ft, relatively flat belt
Belt Width	72 in
Belt Speed	957 fpm
Belt Load	5,000 stph
Idler Specifications	45-degree, 3-roll trough with 10-degree, v-roll return

The simple switch from the existing steel rollers to 7" CEMA E CoreTech Nylon conveyor rollers projects a

Horsepower Savings of 11%

and an

Annual Cost Savings of

$48,500

To obtain further information, request a consultation with a Territory Sales Representative by visiting www.flexco.com/contactus.

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