



Smarter Conveying for Precision Product Control and Faster Throughput on Filling and Packaging Lines



Slip-Torque® Roller Technology
Whitepaper

Slip-Torque Roller Technology

There is little worse in an automated production line environment than a cessation of throughput because of equipment failure, product spillage or product jam ups. The costs of the equipment repair, product damage and clean up, and the lost employee time are marginal compared to the loss of throughput. In high-volume manufacturing plants, interruption of throughput can exceed hundreds of cases per hour not processed because of slowdowns, shutdowns and jam ups.

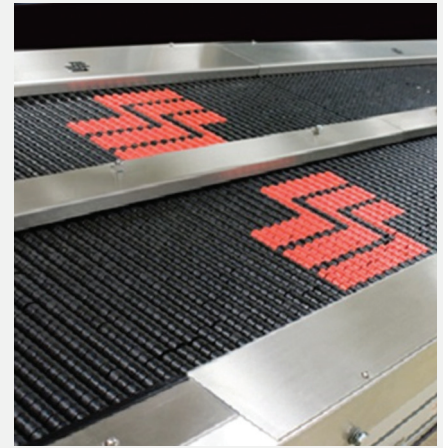
Corporations are increasingly viewing their product line operations from a performance versus cost standpoint. Establishment and monitoring of key performance indicators for maintenance, safety and system uptime within the production environment has taken on a whole new perspective with an eye toward maximum output, optimum equipment utilization and system longevity.

This perspective is nowhere more critical than with the conveyor systems used to transport and index products into the various production, filling and packaging automated systems along the line. Minimizing conveyor line stoppages significantly decreases opportunities for product jam ups and damage. By allowing the process to continue as close as possible to a steady state condition increases line efficiency and throughput profitability.

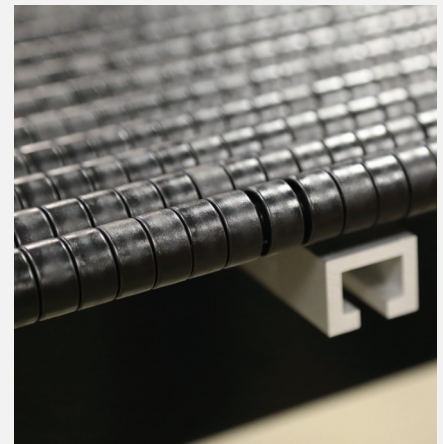
Utilizing the most optimum conveyor system for an application is pivotal for the speed of throughput and smooth performance of the line. Conveyors that are designed for use in industrial environments, for example, may not be well suited for use in food processing, completely aside from wipe-down, wash-down and sanitation requirements. Yet this is frequently the reason why food processors experience back-ups and jamming on their conveyors resulting in product spillage, damage and waste, and why products get marred by making contact with conveyor side rails.

When shrink wrapping or flow wrapping goes awry, which many end-of-line packaging systems experience, the culprit is too often that the conveyors are not designed to adequately stage the products for precise registration for infeed. The same can be said for labeling, and particularly date stamping, where the products may have to be rotated on the conveyor to a precise location to be stamped.

Equally important is maintaining the integrity of the products being conveyed. Whatever the product and process may be – pastries or pizzas with delicate toppings being moved through a filling line, glass pharmaceutical syringes being staged for feeding into a shrink wrapper, solar panels being conveyed for end-of-line packing, or pages of a book being feed into a collator for binding – the need for transporting finished products carefully from manufacturing through wrapping, labeling, packaging and cartoning with high throughput and near-zero product damage is of critical importance. But too many manufacturers are



SLIP-TORQUE ROLLER TECHNOLOGY



SLIP-TORQUE ROLLER SURFACE

plagued with conveying equipment that is inadequate for moving delicate products through these processes.

No matter how efficient the fillers, wrappers, labelers and cartoners may be, if the line does not use conveyors specifically designed for the application then the product quality, speed of throughput and cost-efficiency of the entire production and packaging line will be compromised.

SMARTER CONVEYOR TECHNOLOGY FOR FILLING AND PACKAGING

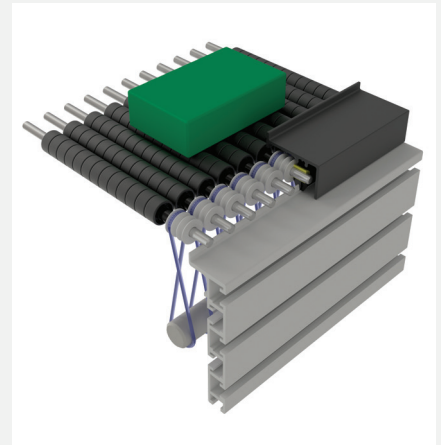
Automated product filling and packaging require conveyor systems that provide precision product placement. Although traditional flat-belt conveyors can deliver some degree of precision placement, they are a poor choice for managing product accumulation, such as is required for staging and spacing product into these automated systems. The result is product jam ups, product damage, misfires on wrapping, wasted packaging materials such as shrink wrapping film, and resultant line slowdowns and cessations.

Fortunately, the solution for effectively managing product staging and spacing, and eliminating these production line difficulties comes in the form of smarter roller technology. One system in particular which is in broad use, and has been in a continual state of refinement over the past several decades, is called Slip-Torque®, which was developed by Shuttleworth LLC.

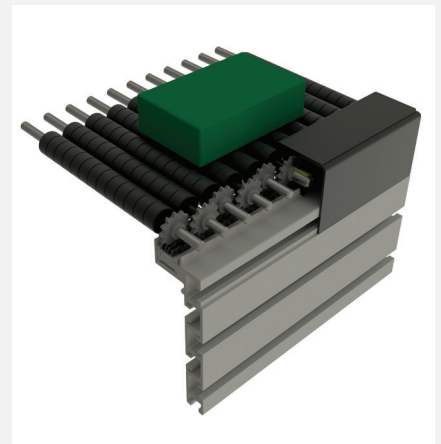
Slip-Torque is very interesting, in that it utilizes individually-powered, stationary rotating roller shafts covered with loose, segmented rollers, which become the conveyor surface. It is powered by a continuous chain to control the drive force of the conveyed products. When the products stop on the surface of the conveyor, the segmented rollers beneath them also stop, generating low back-pressure accumulation, and minimizing product damage. It is the weight of the product being conveyed, combined with the coefficient of friction between the shafts and the inside diameter of the rollers that provides the driving force. As the weight of the product increases, there is a corresponding increase in the driving force supplied.

Slip-Torque's low line-pressure provided throughout the continuous-motion accumulation conveyor allows for precise product placement on the conveyor while it continues to take product flow from an upstream line for a period of time, where other conveyors would have stopped well before. A low-pressure accumulation buffer absorbs irregularities in the production flow and provides a smooth, even flow on the line.

The system allows the same conveyor to be split into multiple, independently-operating lanes. For example, the middle lane can accumulate, while both the right and left lane can both convey, or even run in opposite directions. Each lane can act independently, but is powered by only one common motor, which also reduces energy costs.



SLIP-TORQUE BELT DRIVE



SLIP-TORQUE CHAIN DRIVE

Conveyors with Slip-Torque have the ability to modulate the speed of different sections of the conveyor via a central control PLC and HMI. As products are moving down the line, the rollers at the back end of the conveyor can be moving faster than the ones at the front end of it. The products can be moving at variable speeds on different sections of the conveyor as dictated by throughput requirements. This controls the product spacing on the conveyor, keeping items such as delicate cheesecakes or fragile pharmaceutical products separated, and equally spaced, from each other to minimize product contact and facilitate infeed into packaging equipment such as shrink wrappers.

Such motorized rollers like Slip-Torque can also be used to minimize product contact while steering products into desired locations, such as employing rollers with herringbone patterns to orient products without the use of guardrails, or setting up a series of sequentially smaller roller heights to direct food products into the center of the conveyor for packaging induction, without touching any other conveyor parts. And motorized rollers with tapered corners can be used to maintain product orientation, gently and safely, as it is transported through 45-degree and 90-degree conveyor turns.

Slip-Torque technology can be used in elevated temperature applications such as hot products coming out of ovens up to 500° F (260° C) and in low temperature applications as low as -20° F (-29° C) such as for refrigerated and frozen foods and pharmaceuticals.

OPTIMIZED WRAPPER INFEEED

Nowhere in the packaging process is the handling of the product more susceptible to damage than in the wrapper infeed cycle, resulting in high defect rates, lessened throughput and increased production costs. This is common particularly with shrink wrapping where mis-wraps can easily occur, jamming the line. When shrink coverage does not completely cover the product, it can go unnoticed until later when the product has spoiled due to exposure. Improper sealing is primarily caused by poor infeed and mis-registration.

To achieve a much more consistent level of registration and wrapping integrity, a system called Servo-SmartFeed® is now being used by many companies with automatic L-sealers, horizontal form-fill and seal-flow wrappers, and over-wrappers. Servo-SmartFeed, also developed by Shuttleworth, working in combination with Slip-Torque conveyors, links wrapper infeed to upstream product flow. It is designed to dynamically accumulate and synchronize the release of products into a wrapper or packaging machine without stopping the product flow. Products on the system are always in motion while the downstream equipment is operational.

SmartFeed operates by timing the release of product into the flighted infeed on the wrapper with a pneumatic/electric gate. With a speed-up zone near the discharge end of SmartFeed, one product at a time is



**ALUMINUM DESIGN WITH SLIP-TORQUE
ROLLER TECHNOLOGY**



**GATED SMARTFEED INFEEED WITH SLIP-
TORQUE**

placed onto the infeed of the wrapper. The spacing is very precise, a tolerance of 0.25 inch to 0.5 inch. SmartFeed is in synchronization with the wrapping machine using encoder feedback from the wrapper. A sensor identifies each product's location, and then the conveyor will either accelerate or decelerate the product to place it into position on the flighted infeed of the wrapper.

The system operates in four speed-registration zones to manage the infeed of products: 1) the first zone accepts the product from upstream manufacturing such as a freezer, oven or staging point, then conveys it downstream; 2) the second zone closes the gaps between the product, running the food product back-to-back; 3) the third zone increases the spacing between the products equal to the pitch flight on the wrapper; 4) and the fourth zone positions each individual food item into the gaps between the flights.

The automatic wrapper and SmartFeed are always talking to each other and reacting to whatever products are moving through the line. When there is a delay with an item, SmartFeed tells the wrapper that no item is in position, and to slow down or stop. When the next item is in position, SmartFeed tells the wrapper to start, providing there is accurate indexing of the product to be wrapped.

Servo-SmartFeed creates an integrated system monitoring the flow of product right through to the wrapper. Controls installed upstream regulate the speed of the line throughout, directed by SmartFeed.

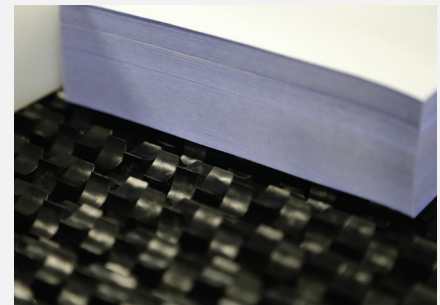
SMARTER CONVEYOR TECHNOLOGY FOR FILLING AND PACKAGING LINES

Slip-Torque conveyor technology has evolved to a level of exceptionally high precision through decades of practical application in numerous industries. Manufacturers now have smarter conveyor systems that are specifically designed for the precision and flexible needs of filling and packaging lines. Systems that incorporate the necessary automation and product handling devices that enable companies to achieve more productivity, increased versatility, decreased product damage and realize a more profitable bottom line.

To learn more, visit our website at www.shuttleworth.com.



EASY CLEAN 1000 DESIGN WITH STAINLESS TUBE ROLLERS



SLIP-TORQUE WITH STAR ROLLERS, A SURFACE SPECIFICALLY DESIGNED TO MAINTAIN STACK INTEGRITY OF LOOSE PAPER

From automotive and electronics, to paper conversion and pharmaceuticals, to food and consumer good markets and beyond, manufacturers across the globe rely on Shuttleworth's proven product handling solutions to increase line efficiency, maximize profitability, and minimize risk. As part of the ProMach Product Handling business line, Shuttleworth helps packaging customers protect and grow the reputation and trust of their consumers. ProMach is performance, and the proof is in every package.

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