

# Throughout improvements from a product-advancing lane merge and in-feed algorithm

By Paul Anderson

Equipment manufacturers offer various options to accurately space randomly arriving products for a subsequent operation. The technology is available, but many times the planning and implementation process, cost, space requirements and maintenance can strain a company's resources.

Complete pre-engineered Solution Packages™ like Yaskawa's Synch-Belt™ random product in-feed can significantly lessen that strain while solving the operational challenge of synchronizing product flow. Synch-Belt™ is a single-lane product phasing application for machines such as cartoners and case packers that require evenly spaced products.

The Yaskawa Synch-Belt Solution Package™ easily integrates conveyors, sensors, servo motors, servo amplifiers, motion network and programmable machine controller into a complete application program that is fully customizable to a particular customer's requirements.

End users start from a Synch-Belt template that can be adapted to each particular application. On the template, the in-feed conveyor delivers randomly spaced products at constant speed. Those products hit a series of Synch-Belts that precisely advance and retard product position by controlling belt speed to deliver items at consistently spaced intervals to a receiving conveyor running at line speed. Each downstream Synch-Belt (controlled by a servo motor and amp linked to the machine controller) makes progressive registration adjustments until product is spaced as required by the cartoner, case packer, shrink wrapper or other subsequent application.

## **The brains of the system**

The Synch-Belt system, which debuted in 2004, is made possible by Yaskawa's MP programmable machine controller platform, which tracks each product on the Synch-Belt system, determines the optimal correction profile necessary to properly position the product on the receiving belt, and controls the scan-by-scan position of each servo axis via the Mechatrolink-II motion network to get the product into position. The system addresses the challenges posed by randomly arriving products and, ultimately, increases throughput.

Yaskawa determines the maximum acceleration for a product based on that product's tolerance and uses its Synch-Belt Application Solution Worksheet to determine the space requirements necessary to correct a product's position while staying within those tolerances.

Yaskawa's algorithm identifies the optimal location of sensors, the points at which speed correction should begin and end, and the maximum

feasible correction for the particular application to ensure that products are spaced in as short a distance as possible.

The queue algorithm holds up to 10 products per belt, and tracks their positions scan-by-scan, adjusting for multiple products simultaneously.

The company's patented Dynamic Smooth Path generator ensures proper handling of each item by automatically creating ideal move profiles for each application. The operator need only enter four basic parameters to generate each profile. The Dynamic Smooth Path generator creates a low-jerk correction profile that stays within acceleration limits, ensuring product never slips on the belt, and keeps belts synchronized as the product transitions to downstream Synch-Belts.

In other words, a Synch-Belt Solution Package™ manages a product's position throughout the entire time it travels from the in-feed to the receiving belt, spacing products as needed.

The system yields a number of operating benefits:

- Improved throughput. The system's ability to transfer multiple products on each conveyor and allow in-feed conveyors to run at full production speed increases throughput.
- Reduced downtime. Accurate placing removes the major source of misfed products.
- Rapid changeover. The system's capacity to work with or without flights on the receiving conveyor and to modify application parameters through simple tag value changes accelerate changeover.
- Reduced space requirements and equipment costs. By continually transferring products through the machine, there is no need for accumulation belts. Overall higher throughput translates to fewer conveyors, and fewer conveyors means reduced space requirements and lower machinery expense.
- Reduced maintenance costs. Products are transferred more efficiently utilizing the Dynamic Smooth Path generator, meaning there are fewer parts to replace and greater savings in maintenance time and expense.

### **Ready to go**

The Yaskawa system, unlike similar belt type systems, is a fully integrated package that is also scalable and easily customizable to meet a wide variety of applications.

Solution Packages™ are developed as generic systems and require modification per a customer's product, application and desired speeds. Those factors help determine the actual number of Synch-Belts required to properly space products. Yaskawa works with customers to offer a variety of sizing options to maximize the positive impact of the Synch-Belt solution on the customer application, and customize the Solution Package™

to integrate with the customer's chosen conveyor manufacturer.

Pre-engineered code is fully functional and reduces the time-to-market and risk associated with a company's application. Templates help customers specify profiles that fit their needs. Documentation helps users customize the application for a specific use—customers can modify programs on their own. Packages are designed to minimize labor, shrink initial engineering time, reduce downtime and cut the incidence of mechanical component replacement, thus helping reduce total cost of ownership.

The intended result is lower costs with higher throughput, tighter accuracy, minimized motor heating and longer machine life.

Contact Yaskawa today to discuss sizing a Synch-Belt Solution Package™ for your application.

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