

CUSTOMIZABLE



HIGH SPEED



FLEXIBILITY/
PRECISION



LOW
MAINTENANCE

PRINTER CARTRIDGE PACKAGING

Packaging - Automation

Low maintenance packaging solution allows on-the-fly changes.

APPLICATION DESCRIPTION:

Downtime can be a manufacturer's worst nightmare, especially if a line cannot be returned to operation within a short period of time. When Dutch machine builder Smart Automation was commissioned by one of the world's leading printer cartridge manufacturers to develop a machine that fully automates the packaging of a wide variety of cartridges, it was essential to build a robust and durable cell.

One of the key challenges Smart Automation faced was finding a guidance system that could be safely built into the core of the new machine. The system needed to run for several years without maintenance and their search was not initially successful. Smart Automation's designers looked at a number of manufacturers before finally deciding to use HepcoMotion, one of the leading manufacturers in the field of linear guidance systems. "Quality and price convinced us," says Roland Mulder, project manager for Smart Automation.

THE CHALLENGE: PROCESS FLEXIBILITY AND FAST CHANGEOVER

At first glance, the packaging of printer cartridges may seem a simple task. However, the specification required the machine to process six standard configurations of packaging formats and contents, including four different combinations of printer cartridge. It was also important to offer the ability to switch between configurations within a matter of minutes. "Bringing together so much complexity in a single machine was a particular challenge for us," explains the mechanical engineer.

Until now, Smart Automation had used a separate packaging machine for each specification of printer cartridge. In terms of time and efficiency, this was not optimal.

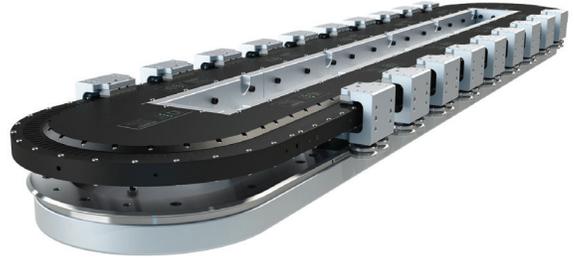
On four moving belts, one per color (Black, Cyan, Yellow and Blue) are fed through a sorter to the cell, where cartridges are filled. Here, four robots pick up two rows of between four and nine cartridges each, and place them on two parallel transport rails, according to the arrangement required for each configuration. Four grippers, specially designed by Smart Automation, pick up two cartridges per second and place them in a tray on the conveyor. During this process, a digital barcode scan ensures the correct colors are placed in each tray. A maximum of 480 cartridges per minute can be processed in this way.

THE SOLUTION:

Smart Automation managed to meet their challenge through the creative combination of modern technologies. Even an old machine frame could be recycled for the cell. “We learned a lot from the project and, whilst there are some aspects we would approach differently a second time round, we are very satisfied with the overall result,” says the Dutchman.

A key feature of the machine is the ability to quickly change product configurations. This is made possible by the use of the Beckhoff eXtended Transport System (XTS) and HepcoMotion’s GFX Guidance System for XTS (using Hepco’s 1-Trak system), which uses individually controlled movers to transport products from point to point.

The total length of the XTS system in the machine is 5m, on which a total of 32 movers travel. Hepco’s 1-Trak system comprises of two straight linear V-guides and two clothoid-shaped end segments. Unusually for this construction, the trays are not directly mounted to the movers, but are supported by the base plate and pushed from position to position by a series of pushers mounted on each mover.



MAXIMIZING SERVICE LIFE:

The designers wanted to ensure the three-bearing movers would not need to be readjusted for as long as possible. “With the long pushers on each mover, the center of gravity is relatively far from the center of the mover. Combined with the speed of movement, this applies a torque to each mover, which presents a major challenge in terms of the usable life of the guides,” Mulder explains.

“This meant we needed to adjust our performance and lifecycle calculations to make accurate product lifetime predictions,” adds Jason Cox, Technical Sales Manager at HepcoMotion, who oversaw the project.

“In order to achieve the maximum service life, we tested a number of different motion profiles and designed the base plate in close consultation with Smart Automation,” says Cox. “Normally, we would reduce acceleration to extend the lifetime of our vee guides, but the unusual design of the application and the frequent start/stop movements meant we needed to rethink this,” he explains. The solution was to maximize acceleration and reduce top speed. The reduction in top speed in this case caused a reduction in the centrifugal loads, which in turn extended the life of the vee guides. The optimum top speed was determined to be 2.13m/s, with a load of 0.293kg and finger length of 52mm. To further extend service life, an automatic lubrication system was integrated into Hepco’s GFX system. Even with a high moment load and acceleration, the system is projected to last 5 years, which is suitable for this application.

The HepcoMotion GFX guidance technology behind the Beckhoff XTS transport system allows for complex motion profiles and durability. The system enables versatility, on-the-fly product changes, and overall improved production rates in manufacturing and packaging applications. Bishop-Wisecarver is the exclusive partner for HepcoMotion products since 1984.

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