

Brushless DC Motorised Rollers Increase Efficiency at USPS O'Hare AMC in Chicago



Project background

The United States Postal Service Air Mail Centre (AMC) at the Chicago airport is one of the largest and busiest distribution centres in the United States. At this facility, mail is conveyed in plastic or corrugated cardboard trays, typically 24" (610mm) long x 11" (279mm) wide, holding about 300 pieces of mail. Trays are transported through a conveyor system that includes a series of straights, bends, merges, etc... which were using old belt driven roller accumulating conveyors. Scanners are used to read bar-coded label on trays to help to sort and divert them to destination. This accumulating systems was very noisy and required a lot of maintenance.

They decided last year to source a modern handling system for the inbound conveyor which could:

- improve the productivity by minimising the maintenance
- offer a overall low noise level to be more comfortable for the operators
- be energy efficient i.e. : run on a demand basis.

Since the USPS facility operates on a 24 hour per day and 7 day per week basis, minimum downtime was allowed for the upgrade. Michael Maravas, Technical Manager of Material Handling Engineering was in charge of this project and had to solve this complex equation.

To avoid downtime, it was decided to retrofit the existing conveyor system one section at a time. The goal was to return the system to operation after only a few hours off line. Key Handling Systems (Moonachie, New Jersey) put a solution together to meet this tough criteria, and was selected for the project by the USPS.

Implementation of the solution

The USPS developed an innovative approach for the retrofit. For the hardware, they decided to keep the existing frames to save time and money. The rollers have been replaced and driven by self-contained brushless 24V DC motorised rollers supplied by ITOH DENKI. Each POWER MOLLER 24 drives 8 slaved rollers positioned on 3" (76.2mm) centers to form a 27" (686mm) motorised zone. Each zone carries plastic or corrugated cardboard trays with a total weight of 32kg (70lb.) at a speed of 55 m/min.(180fpm)

For the control system, Key Handling selected the new brushless Powered Roller Interface Module (PRIM) developed by Honeywell MICRO SWITCH, of Freeport, Illinois. In most instances four zones are controlled by one brushless PRIM module. This device houses several connectors for the sensors, the power supply, and of course, for the POWER MOLLER 24 brushless motorised roller circuit boards. This design creates a true "plug and play" system ensuring full communication between the zones, drives, and sensors.

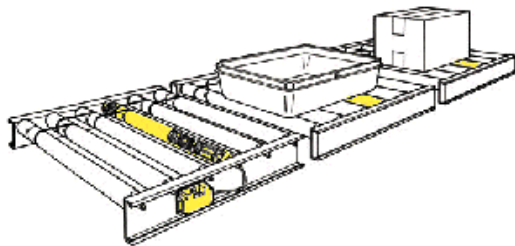
Each PRIM is connected to the host computer through a data bus.

When a tray is detected by a sensor in a zone, the PRIM activates the motorised roller of that particular zone and the following one. When the tray reaches the second zone sensor, the PRIM turns off the first zone POWER MOLLER 24. If there is already a tray in the next zone, the PRIM signals the current POWER MOLLER 24 to stop, and the integral dynamic braking stops the zone, thereby preventing trays from bumping into each other and jamming the whole line.

The built-in speed variation feature of the POWER MOLLER 24 control card allows certain sections to pull a gap between the trays when necessary without needing additional controls. The additional flexibility of the new control system allows the "Mail Flow Controllers" (USPS personnel who monitor the mail flow from a remote location by video camera) to reverse and purge sections at a time if necessary. This ability dramatically decreases the manual interventions required on the conveying lines.

The sophisticated power supply and control system was retrofit to the existing conveyor by Key Handling Systems prior to disabling the system. Once this step was accomplished, the installation team was able to install the Power Moller 24 and idlers at an average rate of 100 feet per 8-hour period, which is exceptionally high under these circumstances.

The 24V DC brushless design has been favored because it is an efficient solution which could be standardised throughout the system, since every piece of equipment (motor, sensor, and PRIM) works from the 24V DC power supply. Also, since the NEMA requirements stipulate that any voltage over 30V must be run in conduit, the 24V DC required for this system has allowed for reduced installation time and the overall cost of the system. More importantly, this voltage is the safest for the operator, which was also a strong requirement from the USPS.



Huge benefits

As a result of the retrofit of the inbound conveying system at the Chicago O'Hare AMC, operational efficiency has increased, while operating costs such as electricity bills and maintenance have been reduced. As an added bonus, the overall noise level of the conveying system has considerably been reduced.

The reduction of the power consumption is achieved by the "run on demand" nature of the system. The sophisticated controls automatically shut a zone down when empty. Also, power is switched off when a sensor detects a tray in an upstream zone. This type of precise control could result in 50% power savings.

Another important advantage is that very little maintenance is required by this system. Most importantly, this system is motorised by the newest generation of the highly reliable brushless 24V DC Power Moller technology pioneered by ITOH DENKI. The switching of the motor is achieved by the associated circuit board which guarantees more than 30 million trouble free cycles. The POWER MOLLER 24 circuit board also provides a signal in case of error which is linked to the host computer through the SDS data bus. In case of error (overload, error, etc...) the maintenance engineer could spot within seconds where the problem is and go to fix it without delay. As the system is completely plug and play, repair will take only minutes, compared to the long downtimes of the past! Moreover, the POWER MOLLER 24 has helped the USPS to drastically reduce the cost of spare parts, since it is no longer necessary to keep cogs, sprockets, chains, etc. in stock for routine maintenance.