Independent cart technology

Linear Motors provide magnetic propulsion and control of multiple carts

MagneMotion
A Rockwell Automation Company
Moving conveyors forward

Advances in linear motion are changing the way manufacturing and material handling original equipment manufacturers (OEMs), system integrators, and system operators approach product flow. MagneMotion and iTRAK independent cart technology by Rockwell Automation uses linear motors to intelligently and accurately move a wide variety of products.

Independent cart technology is the foundation for new, intelligent conveyor systems which are advanced and efficient alternatives to conventional conveyor and positioning systems. These unique control systems have scalable, distributed architectures that can safely and efficiently manage many carts across a network of linear motors enabling:

- Independent position, speed, and acceleration control of each product on line
- Intelligent management of traffic flow for maximum throughput
- Distributed communication between control modules for exceptional scalability
- Built-in self-diagnostics and troubleshooting for rapid identification of malfunctions
How the new Independent cart technology works

The primary side of these motors is embedded within the motor body; in the track itself with iTRAK, or on a custom track with MagneMotion products. The secondary side of the motor resides on individual carts in the form of a permanent magnet array. Force or thrust is imparted by driving current through coils in the motor body. Controlling the magnitude and phasing of these currents creates magnetic fields that propel the cart.

Figure 1 outlines the technology used by iTRAK and MagneMotion products. Positive or negative currents of varying magnitude are driven into independent coils to create a local magnetic field. Negative current in coils 2, 3, 5, and 6 result in a net forward force. As the cart moves along the track, magnitudes and polarity are adjusted to deliver the required thrust as efficiently as possible. Magnetic sensors enable precise and continuous tracking of the cart, eliminating the need for external devices and making the technology easy to apply.

Benefits

- Increased reliability with fewer components subject to wear
- Acceleration and braking not dependent on friction
- Improved performance and precise position control
- Increased speed, acceleration and efficiency
- Gentle, collision free, & zero pressure conveyance
- Negotiate steep grades without depending on friction
- No need for propulsion power or control on carts
- Control of multiple carts on complex trajectories
- No need to transfer communication or control signals to a moving cart

Connect motors to control multiple carts simultaneously
High level control options

iTRAK

With iTRAK, each cart is an axis of motion, enabling high level control that allows every cart to be synchronized to an external axis such as a robot or a cam. A benefit of this approach is that each cart can be individually controlled to be in a specific location on the track at a specified time at all times. This not only enables camming to an external system or device, but also enables adjacent carts to change their relative spacing in a coordinated manner to support folding or compacting type applications.

MagneMotion

MagneMotion’s high level control system also supports axis based cart motion using our SYNC-enabled motors and Allen Bradley ControlLogix® controllers and motion profiles. MagneMotion also provides a ‘fire and forget’ mode, ideal for complex tracks having multiple lanes and topologies where carts need to move from one station or location to the next. The control system manages the paths and flow of carts to avoid collisions. The ability to merge both operating modes provides maximum flexibility to minimize the customer’s PLC host interface.
The definitive solution for diverse sectors

Independent cart technology offers flexibility, scalability, and ease of use, and also minimize power draw compared to conventional conveyor systems since only those coils required to support cart motion are powered.

Factory automation applications using belt and chain conveyor systems, hydraulic actuators, and lead screw drives are a few examples where linear motors could produce the required action, serving as an alternative to these mechanically dependent devices. These are five sectors where linear motor technology is proving to make a definable difference:

**Life sciences**
- Track and Trace
- Collision avoidance
- Easy Serialization
- Fast Cycle Time
- Massive Flexibility
- Easy to Clean

**Food and beverage**
- High Throughput
- Maximum Flexibility
- Repeatable Quality
- Easy to Clean
- Increased Speed

**Material Handling**
- Higher Throughput
- Sequenced delivery
- Smaller Footprint
- Programmable speed and acceleration

**Consumer packaged goods**
- Reduced Maintenance
- Faster Cycle Time
- High Flexibility
- Quicker to Market
- Smaller footprint

**Household & Personal Care**
- Higher Throughput
- Broader Product Mix
- Innovative Packaging
- Faster Product Development
- Faster Cycle Time
- High Flexibility
- Quicker to Market
- Smaller footprint
Independent cart technology in summary

Magnets move over independently energized coils
- Magnets and movers have no intelligence
- Low moving mass maximizes energy efficiency

Coils are stationary
- No flexing cable wear or need for slip rings
- Reduces wear items and maintenance

Absolute positions are measured with closed loop servo control

Technology enables high throughput and flexible machines
- Technology can be applied to straight, curved, or merge/diverge motors.
- Motors can be combined to create a multitude of system layouts
- Systems support 100s to 1,000s of independently controlled moving carts
- Layout and mover quantity flexibility lead to...

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