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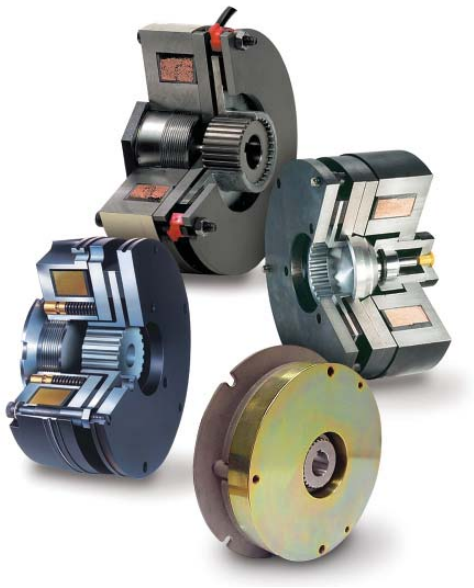
Electromagnetic Brakes Offer Safety and Performance Options to Forklift OEMs



As seen in
Industrial Utility Vehicle & Mobile Equipment
March, 2009

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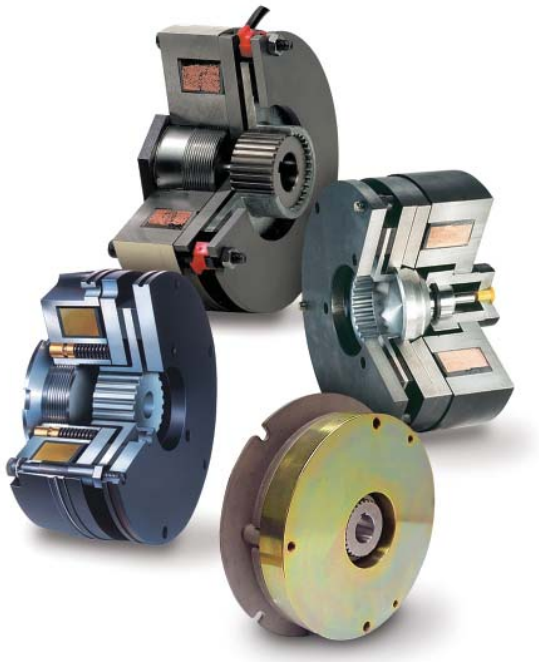

In the past three years, Matrix International and Warner Electric, both members of the Altra Industrial Motion group of companies, have pooled their experience in electromagnetic braking technology to create wheel brake designs and motor regeneration systems that are improving the performance of electric forklift truck vehicles and allowing OEMs to design faster, more flexible and more efficient vehicles.

Together, the two Altra brands are the world's leading provider of brakes for electronic forklifts and industrial trucks. With dedicated engineering and R&D resources, Warner and Matrix design and manufacture a variety of standard and customized solutions that enhance the performance of electric forklifts.

"In the electric forklift market, over the past 10 to 15 years, I think the trend has been for OEMs to adopt electromagnetic braking solutions," said Thierry Denarié, Sales Director of Warner Electric's European Clutch & Brakes sales team. "Hydraulic or purely mechanical braking systems are gradually being replaced by combined electromagnetic/hydraulic or fully electromagnetic systems that can be linked to other more 'intelligent' feedback and control devices."

Of course, there are several different kinds of electromagnetic brakes, each with differing features designed specifically for the various forklift vehicles that serve a wide range of functions and applications. Brakes are frequently customized to provide desired improvements for new OEM model introductions.

Forklift brakes can be generally grouped by style and function as electrically released traction motor brakes, load wheel brakes and permanent magnet brakes.

So how does an OEM design engineer determine which electromagnetic brake features and functions provide the best solution for his specific vehicle application? Thierry Denarié offers some guidelines…

Traction motor brakes

Warner Electric and Matrix have developed a wide range of traction motor brakes to cover the needs of various types of trucks. "The standard traction motor brake for parking and stopping," Thierry Denarié says, "is the electrically-released dynamic (ERD) brake. This on/off dry failsafe brake is designed for use in dynamic applications that require torque capacities from 4 to 14,750 lb./ft. (5-20,000 Nm). Torque values are defined for trucks running at full speed and at full load."

With high heat dissipation capabilities and adjusting spacers, the electrically-released dynamic brake is particularly suitable for trucks that require frequent dynamic braking. These include ride-on pallet trucks, walk-behinds, stackers, and both high-level and low-level order pickers.

One of the performance enhancements of the ERD brake is the electrically-released hydraulic amplified (ERD-H) brake which combines spring force and hydraulic force to achieve the optimal torque needed for a specified deceleration rate and stopping distance. The hydraulic amplification is variable depending on the load weight capacity required. A hydraulic piston is integrated in the shell of the master cylinder, and the hydraulic force applied is proportional to the load on the forks. The ERD-H is particularly suitable for ride-on trucks with high load capacity, such as order pickers and pallet trucks. Torque capacities range from 15 to 75 lb./ft. (20 to 100 Nm).

"End users report that vehicles equipped with ERD-H brakes exhibit improved ergonomics as well as lower maintenance costs achieved by reducing the frequency of worn or flat tires," Thierry Denarié says.

Another adaptation is the electrically-released bi-functional brake (ERD-HBF) which is a parking and stopping brake actuated by the driver. This bi-functional brake provides a hydraulic service brake combined with an electromagnetic failsafe brake. The brake is particularly suitable for demanding reach trucks, very high load capacity ride-on pallet trucks and counterbalanced trucks, according to Thierry Denarié. Torque capacities range from 15 to 10 lb./ft. (20 to 150 Nm).

Another parking and emergency brake suited for applications such as walk-behinds, stackers, ride-on pallet trucks, order pickers, electric counter balance and reach trucks is a low-profile design called the Pan-Cake (PK). The PK is a pre-assembled on/off dry failsafe electromagnetic brake used for parking and emergency only. It offers high torque within a compact space envelope, using a low-profile, space-saving design that is particularly suitable for back-to-back, dual-drive configurations such as ride-on trucks and boom lifts.

In addition to the electrically-released PK brake, the truck's AC motor is used for regenerative braking. The brake uses a high coefficient of friction material and a powerful coil to optimize torque. The coil is linked with a pulse width modulation power supply to reduce power consumption, extend battery life and lower overall maintenance costs.

Load wheel brakes

Wheel brakes provide additional braking force to traction motor brakes for forklift applications that need increased load and speed capacity. These electromagnetic brakes are integrated in the front wheel and are used in addition to the traction-motor brake.

"The decision facing the design engineer here is whether to use hydraulic or electromagnetic technology," Thierry Denarié says. "After decades of working with both systems, we've chosen to focus on electromagnetic actuation for load wheel brakes. These can be assembled faster than hydraulic systems and we feel there is a better balance between motor and wheel brake timing through the AC controller which improves the truck's stability. There is also less maintenance because you're not changing hydraulic oil, and of course, there are no oil leaks."

Trucks with both load wheel and traction motor brakes offer higher braking force and better stability. Controllers monitor the braking between the AC motor and the wheel brakes to provide the benefits of higher load and speed capacity. Load wheel brakes are particularly suitable for reach trucks, stackers and very narrow aisle trucks.

Variable torque permanent magnet brakes

Variable torque braking is at the forefront of current technology, according to Thierry Denarié. The Varistop permanent magnet brake is a Matrix design that addresses the challenge of increasing truck speed while reducing turning radius by taking into account the changes in center of gravity with different loads.

Varistop achieves this with variable torque braking, offering smooth operation with stepless torque change. Electric current that produces torque can be electronically controlled and varied depending on the weight of the load and height at which it is carried. This allows the truck to be braked from speed to rest as quickly as possible without becoming unstable.

The permanent magnet brake functions as both a variable torque motor brake and parking brake, well suited for very narrow aisle trucks and high-level order pickers.

"Our objective in designing every application solution is to reduce the cost of ownership while improving electric forklift performance," Thierry Denarié says. "By listening to customers our experienced engineers in both Warner Electric and Matrix create new benefits for OEMs and their end-users every day."

In support of its dedication to the forklift industry, Altra Industrial Motion has recently launched a new website with educational resources from Warner Electric and Matrix on their braking technology used in forklift applications. Visit www.AltraForklifts.com to access articles, product information and an informational video.

About Altra Industrial Motion

Altra Industrial Motion (NASDAQ:AMIC) is a leading multi-national designer, producer and marketer of a wide range of electromechanical power transmission products. The company brings together strong brands covering over 40 product lines with production facilities in nine countries.

Altra's leading brands include Boston Gear, Warner Electric, TB Wood's, Formsprag Clutch, Wichita Clutch, Industrial Clutch, Ameridrives Couplings, Kilian Manufacturing, Marland Clutch, Nuttall Gear, Stieber Clutch, Twiflex Limited, Bibby Transmissions, Matrix International, Inertia Dynamics, Huco Dynatork, Ameridrives Power Transmission, Delroyd Worm Gear and Warner Linear. For information on any of these technology leaders, visit www.AltraMotion.com or call 815-389-3771.

CHECK OUT

www.AltraForklifts.com

to view a full array of power transmission solutions available from the brands of Altra Industrial Motion

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P-1888-C 1/10 Printed in USA