

ALL THE BREAKS

With this selection of electromagnetic solutions to provide the safest and most effective braking for lift-trucks, vehicle designers have fallen on their feet yet again

Altra Industrial Motion Group comprises companies including Warner Electric and Matrix International, and is a world leader in the design and manufacture of hydraulic, pneumatic and electromagnetic clutches and brakes for battery-powered vehicles (i.e. forklifts, man lifts, wheelchairs, golf carts); off-highway, marine and heavy-duty equipment; and industrial and elevator applications.

With dedicated engineering and R&D resources, Warner and Matrix are able to offer a variety of customised solutions that enhance the performance of electric

forklifts. Their latest focus is the development of advanced and cost-effective braking solutions for reach-trucks, such as electromagnetic failsafe brakes for traction motors and electromagnetic power-applied brakes for load/cast wheels.

For traction motors, Warner Electric's PK60 electromagnetic failsafe brake has proven to be very successful. With a torque rating from 80 to 125Nm, it has been primarily developed to increase the performance of electric reach-trucks and reduce the overall cost of truck ownership.

The PK60 functions as both a parking and

emergency brake. The AC truck motor provides the initial braking, which allows smoother deceleration while regenerating the truck batteries. This reduces the heat dissipation requirement of the brake because it is not submitted to a high dynamic duty cycle. By using high-coefficient of friction material and optimising the magnetic field, the profile of the brake is lowered. This reduces the space required for the drive units, so drivers and engineers can benefit from more available space. The low profile design brake uses less raw material and provides a very cost-effective solution.

The brake coil has been specifically designed to be compliant with a pulse width modulation power supply. The benefits of PWM are:

- A stronger magnetic field to release the brake. This allows a larger air gap and results in longer brake life;
- Reduced holding temperature of the brake, which increases the magnetic field, thereby increasing the product's lifetime;
- Increased reaction time when releasing/dropping the brake.

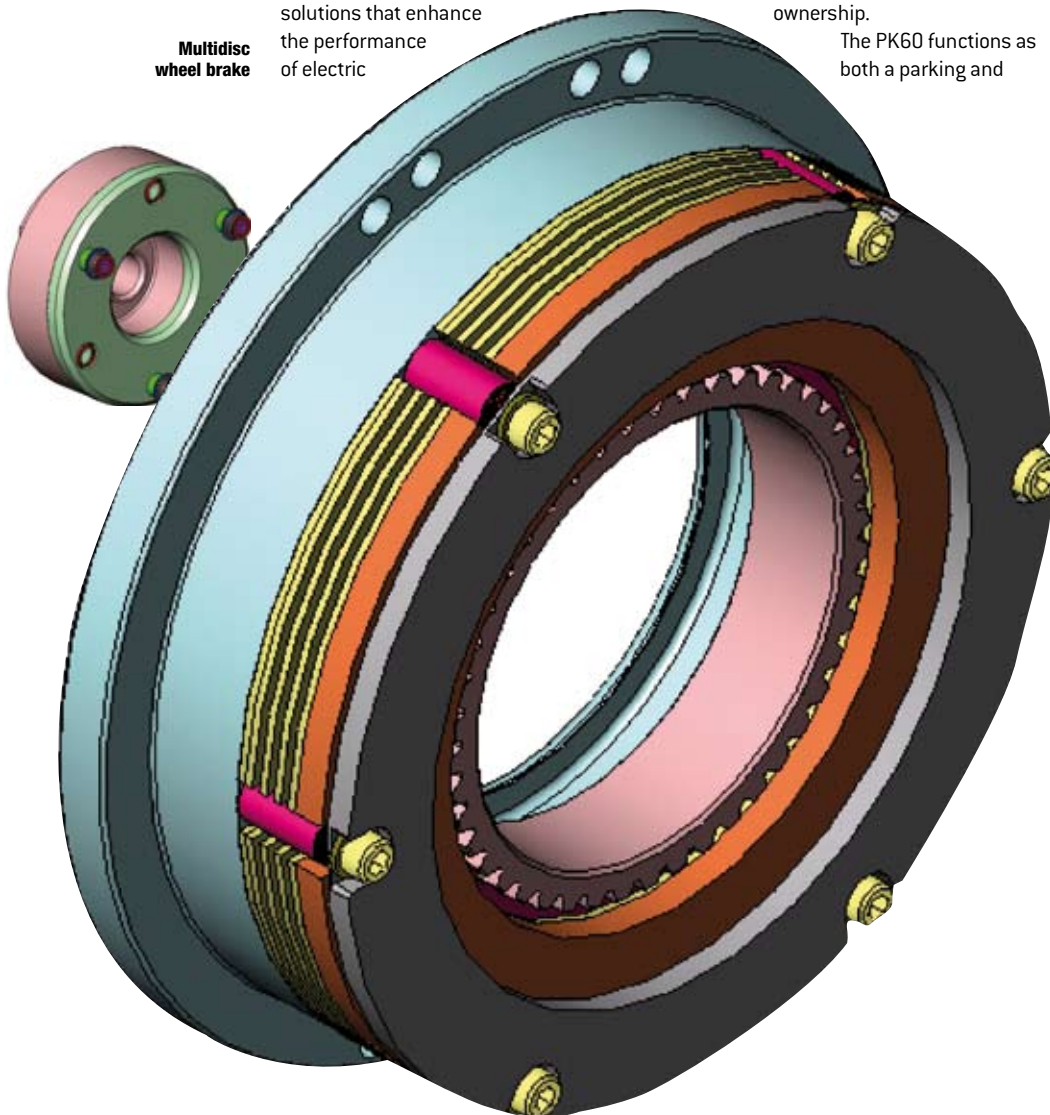
More direct benefits are reduced maintenance costs and improved truck performance. The PK60 has been developed as a plug-and-play product in order to reduce assembly costs for the forklift manufacturer. It is a pre-assembled dry unit with preset torque that eliminates the need for pre-assembly adjustments. There are a variety of mechanical interfaces (hub and flange), torque settings and connectors available to meet the customer's design requirements and to optimise assembly time.

The fit, form and function of the Warner PK60 brake have been developed to meet the current requirements of reach-truck manufacturers. The result is a successful solution for traction motor brake applications that is among the most competitive on the market.

Load/cast wheel brake

To increase load and speed capabilities, reach-trucks require additional braking points and braking force. The use of wheel brakes is a must to meet these challenges. When selecting a wheel brake, the first decision is whether it will be hydraulically or electromagnetically actuated. After many years of working with both electromagnetic and hydraulic

Multidisc wheel brake





Warner Electric's PK60 electromagnetic brake mounted on an AC Sauer-Danfoss drive motor

brakes, Warner has chosen to focus on electromagnetic brakes for load wheel applications. The main advantages are:

- Faster assembly time (no pipes or hoses needed);
- Better braking balance between motor and wheel brake timing through the AC controller. This avoids possible wheel locking and optimises truck stability;
- Reduced maintenance costs (no oil to change);
- No risk of oil leak.

These electromagnetically power-applied brakes have a torque range from 0-1,000Nm, with the torque proportional to the supplied current. To improve assembly time and truck performance, brakes are customised based on truck characteristics (e.g. speed and weight) and wheel and frame mechanical interfaces.

Matrix revolutions

Matrix International has developed two main types of electromagnetic power-applied dry wheel brakes: multidisc and single-disc brakes.

The multidisc wheel brake is composed of one magnet body, dry steel friction plates and a single hub and is designed for fast assembly with only two separate parts. This brake was developed for reach-trucks that require heavy-duty cycles from the wheel brake. The torque is

produced by contact between the numerous friction faces, with the advantages of such a design being:

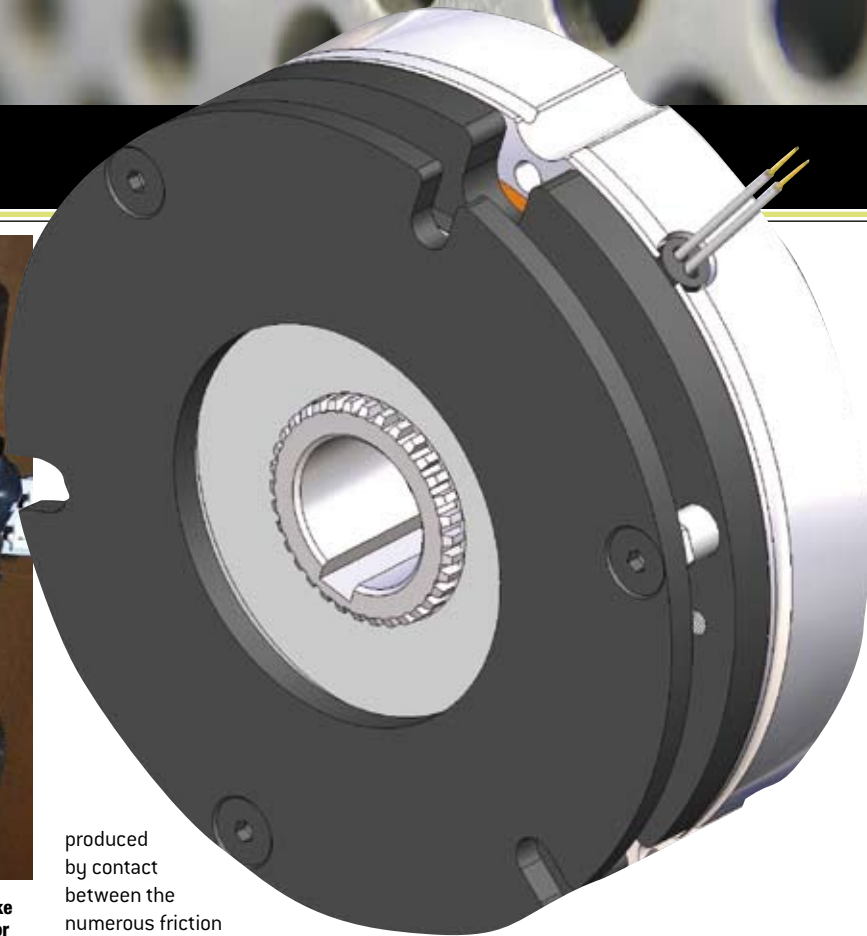
- A wide range of torque flexibility as it is possible to add or remove a disc;
- It has an effective torque/size ratio;
- It is easy to maintain;
- It has high duty-cycle capabilities.

The single-disc wheel brake is composed of one magnet body and one armature, and is maintenance free. The magnet body is made of steel, a coil and a friction disc with low wear and high friction coefficient. The armature is made of steel with a surface treatment to improve wear capability and reduce steel-to-steel contact noise. It uses a patented autogap device that maintains a constant airgap – the autogap adjusts and compensates for wear of the friction material.

This brake is designed to be used in conjunction with the AC motor brake during emergency braking. The advantages of this design are:

- High performance with effective torque versus size ratio;
- Maintenance free and long lifetime;
- Simple design with minimal debris;
- No drag torque and no noise.

By offering various solutions and improving the cost of ownership of the wheel brake, Matrix International can offer a very cost-effective breakthrough technology that optimises the demanding performance requirements of reach-trucks.



PK60 traction motor brake

In summary

By listening to customers and focusing on providing application solutions, Warner Electric and Matrix International have developed some of the most advanced braking technology in the market. These products reduce the cost of ownership and improve electric reach-truck performance.

Globally, forklift brake development at Warner Electric and Matrix International are customer driven. To continue to help truck manufacturers to improve product performance, customised and standard solutions are available for low- and high-level order pickers, sideloaders and VNA trucks, walk-behind and ride-on pallet trucks and stand-up and ride-on counterbalance trucks.

With global sales and service coverage and an experienced engineering team dedicated to forklift brakes and global manufacturing, Warner Electric and Matrix International are recognised as long-term partners by electric truck manufacturers. Both companies are always ready to assist with any new development. **IVT**

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