The hole story

The future of drill rigs according to Atlas Copco: three stunning new concepts explored

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Most countries and major mining companies require all mobile machinery involved in their operations to meet the performance requirements of an international brake system standard.

For earthmoving machinery with wheels or high-speed rubber tracks, ISO 3450 is the standard that defines the requirements and performance of the brake system. While this standard encompasses a variety of requirements, one in particular is quite challenging – the dynamic stopping performance requirement. This specifies that machines, when at their maximum gross weight and travelling at close to maximum speed, must be able to perform multiple stops within a specified distance.

This requirement is especially difficult for large mining dump trucks because the gross machine weights are very large, the speeds are high, and the test is performed on a downhill grade. The truck must stop five times within a specified distance with a 10-20 minute interval between stops without the assistance of an electric or mechanical retarder – this, of course, places a tremendous force and energy (heat) load on the braking system.

The most obvious product for enabling compliance with ISO 3450 is the brakes. Typically, two types of mechanical braking systems are considered for bringing dump trucks to a halt – dry disc brakes and oil-cooled disc brakes (wet disc brakes). The former are similar to the brakes used on a typical automobile, with brake calipers arranged around the disc within the rim, with the heat generated by braking being dissipated by the air moving across the surfaces of the discs.

On the other hand, wet disc brakes have multiple friction discs that are stacked within a housing that fits inside the rim and dissipate braking heat by circulating cooling fluid through the sealed housing. Wet brakes offer several performance advantages that are instrumental in the certification of ISO 3450.

By using stacked discs, wet brakes more effectively make use of the available space within the rim and can provide more braking force than...
Wet disc brake designs, such as those from Pioneer Solutions, ease compliance with ISO 3450. And, by using circulating oil to cool the brake, heat fade is not an issue (as it is with dry brakes) and consistent brake force is generated, even after multiple stops.

These wet brake advantages, as well as other performance, productivity and safety benefits, contribute to an increasing number of dump truck OEMs adopting both front- and rear-axle wet brakes.

**Wet brake solutions**

Pioneer Solutions’ Manufactured Products Division supplies dump truck OEMs with wet brake solutions that exceed the requirements of ISO 3450, and provide a higher degree of performance, productivity and safety to be able to endure abusive mining applications while maintaining reliable, cost-effective performance.

The company has put its over 30 years of experience in brakes and braking systems into the design and manufacture of front and rear wet brakes for mechanical and electric drive dump trucks with payloads of between 25 and 400 tons.

Pioneer Solutions’ brakes have been specially engineered to provide the most reliable performance while maintaining a flexible design that can adapt to a variety of OEM axle configurations and hydraulic systems.

Brake actuation is performed by multiple modular pistons, rather than a single annular piston, and provides higher sealing reliability, accommodates a variety of hydraulic apply pressures, and includes an automatic wear-adjustment feature.

High-quality, glaze-resistant and industry-proven friction material is used in the brake friction pack to yield a longer service life. The friction pack is expandable and can be customised to handle different energy and stopping requirements with minor changes to the brake.

The cost-effective brake design, which maximises parts commonality between the front and rear brakes, simplifies maintenance training and spare parts inventory. Pioneer brakes have been successfully prototyped, tested and certified to ISO 3450, and are now operating in mine sites.

Pioneer’s Manufactured Products Division is well organised to deliver
customer satisfaction throughout the life of the product. In addition to designing and manufacturing the wet brake products, Pioneer Solutions provides technical support to OEMs to assist in the design of the hydraulic brake systems and axle-brake mechanical interfaces, assembly training, factory and ISO 3450 testing, and aftersales support.

Beat the big drum
“Could we get your S-cam drum brake in a bigger size?” was the gist of a question recently put to Knott by one off-highway vehicle OEM. The manufacturer needed a new pneumatic brake for applications where the use of the more common wedge brakes is neither possible nor desirable, for instance for packaging reasons. Therefore, in keeping with its philosophy of ‘serving the interests of the customer’, the technical experts in Eggstätt, Germany, got straight down to work.

What emerged was the biggest S-cam drum brake ever developed and produced at Knott: 500x200mm!

Despite its large dimensions, this brake can be classed as a piece of highly compact technical wizardry. Its future uses will include dump trucks and large-scale field sprayers; however its intended sphere of application was for use in transport machines, where absolute power and reliability are vital. These include vehicle applications ranging from mining, through road trains, to container handlers used in ports: in other words, wherever enormous loads not only have to be moved, but, most importantly, braked extremely safely.

With its amazing braking torque, this is all in a day’s work for the S-cam drum brake. “Even we were surprised,” admits Knott’s chief engineer Franz Schweiger. “The brake was initially designed to deliver a braking torque of 30,000Nm, but on the test rig it proved easily capable of reaching 38,000Nm under extreme test conditions – at least for short-term application.”

Incidentally, this is the highest braking torque so far achieved with a Knott S-cam drum brake. This record is only surpassed by another class of drum brakes: Knott’s wedge duplex brakes, which easily reach 40,000Nm. What this goes to show is that, at a time when demands and legislation are growing increasingly stringent, size really does matter.

Automotive-style performance
Mico Inc has drawn on a background of over 60 years of rugged hydraulic brake design and manufacturing for heavy equipment, and 10 years of electrohydraulic braking expertise, to design Mobeus, a new generation of intelligent electrohydraulic braking systems.

Heavy mobile equipment efficiency, reliability and safety have made incredible progress over the past decade. Much of that evolution has been driven by the integration of electronics into overall machine design, including in hydraulic components and systems.

Mico’s Mobeus family of braking components uses the integration of electronics to create improved performance and efficiency for braking on- and off-highway machinery. The range includes a wide range of sensors, actuators, valves, controllers and software, all of them designed to work seamlessly together inside the vehicle network.

The safety and reliability that antilock braking (ABS), traction control, and electronic stability control (ESC) have brought to the automotive industry in the past are now available to off-highway OEMs. Mobeus products are designed to provide a more controlled braking experience for drivers operating mobile machinery. ABS decreases the probability of wheel lock-up during braking and can also increase the stability and steerability of the vehicle during a braking event. Traction control provides intelligent control of wheel spin to assist a vehicle in slippery or difficult terrain, while stability control employs sensors to measure yaw rate and the centrifugal forces a vehicle encounters while turning, and assists in corrective action to stabilise the vehicle.

The system provides operators with greater predictability by offering similar features to their personal automobiles, making these larger vehicles respond in a familiar fashion. Another benefit is the potential cost saving, which can be realised with decreased tyre wear due to the intelligent braking provided by ABS. In addition, ESC can reduce vehicle instability, potentially reducing the likelihood of vehicular rollover.
Launching a New Brake Product Line

You May Know Us for Engineering Services,
We Now Manufacture Wet Brakes!

OIL COOLED DISC BRAKE PRODUCTS

» Available for Mechanical or Electric Drive Dump Trucks
» Designed to Operate on both Front & Rear Axles
» Adaptable to Existing & New OEM Designs
» Prototyped, Tested, and Operating in Mines

DESIGN & MANUFACTURING EXPERIENCE

» Over 30 Years of Dump Truck Product & Application Knowledge
» Experience in 40t to 400t Wet Disc Brakes
» Expertise in Hydraulic Brake Systems Integration

SEE A BRAKE AT

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PIONEER SOLUTIONS, LLC
Heavy Equipment Engineering Services

24800 Rockwell Drive, Cleveland, Ohio, USA 44117
www.pioneersolutionsllc.com • 216-383-3376 • sales@pioneersolutionsllc.com