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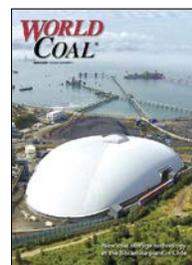
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Releasable Clutch Technology Trends For Mine Conveyors



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An Altra Industrial Motion Company

Releasable Clutch Technology Trends For Mine Conveyors



Dual RDBR 300 models with 70 kNm torque per unit are installed on the 1800 mm (5.9 ft.) wide, 3,050 m (1.9 mile) long drift conveyor at the Moolarben mine that transports coal from the longwall system underground to the surface. The inclined conveyor features an 80 m (262 ft.) lift and has a capacity of 4,500 tph.

Most accidents on mining conveyors are caused by the stored energy in the belt. If not properly protected, a loss of power at mine sites can allow loaded conveyors to reverse direction, causing damage to expensive equipment. With the resulting loss of productivity, it is no surprise that safe mine conveyor operation is a major concern for mine owners and conveyor system OEMs around the world.

Reverse rotation of conveyor belts is typically prevented by installing either a standard backstop or torque-limiting backstop for additional protection of equipment against overloads that could be caused by the stored energy in a conveyor.

However, common backstopping devices on mine conveyors do not allow a loaded belt to be slowly rotated backwards to clear the belt for maintenance purposes. This has become a significant disadvantage since the belt must be completely emptied to allow crews to safely perform routine maintenance.

The functionality of a torque-limiting, releasable backstop can also be achieved using a brake. But this approach comes with a higher cost for the operation (the brake must be actively kept open) and maintenance, so this solution is only good if you need dynamic braking anyway.

Releasable Backstops 1.0

To address the problem, backstopping clutch manufacturers began to introduce backstops with release functionality that allows stored energy to be reduced to a point that maintenance can be done safely under load.

Currently, there are several releasable backstops on the market. On these units, the outer race of the backstop is clamped, either axially or radially. Almost all of these systems only provide manual and, therefore, slow – often inaccurate – release functionality.

Specific conveyor releasable backstop models are designed for either low or high-speed installations. High-speed units that are directly mounted on the gearbox are maintenance-free as they share the oil with the gearbox. High-speed models can also be positioned on the high speed or intermediate shaft of the driving unit in multi-drive systems, such as on large inclined conveyors, where two or more backstops share the reverse load. Low-speed models are directly attached to the drive pulley.

However, these first-generation releasable backstops had some shortcomings. “A capital failure of a torque limiting backstop showed us the weak points of the typical releasable clutch designs,” said Frank Villwock, Stieber Clutch design engineer. “But, in the end, it was a discussion with a consultant in Australia that made us aware of the big safety issues and problems a power failure or interrupted startup can cause.”

According to Villwock, it became obvious that these problems could not be solved with just minor changes to existing products. Another issue was that no torque-limiting or even releasable low-speed backstop on the market could handle a torque load greater than 100 kNm. This limitation was significant since many larger inclined mine conveyors have much higher torque ratings.

An additional factor was that direct drives are coming back in vogue with conveyor system designers. However, in direct drive applications, without a gearbox, there is no way to incorporate a releasable backstop.

Early solutions were also quite limited in matters of heat dissipation and the possibility of rotating backwards fast and/or for an extended slipping period. The torque-to-diameter ratio was often poor and could cause problems on modern downsized gearboxes.

Other weak points were the friction surface, friction material, and the simple centering of the parts that rotate in case of a slippage – all these made for just a few degrees of rotation.

Releasable Backstops 2.0

“Based on the market-driven need for improved performance and functionality, Stieber Clutch engineers designed a pair of innovative torque limiting/load sharing, releasable under load backstops for high speed and low-speed applications,” explained Juergen Schwaer, Stieber Clutch product manager.

Stieber RDBR-E roller ramp type low-speed backstops are externally mounted, self-contained on a shaft extension with a torque arm. With an internal torque limiter, the RDBR-E is designed for use on large inclined conveyors, where a release function or load sharing is required. The RDBR-E also protects the conveyor belt system by cutting peak loads.



Stieber's self-contained, externally mounted RDBR-E low-speed torque-limiting/ load-sharing releasable backstop features a power-dense, compact footprint. A fully bearing supported multi-disc brake provides the torque limiting function.



The Stieber Clutch RDBK high-speed releasable backstop with integrated torque limiter for load-sharing is capable of performing as many reverse rotations as needed to completely unload a conveyor prior to maintenance work being performed.

The Stieber RDBK is a centrifugal lift-off sprag type backstop with an internal torque limiter which is designed for use on the high-speed or intermediate shaft of the driving unit in multi-drive systems, such as on large inclined conveyors, where two or more backstops share the reverse load. These innovative backstops provide up to 3.5 times more torque capacity within the same volume and up to 15 times more energy dissipation than other conventional designs.

All RDBR-E and RDBK models feature Stieber's unique release function that allows the tension of a jammed belt to be carefully released using a simple hydraulic pump or power pack to actuate the internal hydraulic cylinder (a mechanical alternative is available). The operation can be controlled and stopped at any time, helping to boost productivity. When the oil pressure is released, the backstop is automatically re-set to the original slipping torque.

Where multiple backstops are employed, these can be linked and operated simultaneously from a centralized control location. This feature can significantly reduce downtime and ensure that loss of productivity is kept to a minimum.

To ensure that it remains functional after long periods of inaction, the friction linings work in an oil bath, to provide a consistent friction coefficient.

Components that rotate backwards under overload on both the RDBR-E and the RDBK models are fully bearing supported. Both units are capable of performing as many reverse rotations as may be required (within the limits of energy dissipation) to completely unload the conveyor prior to maintenance work being carried out. This feature can significantly reduce downtime and ensure that any loss of productivity is kept to a minimum.

CASE STUDY

RDBK high-speed releasable backstops selected for incline conveyor at a Pennsylvania coal mine

A major gearbox OEM needed a compact, load-sharing, releasable backstop solution for use on a new incline conveyor system at a coal mine in Pennsylvania. Unlike other backstop designs that offer limited reverse rotation after being engaged, the new solution needed to allow for a controlled release under load and be able to rotate backwards for maintenance and clearing work.

To meet the application requirements, Stieber Clutch provided newly developed RDBK high-speed backstops. The RDBK features an internal torque limiter which is specially designed for use on the high-speed or intermediate shaft of the driving unit in multi-drive systems, such as on large inclined conveyors, where two or more backstops share the reverse load.

RDBK units also feature a releasable function which helps reduce downtime once the backstop has been engaged in the event of a blockage, belt jam or overload. Through the use of an internal hydraulic system, the RDBK is capable of performing as many reverse rotations as needed to completely unload a conveyor prior to maintenance work being performed.

With a maximum torque capacity of 180,000 Nm, a unique, compact design gives the RDBK up to 3.5 times more torque capacity than backstops of similar design – with up to 15 times more energy dissipation. The friction linings work in an oil bath to make sure that the unit remains functional after long periods of inaction.



CASE STUDY

RDBR low-speed releasable backstops provide enhanced functionality at the Moolarben Coal Complex in Australia

A load-sharing, releasable backstop solution was needed for use on new conveyors at the Moolarben Coal Complex in Australia. When fully operational, the massive facility will produce approximately 17 million tons of coal per year. The backstops are installed on the mine's 1800 mm (5.9 ft.) wide, 3,050 m (1.9 mile) long drift conveyor that transports coal from the longwall system underground to the surface. The inclined conveyor features an 80 m (262 ft.) lift and has a capacity of 4,500 tph. Additional releasable backstops were also required for the mine's surface ramp conveyor.

Based on a long-standing relationship, Stieber Clutch approached the project's conveyor OEM to introduce its new RDBR-E torque-limiting/load-sharing releasable backstop technology. Unlike other backstop designs that offer limited reverse rotation after being engaged, the new Stieber design allows for a controlled release under load while providing virtually unlimited backward rotation for maintenance and clearing work.

The RDBR-E features an internal torque limiter which is specially designed for use on the low-speed shaft of the driving unit in multi-drive systems, such as on large inclined conveyors, where two or more backstops share the reverse load.

The Stieber backstops were chosen to meet the tough conveyor application requirements due to their superior release functionality. Stieber Clutch provided a pair of RDBR 360 models with 120 kNm torque per unit for the ramp conveyor and twin RDBR 300 models with 70 kNm torque per unit for the drift conveyor.



Twin RDBR 360 models with 120 kNm torque per unit are utilized on the ramp conveyor at the Moolarben coal mine. Advanced release functionality allows for controlled release of the tension on a jammed belt with unlimited backward rotations.

About Altra Industrial Motion

Altra Industrial Motion (NASDAQ:AIMC) 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 Ameridrives, Bauer Gear Motor, Bibby Turboflex, Boston Gear, Delroyd Worm Gear, Formsprag Clutch, Guardian Couplings, Huco, Industrial Clutch, Inertia Dynamics, Killian, Lamiflex Couplings, Marland Clutch, Matrix, Nuttall Gear, Stieber Clutch, Stromag, Svendborg Brakes, TB Wood's, Twiflex Limited, Warner Electric, Warner Linear and Wichita Clutch. For information on any of these technology leaders, visit www.AltraMotion.com or call 815-389-3771.



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