

Ameridrives Couplings

Bauer Gear Motor

Bibby Turboflex

Boston Gear

Delroyd Worm Gear

Formsprag Clutch

Guardian Couplings

Huco

Industrial Clutch

Inertia Dynamics

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Lamiflex Couplings

Marland Clutch

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TB Wood's

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Warner Linear

Wichita Clutch

Enhancing Overland Conveyor Safety and Productivity



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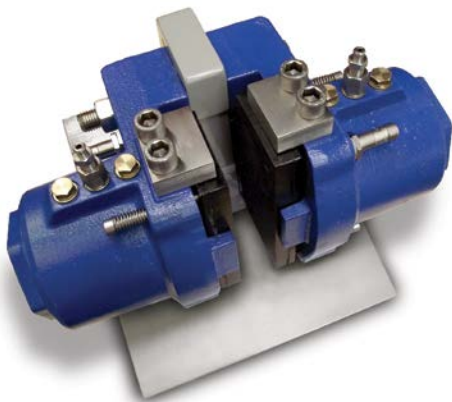
Enhancing Overland Conveyor Safety and Productivity

The role of overland belt conveyor systems is critical in mining operations which are facing ever-mounting pressure to increase output volumes. When it comes to moving coal across longer distances, overland conveyor systems continue to be the most cost-effective, saving up to 40% when compared to truck haulage.

In many cases, as belt technology improves, these conveyors traverse challenging terrain features including steep inclines and declines. The industry's rising productivity goals are putting increased stresses on overland conveyor system components, with most conveyors transporting massive amounts of coal continuously at speeds around 183m (600 ft.) per minute, stopping only for occasional required maintenance.

A mine operator's primary focus is always on safety, while constantly balancing the need for increased output. Coal mining injuries and fatalities have been in steady decline from 1978 thru 2011 (based on MSHA, Mine Safety and Health Administration data), and yet incidents related to coal conveyors continue to be reported. Currently, there is a global resurgence on improving mine safety, particularly in Australia, where mine operators continue to strive for "zero-accident" performance.

Overland conveyor system designers and OEMs, as well as component manufacturers, are keenly aware of the need for enhanced safety, productivity and energy efficiency.



The new Twiflex Model VBS is a spring-applied, hydraulically-released disc brake with a braking force of 1.4kN (10,120 lb.ft.) to 11kN (79,560 lb.ft.).

The Latest Advances in Braking Technologies for Horizontal and Downhill Overland Conveyors

Generally, belt conveyors only require braking when it takes too long for the system to come to rest (i.e., during a power failure or to prevent "roll-back" of the load when the conveyor is inclined/declined). In the case of an inclined conveyor, it's normal to use a backstop. But for a downhill or overland conveyor, regenerative braking is considered the most economical means of stopping, with the brakes being applied only during the final stages of stopping to lock and hold the system in a parked condition. However, regenerative braking is not an option in the event of power failure.

Conveyor load variation is also a braking consideration. One or more sections of the belt can be fully loaded, partially loaded or empty. When a belt is completely full, the braking torque requirement is high, but when partially loaded or empty, it is much lower. Consequently, if the same braking torque is applied, it will bring

Bauer's new PMSM (permanent magnet synchronous motors) already fulfill the requirements of the soon-to-be- implemented IE4 (Super Premium Efficiency) classification. This is evidenced by their potential to achieve energy savings of up to 40% compared to an IE2 inverter-driven squirrel cage motor. Low operating and maintenance costs, combined with optimal energy savings makes these motors ideal for use in constant torque applications such as overland conveyors.

Compact BG Series helical-gear motors are economical and require very little maintenance. Shaft-mounted BF Series geared motors feature an integral torque arm and are easy to install. Power-dense right-angle BK Series bevel-gear motors ensure the highest efficiency, especially when used with frequency inverters.



Bauer Gear Motor's new PMSM (permanent magnet synchronous motors) can potentially achieve energy savings of up to 40% compared to an IE2 inverter driven squirrel cage motor.



Bauer Gear Motor, a leading gear drive specialist, offers a full line of geared motors to meet the specific requirements for all types of coal conveyors. Units are available with motor power from 0.03 kW to 75 kW, in sizes for torques from 80 Nm (59 lb.ft.) to 18500 Nm (13,640 lb.ft.).

the conveyor to a sudden halt, causing overload stress on the gearing, couplings and belt.

Twiflex Ltd., part of Altra Industrial Motion, is a recognized leader in the development of braking solutions for mining applications. Twiflex engineers have been working closely with system designers, gearbox OEMs and major mining companies for more than 40 years to provide superior braking technologies for overland coal conveyors. A new range of Twiflex modular disc brakes has been introduced to provide normal stopping and parking functions, and also the vital emergency-stop function in the event of a power failure.

The new Twiflex VBS, VCSD and VKSD-VR spring-applied, hydraulically-released modular brakes were developed specifically for mine applications with an optional extreme specification for harsh environments. All three models are either supplied as dual spring comprising two modules mounted on either side of a central mounting plate or monospring (floating) and have been designed for a fatigue life of > 2 million cycles at 2mm air gap. Like its existing range, these new brakes include Twiflex's unique "Parked Off" feature.

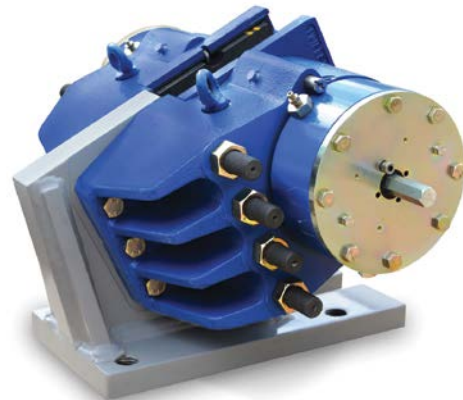
For many years, much has been made of safety features in industrial disc brakes, with manufacturers claiming to provide "safety lock out" during adjustment and pad replacement. With the exception of the "Parked Off" feature these designs typically use a lockout system i.e. nut and bolt which rely on the integrity of the mechanical components to hold the spring force; if these fail then the brake will close, potentially causing serious injury.

"In 'Parked Off' mode, the disc spring load and hydraulic pressure in the Twiflex design are zero, meaning the brakes have no stored energy and are, therefore, safer than other brakes when it comes to maintenance/pad removal," said Twiflex Product Manager, Steve Powell. "The position can quickly be achieved in the field with basic tools and without reliance on a mechanical lock out."

VBS, VCSD and VKSD-VR brakes are extremely easy to understand and install (no hydraulic pressure is required). Optional packaged mounting pedestals/brackets make all models fully interchangeable with most brakes on the market, while allowing for quick and simple swap-over. This is a significant benefit for mine operators who seek to add an enhanced level of



Twiflex Model VCSD spring-applied, hydraulically-released disc brake has a braking force of 11kN (79,560 lb.ft.) to 60kN (433,980 lb.ft.).



Twiflex Model VKSD spring-applied, hydraulically-released disc brake has a braking force of 28kN (202,520 lb.ft.) to 119kN (860,730 lb.ft.).



400hp coal conveyor at Browns Creek Complex – Rupert, West Virginia, drops 468 ft. over a length of 1230m.

safety to their existing overland conveyor systems.

Twiflex's new VBS brake is intended for use on conveyor drives and installed on the high speed side between the motor and gearbox to protect the motor against overspeed conditions when there is a mechanical failure in the drive. The brake uses large pads (10283mm² each pad) for high thermal capacity and is fully sealed against moisture/dirt ingress. The VBS is the smallest spring-applied brake in the Twiflex modular range with a braking force of 1.4kN (10,120 lb.ft.) to 11kN (79,560 lb.ft.). It features a stainless steel piston, cover plate and fittings and optional ISO 12944-5:2007 C5 paint specification.

The VCSD is a spring-applied, hydraulically-released disc brake which has been designed for use in harsh environments while offering superior performance in heavy-duty dynamic and emergency stopping conveyor applications. Both standard pad (15,700mm² each pad) and large pad (28,990mm² each pad) versions are available. The VCSD is a moderately sized unit with a braking force of 11kN (79,560 lb.ft.) to 60kN (433,980 lb.ft.).

The VKSD is a larger spring-applied, hydraulically-released disc brake with a pad area of 36300mm² (each pad) and a braking force of 28kN (202,520 lb.ft.) to 119kN (860,730 lb.ft.). The VKSD-VR was developed for high-duty / frequent-stopping applications and features large pads (59976mm² each pad) to provide a bigger swept area and hence better thermal capacity along with a reduction in pad pressure. This allows for the use of standard organic friction material at higher rubbing speeds.

World-Class Backstops and Holdbacks for Inclined Coal Conveyors

Steeper, longer, faster and more powerful overland conveyors carrying increased quantities of coal require larger drive motors. Stronger and more reliable backstop systems are, therefore, a necessity to protect employees and equipment while preventing massive loads from racing backwards in the event of a power outage or mechanical failure.

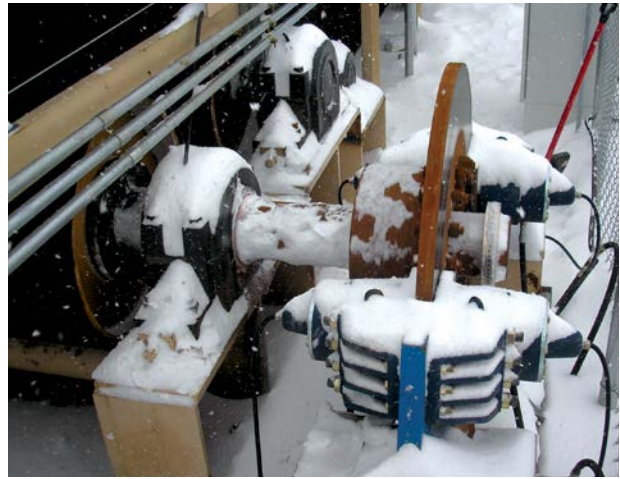
Two U.S. companies within the Heavy-Duty Overrunning Clutch/Brake Group of Altra Industrial Motion are recognized as global leaders in providing precision overrunning and backstopping clutches to the worldwide coal industry.

Marland Clutch has designed and supplied some of the world's largest backstops for protection against the dangerous and potentially damaging effects of reverse torque runaways of inclined and overland coal conveyors. Formsprag Clutch's LLH-model holdback is, likewise, one of the most popular devices utilized to prevent uncontrolled rotation in the opposite direction of mining conveyors.

Known for their rugged reliability, Marland BC-MA Series low-speed holdbacks are mounted on conveyor head shafts usually on the opposite side of the drive pulley from the motor and gearbox. Unlike electrical or pneumatic clutches and brakes, these ramp-and-roller style backstops are completely mechanical and engage instantaneously upon reverse torque to prevent any rotation, thus, providing the highest reliability at a lower installed cost. Savings are achieved since there are no power source or utility costs, no requirement for controls and no installation set up or adjustments required.

These self-lubricated units feature superior roller design, taconite sealed oil chamber and removable torque arms. Units are designed to operate in an environment of severe airborne grit, in temperatures from -40 to +65°C (-40 to +150 °F) and run 24/7/365 for 20+ years. Models are available in a wide selection of torque sizes, with bore ranges up to 600 mm (23.5 in.).

Marland engineers have recently designed a massive new model BC-1200MA backstop rated at 1626000 Nm (1.2 million lb.ft.), according to Mike Travis, Marland/Formsprag sales & marketing manager. "This is the largest conventional backstop ever built, weighing in at 14,500 lbs.," Travis said. "We shipped two of these units to a coal mine in China and, more recently, delivered four additional units to a mine in West Virginia for use on one of the world's largest incline slope coal conveyors."



Two Twiflex VKSD spring-applied, hydraulically-released, modular brakes acting on a 40" diameter x 1.5" thick disc.



Massive Marland BC1200-MA low-speed holdbacks, with a torque rating of 1626000 Nm (1.2 million lb.ft.) are the largest conventional backstops ever built.



Formsprag's popular LLH holdbacks feature sprag technology and are specifically designed for inclined conveyor head shaft applications where reverse rotation must be prevented.

Formsprag's popular LLH holdbacks feature sprag technology and are specifically designed for inclined conveyor head shaft applications, where reverse rotation must be positively prevented. Models are available with torque capacities up to 976270 Nm, (720,000 lb.ft.). LLH units come ready to install and are equipped with a one-piece, quickly detachable torque arm. Formsprag's grease labyrinth seal design protects internal oil seals by preventing airborne contaminants from reaching the internal lip seal area.

Formsprag offers LLH units with both oil or full grease lubricated designs. The oil lubricated clutch assembly also includes an oil sight gauge with filter breather for ease in checking lubricant level.

Formsprag recently supplied LLH units for use on a new coal mine conveyor belt system at a facility located in the Eastern U.S. Eight standard LLH units were installed at transfer points on the overland portion of the conveyor system which operates at approximately 800 fpm. The inclined portion of the conveyor is driven by two 1,500 hp motors combined with two speed reducers mounted to the drive pulley. LLH-3500 units, each with a holding torque rating of 510000 Nm (375,000 lb.ft.) were mounted on the speed reducers' double extended output shaft, providing backstopping load sharing to this dual drive system.

Reliable, Energy Efficient Gear Motors Are Required for the Long Haul

Primary drives are one of the most important components when it comes to long-term productivity of an overland conveyor. Since, in many instances, gear motors run continuously with few stops, selecting a robust, energy-efficient drive solution for a particular overland conveyor application is critical. Bauer Gear Motor, a leading gear drive specialist, offers a full line of geared motors to meet the specific requirements for all types of coal conveyors. Units are available with motor power from 0.03 kW to 75 kW, in sizes for torques from 80 Nm (59 lb.ft.) to 18500 Nm (13,640 lb.ft.).

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 Couplings, Bauer Gear Motor, Bibby Turboflex, Boston Gear, Delroyd Worm Gear, Formsprag Clutch, Guardian Couplings, Huco, Industrial Clutch, Inertia Dynamics, Kilian, 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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