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Boston Gear

TB Wood's

Formsprag Clutch

Wichita Clutch

Marland Clutch

Industrial Clutch

Bauer Gear Motor

Svendborg Brakes

Nuttall Gear

Warner Linear

Delroyd Worm Gear

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Kilian Manufacturing

Lamiflex Couplings

Ameridrives Power
Transmission

Excerpted From

The Future of Material Handling



As seen in
Mining Magazine
December, 2013



Excerpted From

The Future of Material Handling

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Braking systems

In the mining industry a mixture of drum and disc brakes are used on overland and downhill conveyors. On uphill conveyors backstops are used to prevent the load rolling back.

Disc brakes have many advantages over drum brakes both in maintenance and performance, so many large-scale conveyor installations use this technology. The combination of scissor/thruster and modular brakes lends itself to more efficient and cost-effective brake solutions, with the advantage of being able to add sophisticated control systems for stopping the conveyor in emergency conditions.

Brakes are spring-applied, hydraulically-released and installed either on the high-speed side (between the motor and gearbox) or on the low-speed pulley/flywheel to protect against overspeed conditions when there is a mechanical failure of the drive.

Drum brakes are normally larger in size and weight, so are more difficult to install, align and maintain than disc brakes. For example, disc brake pads can be changed in five to 10 minutes, while the shoes on a drum brake can take around one hour to replace and realign.

In an emergency stop, the thermal expansion and distortion of the drum is often a concern, so the advantage of a disc brake that acts on two surfaces (and is therefore more thermally efficient) is a great benefit to the conveyor designer. The use of disc brakes in these installations also means a lower system inertia, so savings can be made in the drive system.

When asked about the biggest technological advances in brake system design over the past 30 years, Steve Powell, product manager for Twiflex (part of the Heavy-Duty Overrunning Clutch Brake division at Altra Industrial Motion), says “The phasing out of asbestos in the early 1980s, which resulted in the development of new friction materials and compounds, was the biggest change over this period. Brake pads are now available with high friction coefficients and longer life.

“Similarly, many high-specification steels and cast materials have become available to the manufacturer, which means that smaller, more compact brakes with less weight are now feasible. Twiflex has recently been designing brakes with low-temperature materials and cryogenic seals for use down to -40°C.”

Braking Selection

The most important factors in selecting a brake system for conveyors are:

- Conveyor profile – rise and fall, concave, convex curves
- Load torque (out-of-balance load)
- Stopping distance and profile (ramp rate)
- Starting and stopping conditions
- Environment – temperature and humidity
- Local government regulations
- Load being carried
- Life expectancy based on remoteness of the installation and availability of spares and skilled work force

Twiflex braking solutions

Twiflex recently introduced a new range of modular disc brakes for normal stopping and parking, and with an emergency-stop function in the event of a power failure.

The new VBS, VCSD and VKSD-VR spring-applied, hydraulically-released modular brakes have been developed specifically for conveyor installations with an optional extreme specification for harsh environments.

All three models are supplied as dual-spring set-ups comprised of two modules mounted on either side of a central mounting plate, or mono-spring (floating) set-up with a fatigue life of >2 million cycles at 2mm air gap.

The new brakes include Twiflex's Parked-Off feature. In Parked-Off mode, the disc spring load and hydraulic pressure are zero, meaning the brakes have no stored energy and cannot snap shut during maintenance/pad removal. This position can quickly be achieved in the field with basic tools and without reliance on a mechanical lock-out.

Twiflex has an in-house testing capability comprising of a climatic chamber with -75°C to +180°C conditions, a fatigue room for brake cycling and inertia test rig for dynamic stops.

Currently, the company's main focus is on developing products suitable for low-temperature applications, but Twiflex also has an extensive programme to look at both sintered and organic friction material for conveyor braking.

Twiflex intends to launch a mono-spring version of the VBS early in 2014. This will provide a solution for high-speed conveyor drives where space is limited. In addition, a new SMART brake controller will be available early in 2014 to support the introduction of the VBS, VCSD and VKSD-VR to the conveyor market.

In the conveyor market, Twiflex is mainly active in the US, Australia, South America, India and China. The company is looking to expand further into the Asia Pacific region with a new Altra manufacturing facility recently opened in Changzhou, China.

The new Twiflex VCSD-VR (large-pad version) brake has been supplied to Sumitomo Hansen Australia for use on the Wiggins Island Coal Export Terminal (WICET) Phase 1 expansion. Here the brakes are being used on the high-speed drives and flywheels of the 5.5km-long overland transfer conveyor. Stage 1 of the project will increase existing long-term coal export capacity to 80Mt/y.

Svendborg Brakes

Svendborg offers hydraulic brakes for mining conveyors. The newly introduced Hydraulic Power Unit (HPU) offers two-stage braking to prevent mechanical damage and unnecessary wear through uncontrolled



The VBS will be introduced as the smallest brake in the Twiflex modular range – a range which continues to grow – with a braking force of 1.4 to 11 kN. The brake is designed to deliver 2 million cycles at 2 mm air gap. It features a stainless steel piston, cover plate and fittings and optional ISO 12944-5:2007 C5 paint specification.

Twiflex in India

Twiflex recently supplied brakes to the Essar Power Co in Bangalore, India, for a 3km-long downhill overland conveyor with 690t/h capacity and a speed of 2.5m/s. The installation is part of a 1,200MW power station fed by coal transported from Mahan near the villages of Bandhaura, Khairahi and Karsualal in the Singrauli district of Madhya Pradesh. Scope of supply included Twiflex VKSD spring-applied, hydraulically-released modular brakes acting on a 1.3m-diameter disc fitted to the tail pulley. Along with a hydraulic power pack, the brake system was designed to stop the conveyor in the case of power failure and in overspeed conditions when the tail pulley exceeds the recommended speed of 55rpm. In both cases, the system provides up to 75,000Nm of torque to stop the conveyor in a controlled manner over a 25-second period.



Svendborg brake for the high-speed side of a conveyor drive (above).

Svendborg SOBO brake for the low-speed side (below).



braking. The HPU is available in two versions: basic (single dump) and premium (dual dump) with a cabinet/enclosure, and various options and accessories.

In addition, Svendborg has updated its Soft Braking Option (SOBO) brake control unit (BCU). This was introduced in 1998 and uses pulse-width modulation to control deceleration and improve safety. The new SOBO BCU incorporates PLC functionality and offers: controlled braking independent of load; position braking on time or distance; adjustable brake ramps/curves; controlled start-up; and real-time braking-sequence monitoring.

O'Brien explains that the SOBO is undergoing continued R&D with improvements being introduced almost every six months. "We also have an on-going brake-pad R&D programme to assess noise, wear and friction. Our wind-turbine brake division has a constant R&D programme over all aspects of braking, and we in the industry sector gain from any benefits made there," he adds.

Svendborg's main markets for mining products are Australia, South Africa, South America, Czech Republic and several OEM suppliers in Germany. "Product installations in early 2014 include the Wiggins Island Coal Terminal in Queensland, Australia," says O'Brien.



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