Warner Electric

Boston Gear

TB Wood's

Formsprag Clutch

Wichita Clutch

Marland Clutch

Industrial Clutch

Nuttall Gear

Warner Linear

Delroyd Worm Gear

Stieber Clutch

Ameridrives Couplings

Inertia Dynamics

Matrix International

Huco Dynatork

Bibby Transmissions

Bauer Gear Motor

Twiflex Limited

Kilian Manufacturing

Ameridrives Power Transmission

Braking Control for Downhill Conveyors

Twiflex® Limited

An Altra Industrial Motion Company

Braking Control for Downhill Conveyors

4 Twiflex fail safe disc brakes on two discs.

Correctly engineered braking systems are of paramount importance when ensuring the safe control of downhill conveyors. One such example is at the Hazelwood Power Station in the Australian State of Victoria. Here some 4500 TPH of overburden is conveyed 90 meters downhill on a 1.3 km long belt.

A total of four Twiflex VKSD spring applied / hydraulically released fail safe disc brakes are installed on two discs, 1.5 meters in diameter. One disc and brake set is mounted directly on the primary drive drum and the second on the tail pulley. The brakes, which provide a controlled release during start up and controlled application during stopping, operate from a hydraulic power pack. A closed loop control system designed by Twiflex interfaces with the conveyor. The principle is as follows:

A positive displacement pump discharges its flow through a check valve to an accumulator and is automatically switched off when the system pressure is reached. Two solenoid valves are employed, one on the flow line into the brake and one on the discharge side. When the primary drive motor is energized the discharge valve closes and the input flow valve opens. This permits the oil to maintain pressure on the brake springs to keep them compressed and the brakes released.

These solenoids are inter-linked with the primary drive motor circuitry, and when de-energized they open the discharge valve and closes the input flow valve. This releases oil pressure from the calipers and arrests the input flow of oil allowing the springs to apply force to the brake pads.

Conveyor control is activated by signals fed through a PLC. A tachogenerator mounted on the drive drum shaft measures the RPM and converts this to frequency signals which are fed to the PLC. The controller is pre-programmed to compare RPM against time to a ramp down velocity rate which is suitable for optimum conveyor retardation.

If the measured speed becomes lower (conveyor retardation slows down) a signal is transmitted to operate the solenoid valve towards its closed position until the speed corresponds to the programmed ramp down. This increases the back pressure on the brakes and decreases the braking torque. Alternatively, if the measured speed becomes higher a signal is transmitted to operate the valve in the open direction.

A fast approach circuit is also integrated into the system. It consists of an auxiliary circuit which is the first to be activated when stopping the conveyor. The control valve in this circuit operates immediately to the fully open position and quickly relieves the back pressure to a pre-determined level. This is achieved by controlling the flow of hydraulic fluid into a separate accumulator which is charged to a controlled level.

This level gives enough back pressure relief to allow the brakes to just touch the disc. No braking force is applied at this stage; it is simply to quickly close the gap between the pads and disc to the point where controlled braking can commence. With the gap closed the PLC activates control to the programmed deceleration rate.

During a power failure an open loop braking mode is activated. Under this condition the control switches to an alternative source which provides power to control braking within a pre-determined ramp down rate. This is not adjustable, but over-stress in the drive train and belt is avoided by programming the ramp down to suit a fully loaded belt. A partially or empty belt will take longer than is actually necessary to stop.

Full system monitoring is also provided with this system to ensure safe control at all times.

Twiflex® Limited

An Altra Industrial Motion Company

Customer Service

+44 (0) 20 8894 1161
www.twiflex.com

Asia Pacific

For a list of our AP sales offices:
www.AltraMotion.com/ContactUs

P-7213-TF 12/11 Printed in USA