Control and drive systems for mine conveying

Complete overview of our portfolio of conveyor solutions to increase overall reliability.

- Process improvement and optimization
- Maximized performance
- Reduced carbon footprint

Conveyor systems portfolio
Reliable systems for efficient mining

Complex design is a rule rather than exception in mining conveyor applications. Ascent and descent angles, bulk weight and distribution, fluctuating operational conditions and many other factors mean that each application has its own unique requirements.

Having designed control and drive equipment for more than 800 kilometers of belt conveyor systems around the world, ABB has an extensive library of application solutions. The latest simulation techniques, in combination with the most recent drive and motor technology, results in applications with high availability, low maintenance requirements and efficient energy use.

ABB's conveyor systems portfolio includes:
- High power, gearless conveyor drives
- Medium power, gearless conveyor drives
- Conveyor control program, MCCP
- Digital solutions for process optimization and integration
- Control equipment
- Instrumentation
- Automation
- Electrification

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Overland conveyor with gearless drives in chilean copper mine

Gearless drives for the world's most powerful conveyor

Gearless conveyor drives from ABB are used to operate the world's most powerful belt conveyor system, with a design capacity of 11,000 tonnes per hour, at the Chuquicamata copper mine in northern Chile. The mine is located at an altitude of 2,850 meters, 215 km northeast of Antofagasta.

Eleven 5 MW gearless drives are used to drive three conveyors; two with four motors each and one with three motors. Two 20 MW conveyors are used to transport the ore to the surface, overcoming a significant elevation change of about 1000 meters. The second conveyor feeds into a slightly smaller, 15 MW, overland conveyor.

Conveyor designs with such high power is only possible to achieve with gearless drives. A small number of large drives, instead of a greater number of smaller drives, means fewer caverns are needed to house the drives, resulting in substantially lower investment costs. In addition, fewer drives in the system reduces engineering complexity, saving further costs.

No motor assembly is required on site. The motors are transported from the factory to the site fully tested and assembled, reducing the risk of damage during installation. Installation takes just one day and reduces the overall installation time of the system tremendously.

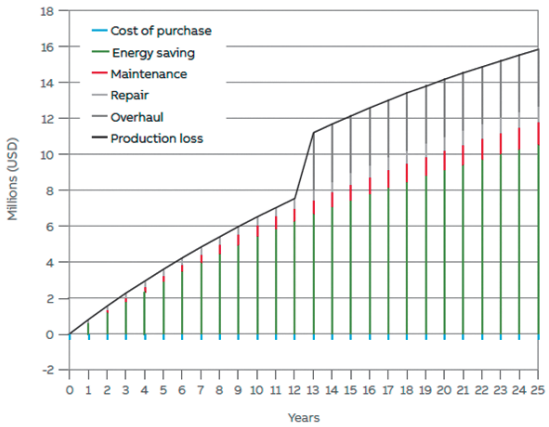
Gearless conveyor drive with low speed motor

The gearbox is the weakest link in mining conveyor drive. ABB has addressed this issue by eliminating the gearbox altogether, replacing it with robust, reliable control from variable speed drives running accurately performing, low speed motors.

Gearless conveyor drives for high power operate with synchronous motors that run at low speed, 50-60 rpm. Gearless drives for medium and low power use permanent magnet motors designed for this speed range.

ABB gearless conveyor drives are built to withstand the shocks and vibrations in mining conveyor applications and address the required IP rating. They are available for shaft and foot mounting.

The gearless conveyor drive reduces the need for maintenance, repair and asset management, whilst significantly reducing downtime. The failure rate can be as much as 50% lower than a standard design with gearbox. It is also more efficient, which means running costs are lower. The expected lifetime of 25 years is almost twice as long as that of a gearbox.



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The graph shows the total cost of ownership and accumulated savings compared to a system with geared drives over a 25-year life of the asset.

The diagram shows a conveyor system using four flights with 12 drives; with a power of 1,000 kW; transporting 8,800 tonnes per hour; energy cost is $0.10/kWh; gearbox efficiency is 96 percent; annual operation time is 6,900 hours; and the stockpile capacity is three days.

Over a 15 year period, this mine would save about $12 million by using gearless conveyor drives.

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Gearless conveyor drives (GCD) for high power

Mining Conveyor Control Program MCCP

All the functionality of the main drives control is now be programmed into the drive. Conveyor start and stop, starting profiles and load synchronization, normally handled by a separate system, can be achieved with the MCCP for variable speed drives. The program ensures that all connected drives work together to share the load between pulleys and motors.

The pre-engineered solution reduces engineering time and ensures faster commissioning. The communication between drives is set up automatically. With accurate belt control, belt movement is smoother, reducing the wear of mechanical parts and the stress on the belt. Belt slip is reduced to a minimum and the belt starts easily even with high loads. Conveyor parameters are simple to adjust without specialist staff.

Digital solutions

ABB Ability™ is a portfolio of digital solutions that help companies increase productivity and safety with lower costs, whilst tapping into the expanding field of automation applications provided by the digital solutions.

The ABB Ability™ framework provides data collection, pre-processing, calculation engine and dashboards. Operational requirements are assessed in real time. Short interval control is combined with high level planning to meet targets, metrics and KPIs, enabling operators to take corrective action when abnormal situations arise. Using a dedicated stockyard management system for example, every batch of material is tracked and its onward path predicted, enabling real-time adaption and optimization. The result is one seamless and efficient operation from mine to port.

The precise maintenance needs are evaluated by pulling together data that usually resides in disparate locations to assess the condition of the equipment. ABB has worked with experienced operators to develop a specific KPI system that identifies optimization potential in mining applications.

ABB Ability™ provides production information management with analytical insights to identify best practices and improve the overall operation of the mine.

Engineering services for mining

Automation is often more basic in mining than in other industries and is frequently limited to simple control of motors, equipment or certain parts of processes. Additionally, mines tend to have a large number of independent pieces of equipment and systems from different suppliers. The electrical systems that provide the power for industrial processes have also tended to exist in their own world.

All this can be brought together and controlled efficiently using ABB System 800xA. This is not only a distributed control system, but also an electrical control system, a safety system and a collaboration tool, with the capacity to improve engineering efficiency, operator performance and asset utilization.

ABB can supply all electrical infrastructure and power supply, including the construction of grid code-compliant incoming substations and distribution systems to provide power for the whole mine. Optimized substation and electrical room layouts, cable engineering, grounding systems, communication systems, fire detection and protection, air-conditioning and ventilation systems all contribute to the efficiency of the mine.

ABB also provides instrumentation for mining conveyor systems that can withstand harsh conditions. Efficient control of the conveyor requires reliable measurements of factors such as weight, volume, temperature, vibration, belt position and belt thickness. Highly accurate and robust sensor technologies provide exact measurement values, consistently delivering the correct data to the operation system.

Combining the knowledge of mining operations with expertise in industrial processes and state-of-the-art technologies, ABB is a dependable partner for mining automation and electrification projects, from feasibility studies to start-up.

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Failing conveyor idlers waste energy and create noise, as well as excessive belt wear and misalignment – or, in the worst case, belt rupture or fire. The condition of rollers can be measured from a sensor carrier that runs alongside the conveyor.

Combining the knowledge of mining operations with expertise in industrial processes and stateof-the-art technologies, ABB is a dependable partner for mining automation, electrification and digitalization projects, from feasibility studies to start-up.

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ABB Mining business is represented in the following countries: Australia, Brazil, Chile, China, Germany, North America, Peru, South Africa, Sweden and Switzerland.
For contact details, please visit our website:

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