Fast-Track Mine Efficiency with the Right Brakes

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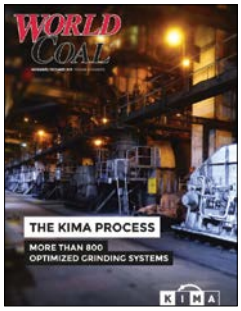

Svendborg Brakes®
Altra Industrial Motion

Fast-Track Mine Efficiency With the Right Brakes

Efficient and productive mining facilities are characterized by smooth conveying operations. To successfully transfer heavy loads of materials over long distances – both uphill and downhill – mine conveyors need reliable and responsive braking systems. Using the latest advances in control technology and data processing, mine operators are able to monitor and control conveyor braking systems with more precision than even before. By improving the efficiency of the material handling network, productivity will improve.

Tilman Speer, International Sales Manager at Svendborg Brakes, a brand of Altra Industrial Motion Corporation, explains how to adopt smart controllers into braking systems for mining conveyors.

The ability to control the speed, acceleration and deceleration of conveyors is crucial to maximize material handling efficiency. In particular, it is extremely important to avoid abrupt start-ups, prevent conveyors from running backwards when travelling uphill or from rushing downhill under the influence of their load. Braking control is also necessary when mine operators need to halt conveyors or to avoid issues during power failures.

In these situations, the conveyor should not immediately come to a halt. The brakes should rather stop it in a gradual and controlled way to protect the power train from shock loads – a practice commonly referred to as ‘soft braking’. In this way, it is possible to avoid excessive tension on the conveyor belt and eliminate considerable stress to multiple pieces of equipment, such as rollers.

Conventional braking systems, while facilitating controlled stopping and holding, have seldom been able to effectively modulate speed in operation or operate autonomously. Therefore, it is important for mine operators to explore new technologies that can deliver more responsive and reliable solutions to allow them to maximize productivity and increase equipment service life.

In addition to the traditional considerations of brake specification, a modern system should be specified based on its ability to automatically modulate the braking force: regulating the conveyor’s speed, acceleration and deceleration. The most effective way to introduce soft braking is to equip the system with a control system based on a closed-loop feedback mechanism.

The SOBO® iQ solution from Svendborg Brakes uses controllers based on proportional integral algorithms. By combining proportional and integral responses, the controller is able to handle the fast dynamics of the braking process in a highly efficient and reliable way.

Choose a suitable control system

Closed-loop braking system controllers receive one or more reference signal from sensors associated with the conveyor, such as the conveyor’s torque, speed and/or pressure. The controllers compare the data received to pre-defined setpoints, the results of which trigger a proportional corrective change to adjust the motion of the conveyor accordingly.

The best way to manage the data and modulate the braking force involves the use of controllers based on proportional integral (PI) algorithms, such as the SOBO® (Soft Braking Option) iQ solution from Svendborg Brakes. By combining proportional and integral responses, these controllers are able to handle the fast dynamics of the braking process in a highly efficient and reliable way.

Firstly, the proportional response offers immediate action to address a major difference between sensor data and setpoint. For example, if the conveyor's speed starts to rise significantly, exceeding the setpoint, PI controllers will need to promptly slow the conveyor by applying an elevated braking force.

The proportional action responds quickly, addressing big fluctuations, but cannot get the setpoint and sensor data to precisely match. In fact, the proportional term alone would likely excessively reduce the speed as well as consume more energy.

This is why the secondary, integral response is needed. This conducts an averaging operation that filters out small oscillations by taking into account past and present deviations over time. As a result, the controller is able to stabilize the braking force and ensure a gentle stop.

To successfully transfer heavy loads of materials over long distances, mine conveyors need reliable and responsive braking systems.

Offering actionable insight into the braking process

Having chosen to utilize PI braking controllers, it is essential for mines to fine-tune the proportional and integral terms, both individually and in relation to one another, to get the most suitable output and response: maximising performance, productivity and efficiency. This task requires extensive knowledge on how mining conveyors should move in different situations. This insight can be gained by leveraging the power of Big Data.

In systems such as SOBO iQ, all the sensor data points obtained by the braking controllers are accessible and can be used by mine operators. In this way, they are empowered to identify key patterns as well as having real-time, remote monitoring capabilities to make on-the-fly adjustments when needed. As a result, the system helps operators to implement Industrial Internet of Things (IIoT) within their mining facilities.

In addition, Svendborg Brakes has a large installed base of SOBO iQ braking control systems on mine conveyors around the world. This experience has allowed the company, to create a comprehensive and up-to-date data warehouse. This can be accessed by the company's global network of service technicians every time a new control system is installed or commissioned. Once SOBO iQ is set up and the algorithms adjusted, not subsequent fine-tuning is required.

Case study: Controlling world's highest downhill mine conveyor

A coal mine in Colorado, U.S., needed a braking control system for its two downhill longwall panel conveyors. The challenge arose in maintaining a consistent stopping time of 35 seconds, even as the length of the conveyor changed as the longwall machine retreated.

Svendborg Brakes' SOBO iQ offered the ideal system. Its dual-loop PI control, coupled with advanced functions, such as independent overspeed monitoring, rollback, gearbox and out-of-band monitoring, allowed the operators to ensure consistent stopping times in any situation.

Case study: Remain in control during power outages

A mine in Chile wanted a solution that would minimize the effects of power failures on its conveying operations. The most important aspect was in providing parking and tension control during a power failure. By ensuring that tension in the conveyor's belt is maintained, equipment stress would be minimized.

To address this issue, Svendborg Brakes decided to apply a torque feedback sensor on its SOBO iQ. In this way, the system would monitor the line pull of the take-up winch cable, rather than the conveyor's speed, thus gathering actionable insight into the actual tension.

Thanks to this new, smart brake modulating setup, the Chilean mine could maximize reliability and equipment service life.

Sophisticated braking is the route to success

Soft braking systems that ensure correct starting and stopping of mine conveyors require highly responsive and consistent solutions to assess and address different situations. The level of sophistication offered by PI controllers that feature state-of-the-art data processing and visualization capabilities, such as SOBO iQ, makes it possible for mine operators to succeed. By using such systems, they can create and maintain highly productive, reliable and efficient conveying systems, despite the challenging and unstable operating conditions.

By relying on skilled brake manufacturers that have extensive experience in intelligent braking solutions, such as Svendborg Brakes, mine operators can benefit from crucial support in identifying the most suitable system for a specific application, maximising performance, efficiency, equipment service life and, ultimately, productivity. Even more, they can rely on the company's expert teams for remote service and troubleshooting of the braking system, optimising uptime.

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Svendborg Brakes GLOBAL REPRESENTATIONS

www.svendborg-brakes.com

DENMARK	sb@svendborg-brakes.com	+45 63 255 255
GERMANY	sb@svendborg-brakes.com	+49 5422 9272 000
CHINA	sb@svendborg-brakes.com	+86 21 60580600
USA	na@svendborg-brakes.com	+1 (303) 285 1271
BRAZIL	altra.vendas@altramotion.com	+55 11 4615 6300
INDIA	milind.sule@altramotion.com	+91 83909 97970
POLAND	biuro@vitech.pl	+48 605 765 904
AUSTRALIA	sales@altramotion.com.au	+61 (0) 8 94 160300
KOREA	jong.lee@svendborg-brakes.com	+82 10 9703 0979
SOUTH AFRICA	sbsales@sintech.co.za	+27 83 382 2479
CHILE	sa@svendborg-brakes.com	+56 23 203 9150
SPAIN	sb@svendborg-brakes.com	+34 (975) 2336 55
CZECH REP.	jan.mikyska@svendborg-brakes.com	+420 2 51 68 01 68
PERÚ	pe@svendborg-brakes.com	+51 959 224488

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