Bernd Küsel, CBG, Germany, describes a system for conveyor belts that can substantially increase safety and operating efficiency.

Conveyor belts are often subjected to exceptionally high stress. Apart from countless bendings in longitudinal and transverse directions, the belts suffer from permanent material loading impact from lack of maintenance, worn, failing or wrongly adjusted conveyor parts and foreign objects. A failure or massive damage to the conveyor belt can have dramatic consequences.

Monitoring systems based on X-ray technology are well on the way to helping reduce such problems and revolutionise the safety and the operating efficiency of conveyor belts.

IN GOOD HANDS

Figure 1. A CBGuard scanner with a safety fence in an overland conveyor.

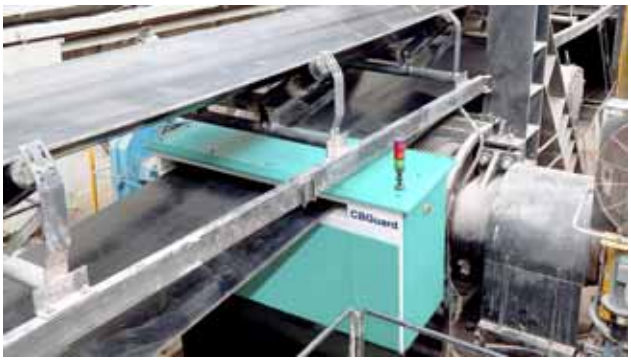

Figure 2. A CBGuard system operating at a cement plant.

Figure 3. A CBGuard scanner with the belt passing through it.

Benefits

Cost reductions

Having a conveyor belt permanently monitored obviates the need for time-consuming, insufficient visual inspections by maintenance personnel. During this gained time, the conveyor can continue to work and the staff can take care of other important tasks. Repairs can be performed at the optimum point of time – not unnecessarily early and not too late, as it would be in the case of visual inspections.

The CBGuard system permanently and accurately reports the severity of injuries and deficits. Examples for such deficiencies are holes, scratches, edge damage, delamination, protruding cords and stuck foreign objects.

Fatal errors, such as a belt break, that can incur dramatically high costs, can be avoided. Thanks to the live analysis, arising defects, not still visible from the outside, are detected at an early stage and can be repaired in a timely manner.

The CBGuard system measures the belt thickness and yields timely information about the upcoming need for a replacement belt. Hence, the maximum lifetime can be obtained from the conveyor belt.

Safety

The CBGuard is an important part of the preventive maintenance programme.

Exact, continuous status reports not only offer cost benefits, but they also increase safety. Arising damages, not visible from the outside, can be eliminated in a timely manner. Serious damages, for instance, broken or corroded steel cords, trigger an alarm, which advises the belt operator to carry out the repair as soon as possible. The X-ray unit is an important part of the preventive maintenance programme.

Extremely critical failures, such as the imminent opening of a belt splice or the slitting of the belt, automatically stop the belt drive. Splices are the weakest points on conveyor belts and so need special attention. They put the operation at a higher risk leading to potentially dramatic consequences. The CBGuard scans all of the splices. Each splice in a belt is individually recognised in the database. Any deviation from the desired splice condition will automatically trigger an alarm or even stop the conveyor, for instance, in case of threatening failures, such as excessive movements inside a splice. That way, dramatic consequential damages, for personnel and plant, are avoided.

Industrial Internet of Things (IIoT)

The X-ray scanner digitises the entire conveyor belt; every cubic millimetre of the belt is captured. That way, the X-ray system can be integrated into the IIoT. A reconciliation with the control units of other conveyor components is enabled. Since the X-ray even detects material build-up on the belt, it is possible to automatically demand corrections of the cleaning devices.

In combination with other elements of the logistical chain, the optimal time of the next maintenance stop can be scheduled.

The condition of the belt can be observed from any place in the world over the internet.

Who needs it?

The use of an X-ray belt scanner is recommended for most conveyors. However, the economical benefit increases with the length of the conveyor or with a special risk situation. It is not unusual that overland belt conveyors run through the wilderness, on high trestles or in difficult terrain.

Originally, the request for an X-ray system came from underground coal mining, because a visual assessment of the conveyor belt is difficult there. Under the Safety First rules, belts were replaced because it was assumed they were not reliable anymore and assets were burned because of lack of information.

Meanwhile, there are hundreds of X-ray systems operating.

Users are reporting over 25% longer belt service life and significant cost savings as a result of reduced conveyor downtimes and lower insurance premiums.

Particularly important is the X-ray scanner for steel cord conveyor belts with a length of about 500 m (250 m centre to centre) and more. Damages to such long, and often expensive, belts can have catastrophic consequences. In most cases, they are the lifelines of mines, power plants and ports.

Functionality

The scanner uses the technology known from medical diagnostics. The entire belt is X-rayed continuously and the findings are available in real time.

The software generates an intelligent, holistic analysis of any kind of threat to the belt. The current condition of the belt and the splice(s) is compared with the target condition. Any deviation triggers a customised action – from a warning to the automatic shutdown of the conveyor system.

The CBGuard scanner is suited for a belt width of up to 3200 mm, a belt thickness of up to 60 mm and a velocity of up to 9 m/sec.

Installation

The device is compact and fits in almost all conveyors: it weighs 700 kg and has a size of 1.9 x 0.7 x 1.1 m in case of a 1200 mm wide belt.

The preferred place is in the bottom part of the conveyor (the return run). The belt needs to run flat (not troughed) through the device.

A concrete foundation and safety fence have to be provided. Only authorised and qualified personnel have access to the system. The scanner itself is equipped with several safety devices.

The emission is similar to airport scanners. Before work on the device, it is switched off in the control room. When turned off, there is no radiation at all.

The analysis software runs on Windows XP, 7 and 10, with access through TCP/IP protocol. The programme is intuitive and easy to use. Remote servicing by the supplier or other experts is possible anytime.

The scanner is almost wear-free, because it neither has moving parts nor contact with the belt. The device signals in good time when the X-ray tube is about to be replaced.

Conclusion

X-ray technology, in combination with sophisticated software, has begun to make an impact on conveyor belt health monitoring. No other independently working system or technology is capable of providing and processing such a wealth of detailed information.

The reduction in operating cost and the increase in safety are most convincing arguments for the implementation of these state-of-the-art scanners. **DB**