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MINING & QUARRY WORLD

Conveying Solutions

Conveyor operators in the mining and quarrying industry have to manage a diverse set of challenges, most of which take a heavy toll on the conveyor belts themselves. Here, Rob van Oijen, Manager Application Engineering for Fenner Dunlop Conveyor Belting in The Netherlands, provides expert advice on some of the most common conveying problems facing our industry.

Too soon on the scrapheap – premium grade European-made belts out-last cheap imports by as much as three or four times.

QUESTION: WHAT CAN OPERATORS DO TO MINIMISE CONVEYOR LIFECYCLE COSTS?

RvO: The best way to minimise conveyor lifecycle costs is to choose belts based on their durability, suitability and longevity (whole life cost) rather than for short-term 'economic' or budgetary motives. It really is as simple as that. Virtually without exception, the price of a belt will be reflected in both its quality of performance and the length of its working life, with premium grade European-made belts out-lasting cheap imports by as much as three or four times the operating life.

The 'lower labour costs' argument that some use to explain big differences in price is a fallacy because the labour element accounts for as little as 5% of the production cost. By comparison, raw materials make up some 70% of the cost of producing a conveyor belt so the only way to make a low-price belt is to use low-price (low grade), unregulated raw materials such as carbon black made by burning old car tyres, minimising or completely omitting key additives (such as antiozonants to prevent ozone & UV damage) in the rubber and using low-grade inner synthetic plies.

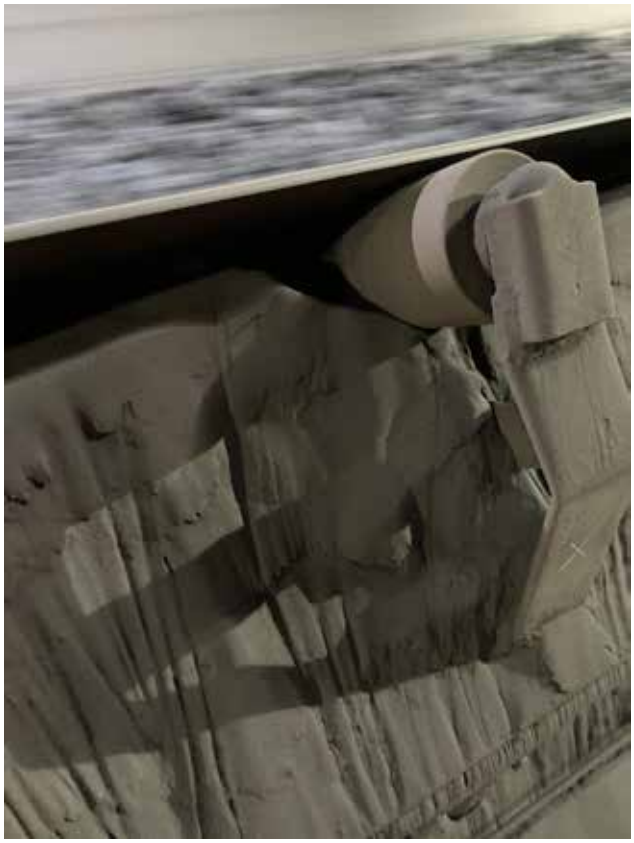
From an operational view, most good quality belts can be left to do their job once installed but it is still vital to 'walk the conveyor' on regular basis, checking for broken parts or other irregularities. Very often, external influences like broken idlers or scrapers, material build-up on pulleys, or belt becoming lodged behind skirting cause premature belt failure, which could have been avoided with regular inspections.

QUESTION: WHAT STEPS CAN OPERATORS TAKE TO EXTEND CONVEYOR BELT LIFE?

RvO: Assuming that a good quality conveyor belt is in place, the standard of maintenance becomes the key influencer. Regular, preventive maintenance, good quality components such as idlers and rollers and a clean working environment are all essential factors that help to extend conveyor belt life. Other factors include making sure that any scrapers that are fitted are correctly adjusted and drum linings (where applicable) are in good condition.

Belt tracking is also important because a mis-tracked belt can limit belt life and contribute to uneven wear. The primary cause of mis-tracking is often found to be material build-up on the bottom side of the conveyor belt or drums and pulleys. My doctrine is simple: "It is not what you expect, it is what you inspect".

Another key element is to have the correct belt specification matching the conveyor design. Unsuitable belt types may behave badly and limit its life span. Quality belt suppliers will have engineers to verify belt selection when provided with sufficient information on the conveyor design and material properties.



Material build-up accelerates wear of the belt and other components

QUESTION: WHAT IS THE BEST WAY TO DEAL WITH RECURRING RIP, TEAR AND IMPACT DAMAGE PROBLEMS?

RvO: Because of the huge disparities between the types of materials being conveyed, the design of the conveyor systems and their working environments, there is no 'silver bullet' answer to this question. What will almost certainly NOT solve the problem is fitting a thicker belt or increasing

Uniquely designed fabrics – the strands gather into a bundle that can stop the belt in its tracks. (Simulated image)

the cover thicknesses and/or the number of plies. Belts that are too thick for the design of the application can cause problems such as excessive rigidity (lack of troughability) and steering and handling difficulties. The same applies to increasing the tensile strength. It is important to remember that for every step increase in tensile strength, the pulley and drum diameters need to be increased by 25%. If this action is not taken then the belt carcass may fail due to dynamic stress.

The best way to manage rip, tear and impact damage is to fit a conveyor belt that has been deliberately designed for the purpose. Belts such as Fenner Dunlop UsFlex and Ultra X are specifically engineered to withstand the kind of punishment that would destroy a normal belt in a matter of months or even weeks. Although they have a higher initial purchase price, they are unquestionably the most cost-effective solution. The best examples use uniquely designed fabric plies that allow the nylon strands to stretch. As the trapped object is being pulled through the belt, the strands gather into a bundle that eventually becomes strong enough to stop the belt in its tracks rather than propagate over a much long distance.

The design of the fabric also allows the energy created by heavy impact to be dissipated over a much wider area. However, beware of cheap imitations. As laboratory testing consistently reveals, they are cheap because they are made using cheap, low-grade materials with the result that their rip, tear and impact resistance is 60% less than the genuine article.

QUESTION: WHAT CAN BE DONE TO MINIMISE DUST EMISSIONS?

RvO: In my experience, dust emissions in the mining and quarrying industry mostly emanate from cracks in the rubber covers of the conveyor belt caused by exposure to ozone pollution and ultraviolet light. At low altitude, ozone becomes a pollutant that is created by the photolysis of nitrogen dioxide (NO2). Exposure is unavoidable because even tiny traces of ozone in the air will attack the molecular structure of rubber, increasing the acidity of carbon black surfaces. This process is known as 'oxidative ageing'. Small transversal cracks begin to appear in the surface of unprotected rubber at a surprisingly early stage. Although they may seem insignificant, the rubber quickly becomes increasingly brittle, and the cracks deepen under the repeated stress of passing over the pulleys and drums.

Ultraviolet light (daylight and fluorescent) also accelerates the deterioration of rubber. Fine dust penetrates the cracks caused by ozone and UV and is then discharged (shaken out) on the return (underside) run. Ozone and ultraviolet damage is relatively easy to prevent by including antioxidants within the rubber compound mixing process. Unfortunately, laboratory testing has revealed that some 90% of 'economy' belts sold in Europe, Asia and Africa have virtually no in-built protection because the antioxidants are seen as an avoidable cost by the manufacturers.

Dust emissions at the point of discharge caused by the agitation of the material can usually be controlled with proper chute design with dedusting equipment, use of loading spouts and limiting 'free' movement of material. Dust emissions at the belt loading point can also be reduced by proper chute design as well as projecting material flow in the belt movement direction and limiting free-fall height and velocity differences. Enclosures around the loading zone with proper sealing to the belt and equipped with dedusting devices allow materials to settle.

Pollution problems – fine particles of dust penetrate the cracks and are then discharged (shaken out) on the return (underside) run of the belt.

QUESTION: WHAT CAN BE DONE TO PREVENT REPEATED SPLICE JOINT FAILURES?

RvO: It is estimated that splice joint problems account for some 80% of unplanned stoppages to carry out repairs. The cost of repairing splice joints and the cost of lost output is considerable but should not be necessary at all. Apart from poor workmanship, one of the biggest causes of splice problems are shortcomings in the quality of the conveyor belt itself. The low-grade rubber and poor adhesion between the inner plies are both faults commonly found in so-called 'economy' belts and make the job difficult even for the most skilled splicer. Another common cause is the use of splice materials that have not been supplied by the manufacturer of the belt, so they are often not entirely compatible.

The cost of splice joint repairs and the associated lost output should both be included

The cost of splice repairs and lost output is considerable

when calculating the whole life cost of a conveyor belt. As the old saying goes, price is what you pay but cost is what you spend.

QUESTION: DO YOU HAVE ANY TIPS FOR IDENTIFYING POOR QUALITY CONVEYOR BELTING?

RvO: This may surprise you but one of the very best ways to identify poor quality rubber belt is by its smell. Good quality rubber usually has very little smell whereas low quality belts usually emit a strong odour that can often be smelt from quite a considerable difference. This is because they contain high levels of recycled scrap rubber and/or highly questionable levels of hazardous chemicals such as short-chain chlorinated paraffin's (SCCP's) and N-cyclohexyl-2-benzothiazole sulfenamide, which produce a highly pungent aroma.

Rubber that has a strong smell can indicate the use of unregulated chemicals

SCCP's are used to artificially accelerate the vulcanization process. They are most commonly used in Asia where their use effectively remains unregulated because they are not subject to European REACH (Registration, Evaluation and Authorisation of Chemical substances) regulation. In this instance, REACH regulations clearly stipulate that they should either not be used at all or at least only used on a very restricted basis because they are listed on the International Agency for Research on Cancer's (IARC) Carcinogen List as "Possible Carcinogens." They also pose a threat to the environment, which is why they are subject to the Persistent Organic Pollutants (POPs) Regulation in the European Union (EU). In short, if you can smell the rubber then do not touch it in any respect.

ABOUT THE AUTHOR:

Rob van Oijen has specialised in conveyors for over 17 years, supporting businesses throughout Europe, Africa, the Middle East and South America and is widely regarded as being one of the most respected application engineers in the conveyor belt industry.