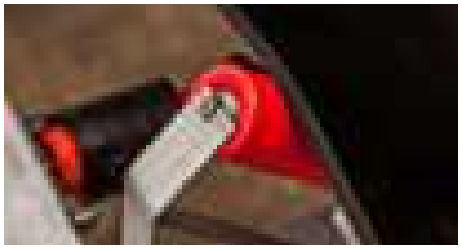
CONVEYOR CLINIC - AFRICA

Common conveyor problems – effective solutions

Rob van Oijen, Manager Application Engineering for Fenner Dunlop Conveyor Belting in The Netherlands, provides expert advice on some of the most common problems facing conveyor operators in Africa.

QUESTION: What is the best way to deal with recurring rip and tear damage problems?

RvO: Because of the huge differences in the type of cargo, conveyor system design and working environments, there is no 'silver bullet' answer to this question. What will almost certainly NOT solve the problem is to increase the cover thickness 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%. The belt carcass may delaminate if this action is not taken.



Caption: Belts that are too thick can cause problems such as excessive rigidity

The only proven solution to rip, tear and impact damage is to fit a conveyor belt that has been specifically engineered to withstand ripping and tearing. In Fenner Dunlop, our 'rip and tear' belts are UsFlex and Ultra X. Although they might have a higher purchase price, they are unquestionably the most cost-effective solution by far. This is because they use uniquely designed, extremely strong, fabric plies that allow the weft 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 longer distance. 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 and tear resistance is 60% less than the real thing.

QUESTION: What can I do to minimise conveyor belt lifecycle costs?

RvO: The best way is to choose belts based on their durability and longevity (whole life cost) rather than for short-term 'economic' or budgetary reasons. It really is as simple as that. Experience shows, without doubt, that the price of the belt will invariably be reflected in both its quality of performance and the length of its working life.

Caption: Too soon on the scrapheap – the price of the belt will invariably be reflected in the length of its working life.

We regularly see cases where a good quality belt can produce a working life of more than five years compared to low-grade belts that have been bought on the basis of low price but need replacing annually. 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. There is simply no other way.

QUESTION: What steps can be taken to extend conveyor belt life?

RvO: Apart from using good quality conveyor belts and components such as idlers and rollers, regular, preventive maintenance and a clean working environment are essential. Good quality belts can usually be left to do their job once installed. However, 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. My doctrine is simple: "It is not what you expect, it is what you inspect".

Caption: It is vital to 'walk the conveyor' on regular basis

Other factors include making sure that any scrapers 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. A primary cause of mis-tracking is often material build-up on the bottom side of the conveyor belt or drums and pulleys.

Other causes of steering problems include the belt not being entirely straight; poor quality (low cost) fabric and the use of totally polyester (EE) fabric plies in a carcass that is claimed to be an EP construction, which compromises a whole range of essential mechanical properties. The reason for the deception is that polyester (EE) fabrics cost around 30% less than EP so it is a big help in creating the perception of a lower 'like for like' price. It is important to note that all-polyester fabric is fine when used for specialist belts such as sawmill belts and the specially woven fabrics used on advanced design single and dual-ply belts as used on Fenner Dunlop's X Series range of problem-solver belts.

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

Another factor is having a belt designation that matches the conveyor design and the materials being conveyed. Incorrect belt types may behave badly and have a limited life span. Quality belt suppliers have experienced application engineers to verify belt selection when provided with sufficient information on the conveyor design and material properties.

QUESTION: Too many of our belts are failing because of delamination. What is the cause and what is the answer?

Adhesion between the plies and the covers is fundamental to the durability, functionality and structural integrity of conveyor belts because they continually flex over pulleys and drums, stressing the ply adhesion. It is therefore essential that the belt has adequate ply adhesion in order to withstand dynamic stress without delaminating, which is where the various layers separate and the belt begins to fall apart.

Caption: Delamination – layers separate and the belt literally falls apart.

Good adhesion also enhances the belt's ability to trough and carry heavy loads without the risk of ply separation. In addition, it also has an enormous impact on the creation and ongoing reliability of splice joints. There are several reasons why a belt can have inadequate adhesion properties. As with nearly all other problems with conveyor belts, the root cause is the use of low-grade (low-cost) ingredients, the quality of the rubber and other cost-cutting methods such as the use of bulking fillers such as chalk or clay in the rubber compound.

QUESTION: What can be done to minimise spillages and dust emissions?

RvO: Most spillage and dust emissions occur at the loading point, at the discharge point or, most commonly of all, from cracks in the rubber covers of the conveyor belt caused by exposure to ozone pollution and ultraviolet light. This is because at low altitude, ozone becomes a pollutant that is created by the photolysis of nitrogen dioxide (NO_2). 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. Small transversal cracks begin to appear in the surface of unprotected rubber at a surprisingly early stage. Although the cracks may not seem to be a big problem, the rubber quickly becomes increasingly brittle and the cracks deepen under the repeated stress of passing over the pulleys and drums. In time, the cracks join up and pieces of rubber cover start to break away.

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

Ultraviolet light is also accelerating the deterioration of the rubber. Fine dust penetrates the cracks caused by the effects of ozone and UV and is then 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, even though climatic conditions in Africa magnify the effects, laboratory testing has revealed that some 90% of 'economy' belts sold in Africa have virtually no in-built protection. My advice is to always make ozone & UV resistance an obligatory requirement when selecting any rubber conveyor belt.

QUESTION: We experience far too may splice joint failures. What is the best way to avoid them?

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 lost output is considerable and should be included when calculating the whole life cost of a conveyor belt.

Caption: The cost of splice repairs and lost output is part of the cost of the belt.

The biggest cause of splice problems is the quality of the conveyor belt itself, in particular poor-quality rubber and poor adhesion between the inner plies. Other common causes are poor quality splicing materials and workmanship.

QUESTION: We regularly experience belt slippage problems. What are the main causes and how are they best solved?

Belt slippage problems have several causes including unclean environments and worn drum lining and pulley lagging. Most problems, however, revolve around belt tensions and the tensile strength of the belt itself. Over time, conveyor belts can lose tensile strength due to wear and tear and general fatigue, necessitating regular maintenance and monitoring. All too often, such issues reveal themselves far too early in the working life of the belt. And as with so many other conveyor problems, the cause is simply that the belt was designed and manufactured with the objective of achieving a competitive price rather than performance and longevity. As I always say, price is what you pay but cost is what you spend.

Rob 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 best application engineers in the conveyor belt industry.