Moving forward...

Common 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 the dry cargo industries.

Question: *We spend a lot of money on our conveyors. What can I do to minimize conveyor belt lifecycle costs?*

RvO: The best way to minimize 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. 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. 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.

The 'lower labour costs' argument that some use to explain extremely low prices offered for belts imported from Southeast Asia is a fallacy because the labour element accounts for as little as 5% of the production cost. The true reason is that 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. Cost-cutting practices include using cheap, low-grade carbon black made by burning old car tyres, minimizing or completely omitting vital additives (such as antiozonants to prevent ozone & UV damage) in the rubber and using low-grade inner synthetic plies. As I always say, price is what you pay but cost is what you spend.

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

RvO: In addition to buying good quality conveyor belts and good quality components such as idlers and rollers in the first place, regular, preventive maintenance and a clean working

environment are essential factors that help to extend conveyor belt life. From an operational view, 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".

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.

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

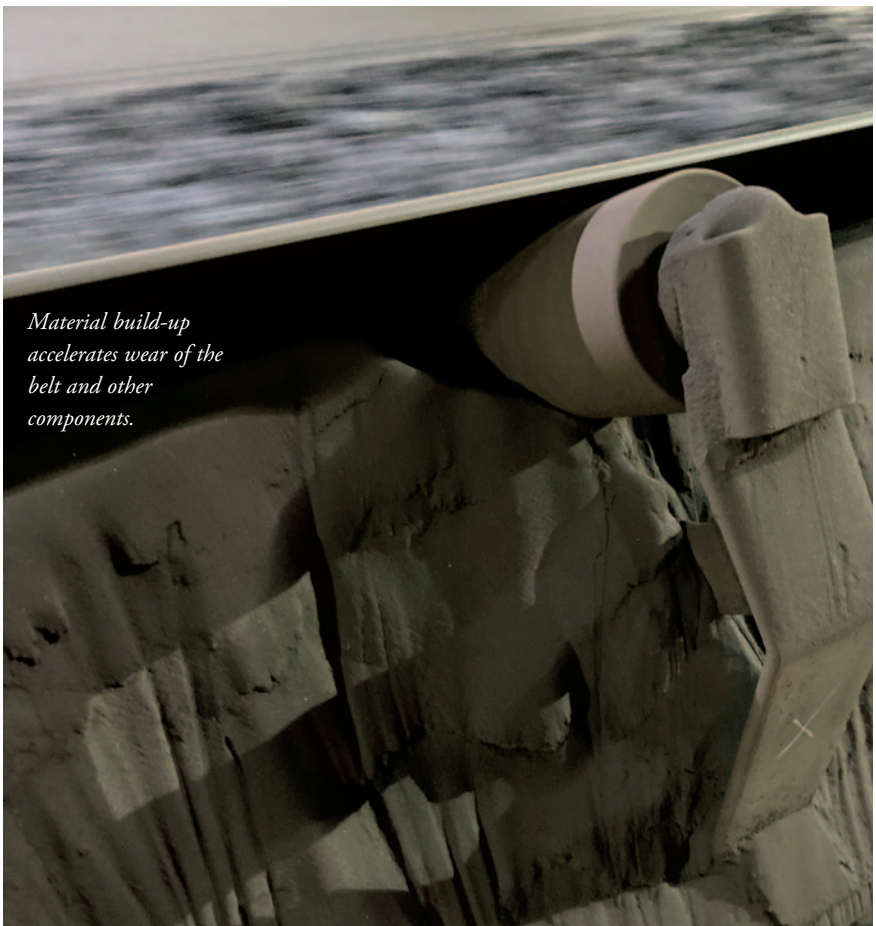
It is vital to 'walk the conveyor' on regular basis.

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

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

RvO: Because of the huge disparities between the types of cargo 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 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 fail due to dynamic stress if this action is not taken.

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



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

solution by far. This is because they 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 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.

Q: *What can be done to minimize dust emissions?*

RvO: Most 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.

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

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

The cost of splice repairs and lost output is considerable.

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, laboratory testing has revealed that some 90% of 'economy' belts sold in Europe, Asia and 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.

Dust emissions at discharge occur from agitation of the material, which can

Oil seriously distorts flat rubber belts.

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 can be reduced by proper chute design, 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 the use of dedusting devices allow materials to settle.

Q: *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, which is a statistic that does not surprise me. The cost of repairing splice joints and the cost of lost output is considerable but should not be necessary at all. The biggest causes of splice problems are shortcomings in the quality of the conveyor belt itself, the materials used to join the belt and the quality of the workmanship.

Low-grade rubber and poor adhesion between the inner plies are both faults commonly found in the low-grade belts that I referred to in an earlier answer and make the job difficult even for the most skilled splicer. The cost of splice joint repairs and the associated lost output should both be included when calculating the whole life cost of a conveyor belt.

Q: *We are handling increasingly large volumes of biomass. What are the most important properties for belts that carry biomass?*

RvO: Conveyor belts that are transporting biomass should be made of a rubber that has good resistance to both fire and oil. Because it can self-ignite, all rubber belts used to convey biomass should be able to resist fire. The EN12882 standard is for safety requirements for conveyor belts for general-purpose, above ground applications and describes a range of classes from '1', '2A", '2B' up to '5C'. Given the highly flammable nature of biomass, 'S' grade (EN 12882 Class 2B including anti-static requirements) should be regarded as the minimum standard. A higher level of fire resistance (EN 12882 Class 4A) is recommended for conveyors that are used in enclosed areas.

Belts that are not adequately resistant to the oils and resins contained in biomass will provide a much shorter working life than should reasonably be expected. As oil and resins penetrate the rubber it softens and its ability to withstand wear decreases dramatically. It also loses its tensile strength while at the same time becoming much more prone to ripping and tearing. The next stage is that the rubber begins to swell and distort, causing steering and handling problems and a serious reduction in the elongation at break (the amount of stretch before the belt snaps).

Despite the fact that each has its own particular effects, most conveyor belt manufacturers only offer one oil resistant rubber cover quality compound. This is often referred to as 'MOR' (medium oil resistance). In my experience, to provide the best possible protection against the differing effects of each category requires an oil resistant rubber that is as specific as possible to the type of oil or resin rather than a single 'one rubber compound suits all' approach. At Fenner Dunlop we have two types — ROM grade for vegetable-based oils and ROS grade for mineral based oils and products with a particularly high concentration of vegetable oils or resins. Because biomass can contain wood from a variety of sources, it is always safer to use conveyor belts that have a combined resistance to fire (EN 12882 Class 2B) and vegetable oil.

Rob van Oijen

Rob van Oijen has specialized 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.