COMMON PROBLEMS, EFFECTIVE SOLUTIONS

World Fertilizer sat down with **Rob van Oijen, Manager Application Engineering, Fenner Dunlop Conveyor Belting, the Netherlands,** to get his advice on some of the most common problems facing conveyor operators in the fertilizer industry.

Q: Operators spend a lot of money on their conveyors. What can they do to minimise conveyor belt lifecycle costs?

A: 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. The big temptation, of course, is that there can be up to 50% (or more) difference in price for belts apparently of the same specification. Experience shows, without doubt, that the price is invariably reflected in both quality of performance and the length of

working life. We regularly see good quality belts that produce up to five times longer working life compared to low-grade belts that have been bought on the basis of low price.

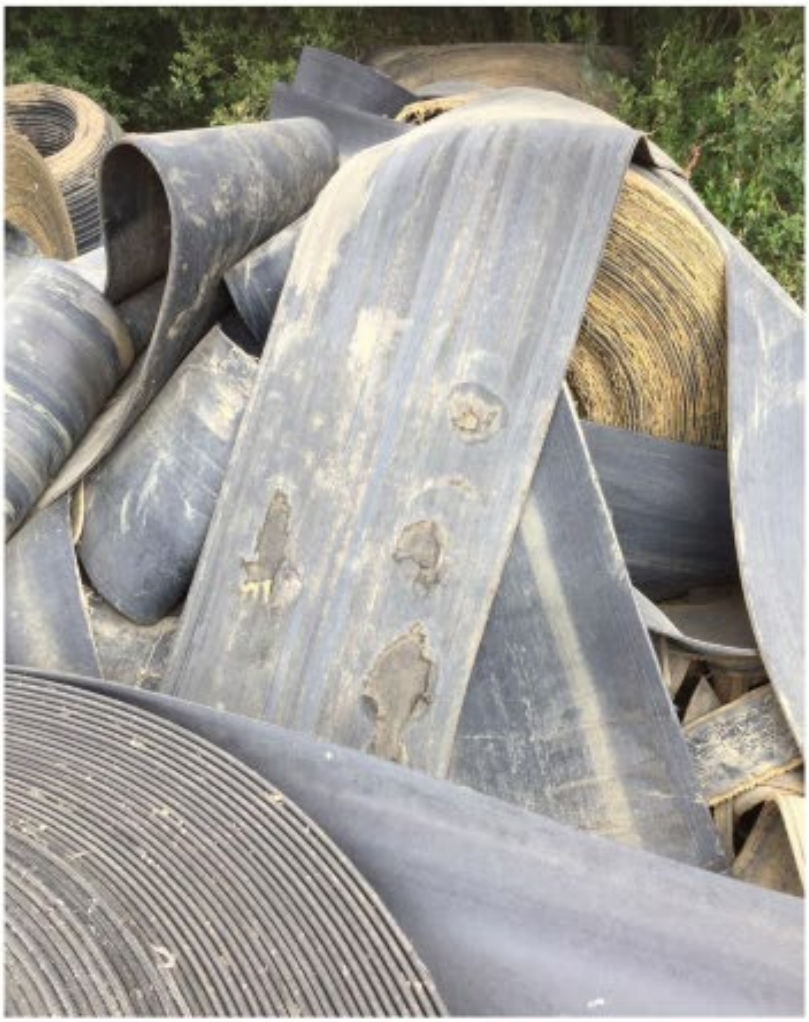

Figure 1. Too soon on the scrapheap - the price of the belt will invariably be reflected in the length of its working life.

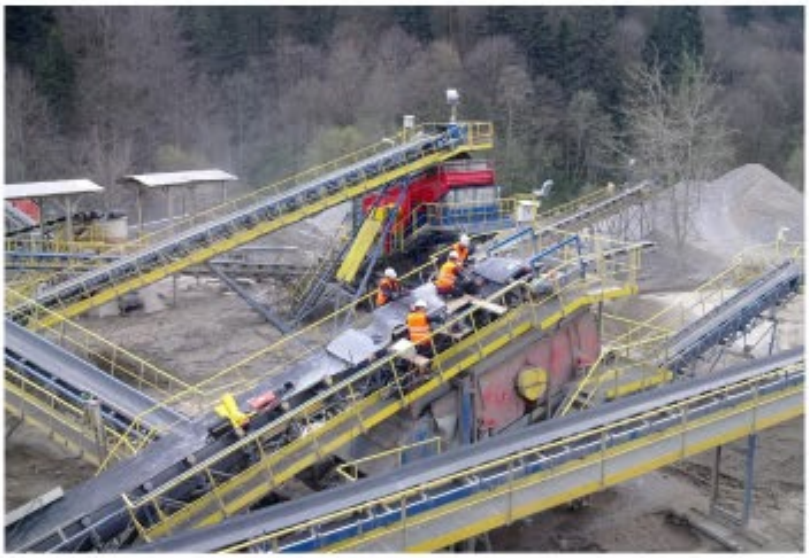

Figure 2. The cost of splice repairs and lost output is part of the cost of a conveyor belt.

The reason for such huge differences in price is easily explained. 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, minimising or completely omitting vital additives (such as antiozonants to prevent ozone and UV damage) in the rubber and using low-grade inner synthetic plies. The only way to accurately evaluate the true cost of conveyor belts is to calculate and compare on the basis of whole life cost, which should include the cost of repairs (including splice joint repairs) and the associated lost output. Price is what you pay but cost is what you spend.

Q: If an operator is experiencing too many splice joint failures, what is the best way to avoid them?

A: It is estimated that splice joint problems account for some 80% of unplanned stoppages. The cost of repairing splice joints and lost output is considerable but should not be necessary at all. The first thing to check is that the belt is the correct specification for the conveyor. Wrong spec belts can cause splice failures, e.g. when flexibility is insufficient, or the carcass requires bigger pulleys.

However, the biggest causes of splice problems across all industries are shortcomings in the quality of the conveyor belt, the materials used to join the belt, and the quality of the workmanship. Low-grade rubber, poor adhesion between the inner plies and inadequate elongation (stretch) are faults commonly found in the low-grade belts, which make the job almost impossible even for the most skilled splicer.
Such problems are most commonly associated with imported belts from Southeast Asia but even some European 'economy' manufacturers have similar traits. This is largely because nearly all Europe-based manufacturers supplement their production with imported belting from the Far East.
My advice is to always ask for certified confirmation of the actual place of manufacture.

In the fertilizer industry, there are also the additional issues of oil and chemical penetration, which are the cause of numerous problems, not least of which is a serious reduction in the elongation at break (the amount of stretch before the belt snaps). The weakest point of any rubber conveyor belt, of course, is the splice joint. Consequently, belts that have an inadequate resistance to the oils and chemicals found in

fertilizer production are much more prone to splice failure.

The high temperatures in the fertilizer production process is another cause because heat reduces the adhesion between the covers and the inner carcass and between the inner plies. This is known as delamination and causes the plies to separate and the belt literally to fall apart. Sub-standard resistance to heat is therefore another likely reason why you are experiencing splice joint problems. To improve splice joint reliability, always try and use splicing materials that are compatible with the rubber used to manufacture the belts, ideally sourced from the belt manufacturer. The rest of the solution to splice joint failures is again, only choose premium quality belts that have the proven ability to withstand challenges such as heat, oil and chemicals.

Q: Apart from the quality of the belt itself, what steps can be taken to extend conveyor belt life?

A: In addition to buying good quality conveyor belts and components such as idlers and rollers, regular, preventive maintenance and a clean working environment are essential in helping to extend conveyor belt life. Even though good quality belts can usually be left to do their job once installed, it is still vital to 'walk the conveyor' on a regular basis, checking for irregularities. Very often, external influences like broken idlers or scrapers or material build-up on pulleys can cause avoidable premature

Figure 3. It is vital to 'walk the conveyor' on a regular basis.

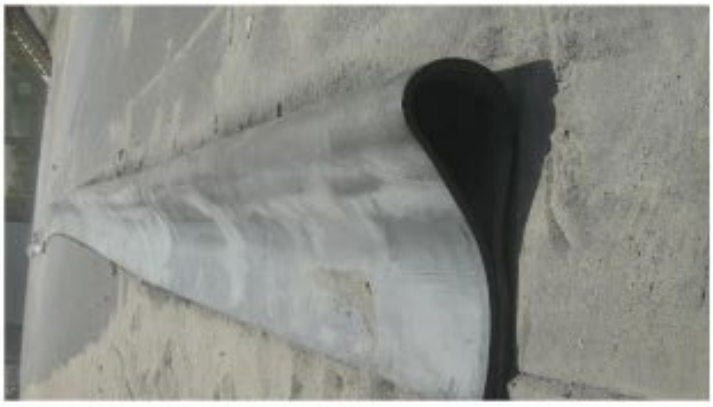

Figure 4. Oil seriously distorts rubber belts.

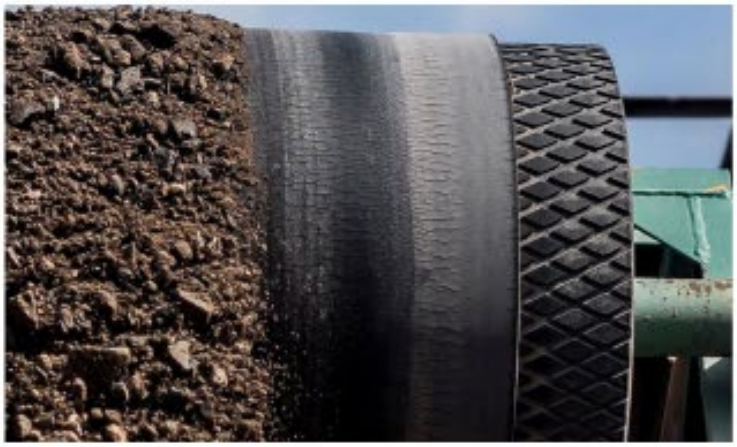

Figure 5. Surface cracking caused by ozone and ultraviolet.

belt failure. 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.

Q: As part of its production process, an operator sprays a solution onto 33.5% ammonium nitrate at 80°C in a mixer before it is deposited on the conveyor belt. The solution not only consists of waxes and oils but also other chemicals such as amines. The operator is using oil resistant belts, but the covers seem to soften quite quickly and the carcasses become badly distorted. Is this an inescapable consequence?

A: No, this is not an inescapable consequence. Conveying material treated in this way simply requires a higher standard of oil resistance compared to 'everyday' oil resistant belts. The root of the problem is that, despite the fact that different types of oils and chemicals have their own particular effects, most belt manufacturers only offer one oil resistant rubber cover, usually referred to as medium oil resistance (MOR). In my experience, to provide the best possible protection requires an oil resistant rubber that is as specific as possible to the type of oil 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 oils or chemicals such as the cooling solution you are using.

Q: An operator's belts start to show signs of surface cracking literally within a few months of installation, sometimes only weeks. What is causing this?

A: There are two probable causes. If the belts are conveying high temperature materials then it may well be that they have insufficient resistance to heat. Another, and even more probable cause, is that the belts are not resistant to the damaging effects of ground-level ozone and ultraviolet light. 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. The rubber quickly becomes increasingly brittle, and the cracks deepen under the repeated stress of passing over the pulleys and drums, allowing oils and chemicals to penetrate the carcass more easily.

Ultraviolet light (both sunlight and fluorescent light) also accelerates the deterioration of the rubber. Known as 'UV degradation', it produces photochemical reactions that promote the oxidation of the rubber surface resulting in a loss in mechanical strength. Another unwanted side-effect caused by ozone and ultraviolet radiation is the ability to resist surface wear and cutting.

Although ozone and ultraviolet damage is relatively easy to prevent by including antioxidants within the rubber compound mixing process, laboratory testing shows that some 90% of belts sold in Europe, Asia and Africa have virtually no in-built protection. My advice is to always make ozone and UV resistance an obligatory requirement when selecting any rubber conveyor belt. WF