RESISTING DISASTER

Leslie David offers a guide to rip-resistant conveyor belts

Conveyor belt damage is an expensive problem for mine operators but it is possible to reduce its occurrence

Conveyor belts are critical, surprisingly complex components whose reliability and efficiency has a direct impact on the bottom line, none more so than when a foreign object or sharp rock becomes trapped. Even the strongest, heaviest multi-ply and steelcord belts can be punctured and ripped apart longitudinally over their entire length in a matter of minutes. Rip, tear and impact damage is highly expensive problem for mine operators, but there are several approaches they can take to minimise risks.

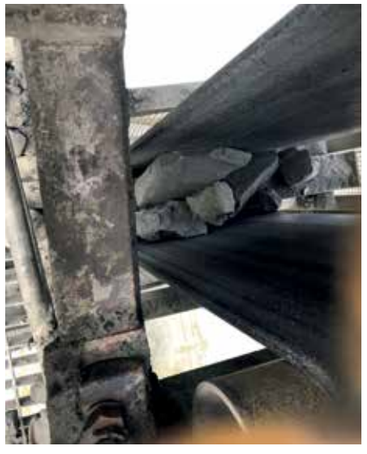
RIP AND TEAR RESISTANCE

Trapped objects that rip the belt longitudinally are every conveyor operator's worst nightmare. The whole event can be over before anyone has a chance to stop the conveyor. Even if a replacement belt is on standby, the financial consequences are invariably very bad news indeed, not least of which are the costs of lost production. Despite the seriousness of the risk, opinions seem to vary regarding the best way to approach the problem.

The most common misconception is that fitting belts with thicker outer covers and/or an increased number of plies will help. The harsh reality is that unless the inner carcass is engineered to resist ripping and tearing then using more of the same material will not provide the solution and most likely create other headaches because belts that are too thick for the design of the application can cause troughability, steering and handling difficulties. The same applies to increasing the tensile strength.

NOT WORTH THE SACRIFICE

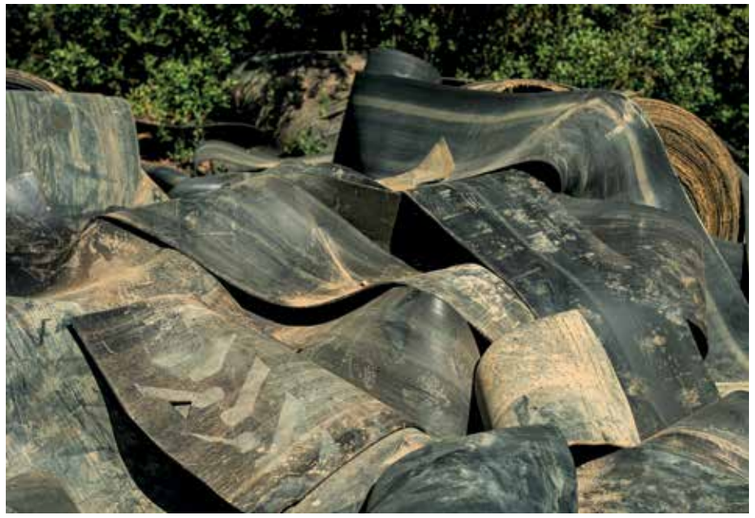
Another course of action when faced with repeated damage problems is to opt for low-grade, 'sacrificial' belts, which are almost invariably imported from Asia. The sentiment seems to be that it is not worth paying good money for a belt that, sooner or later, will be ripped from end to end. This attitude does not make sound economic sense.



Trapped granite buckled the conveyor but the UsFlex belt kept on rolling

Cheap belts are low-priced for a very good reason, which is that they have been made using poor quality, unregulated raw materials. It has little or nothing to do with lower labour costs in Asia. Low-grade belts are the result of a 'pile it high, sell it cheap' mentality so they lack the necessary durability and are very easily damaged. When you add the cost of incessant patch repairs, the splice repairs, the cost of replacement belt after replacement belt together with the invisible 'un-invoiced' cost of the lost production while all those unplanned stoppages are taking place, the true cost is several times higher than the price paid for the original belt. As the old saying goes, price is what you pay but cost is what you spend.

Another answer might seem to be replacing the multi-ply belt with a steelcord belt, but this is also extremely unlikely to be the right answer. Conveyors that use steelcord belts have to be designed differently from those that use multi-ply belts. Because of their innate tensile strength and low elongation (stretch), steelcord belts are typically only suited to conveying over longer distances. In any case, their big weakness is that although the steel cords themselves are very strong, they provide little or no protection against ripping. Trapped foreign objects that penetrate through the rubber covers run parallel with the cords, ripping the belt longitudinally. The only practical way to create rip resistance in a steelcord belt is by the use of breakers.



'Sacrificial' belts sacrifice productivity, money and time

USING BREAKER PLIES

The use of breaker plies can be a solution because they can provide a considerably increased level of resistance against longitudinal ripping, especially in the case of steelcord belts. The breaker ply performs two functions – firstly it can help prevent the penetration of the belt by a foreign object. Secondly, it acts as a barrier if an object does penetrate between the steel cords or through the inner fabric plies and starts to rip along the length of the belt. However, before operators take this path, it is important to bear in mind that breaker plies have to be embedded in the rubber covers of steelcord belts during the manufacturing process, so each belt has to be custom-made. This means a much higher price per metre and invariably, much longer lead times.

There are numerous types and strengths of breaker. The lighter weight versions are designed to simply absorb and dissipate energy whereas stronger, heavier weight breakers can actually limit the amount of damage. These are commonly referred to as 'rip stop' breakers. In this market, traders rather than manufacturers are promoting the vast majority of rip resistant belting on offer, which means that most of these belts almost certainly originate from Southeast Asia.

Secondly and almost without exception, the technical reason given for the promised high level of rip resistance was the use of steel breakers within the top cover. However, steel breakers do have an inherent weakness because the thin steel strands used in conventional 'ripstop' breaker plies have a limited amount of stretch before they snap as the belt is pulled against the trapped object. Strange as it may seem, all the evidence points to (good quality) synthetic plies being much more effective than steel when it comes to actually minimising rip propogation.

ENGINEERED FOR THE TASK

Although belts with an inbuilt 'steel reinforced' breaker ply will resist rip damage more than conventional multi-ply belting, the most practical and economical solution is to fit a conveyor belt that has a carcass that has been genuinely engineered for the purpose and that has a proven performance record. A good example of this is UsFlex, which has been a popular choice in the rip-resistant belt market for more than 20 years, and its much younger but well regarded stable mate, Ultra X. Both belts are manufactured in the Netherlands by Dunlop Conveyor Belting. The company maintains that what makes these belts so effective in resisting damage is their innovatively designed fabric plies. The company designs and manufactures

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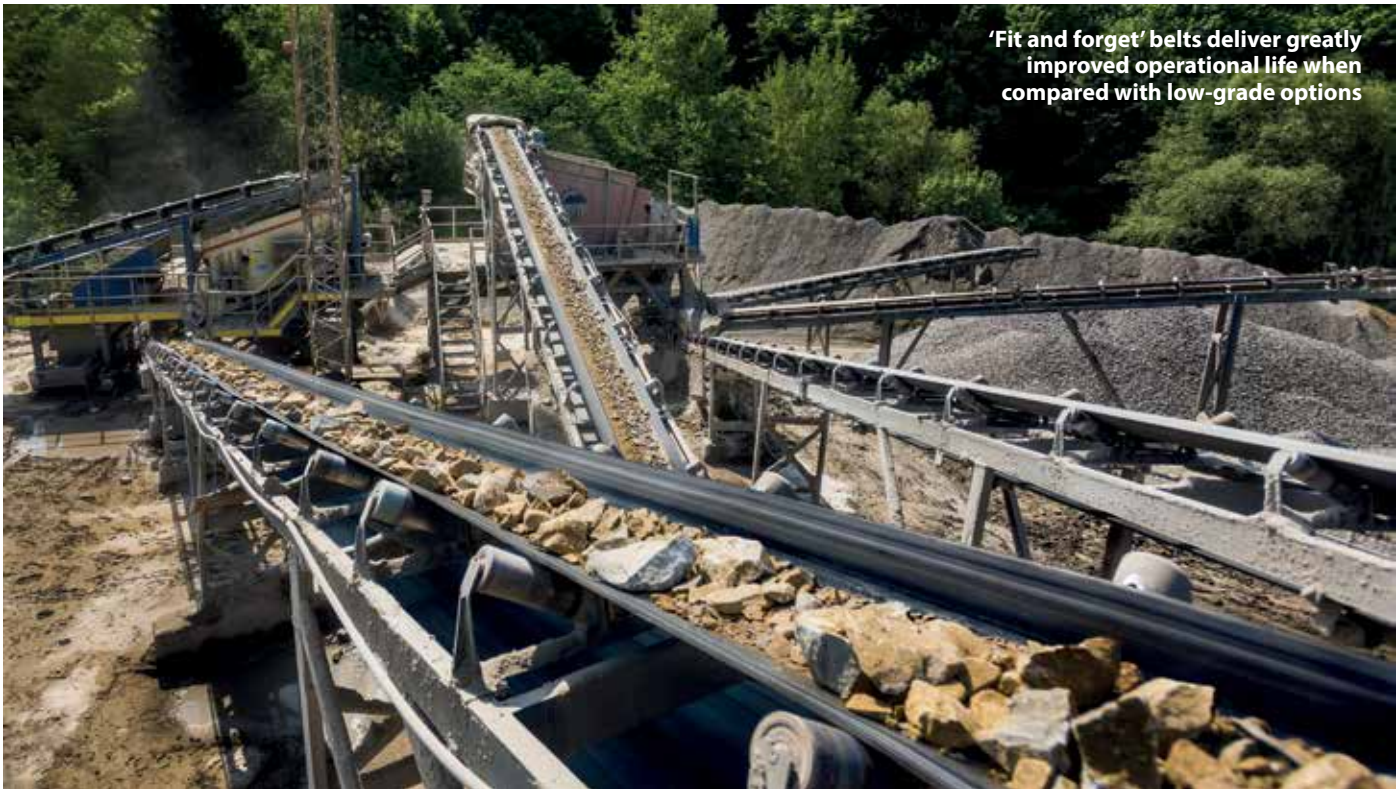
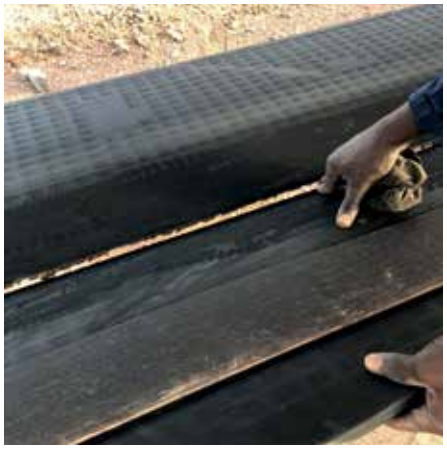


'Fit and forget' belts deliver greatly improved operational life when compared with low-grade options

these specialist fabrics in its own fabric-weaving centre in the USA.

How the UsFlex and Ultra X fabric plies work is that as the belt is being pulled through a trapped object, the design pattern of the strands allows them to 'gather together' into a bundle rather than individually snapping, as is so often the case with steel strands.

The bundle can eventually become strong enough to stop the belt or expel the trapped object. As a result, UsFlex has a longitudinal rip resistance of more than five times greater than that of multi-ply belts of equivalent rating and is even superior to solid woven and EPP construction belting. The design also plays a very important role in dissipating the impact energy of heavy objects falling on to the belt across a wider area, thereby minimising potential damage to the carcass.



Longitudinal rips are every conveyor operator's nightmare

LESS IS MORE

Conventional wisdom would seem to dictate that a higher number of inner plies will result in a stronger belt but this is not actually the case. The greatest influence on the strength and other essential physical properties of a conveyor belt is the actual design and quality of the ply material used to create the carcass.

For some, the very idea that a conveyor belt with only one or two plies can be dramatically stronger than a belt with multiple plies may not make much sense. However, the answer lies with the advances in technology and design. One analogy that can be used here is armour plating on military tanks. The composite armour used on military vehicles nowadays provides far greater protection than ever before and yet it is a much thinner and lighter construction compared with the extremely thick, cumbersome heavy steel plating used in the past.

It is not difficult to understand why specialist belts such as UsFlex have such a strong reputation within the mining and quarrying community when you hear about tales of their strength, such as a recent example from Scotland. Several large pieces of granite became jammed against the conveyor pulleys. The force around the tail pulley was so strong that it dislocated the complete steel construction on which the tail pulley was mounted. Amazingly, the UsFlex (1000/2) belt did not break. Instead, it simply kept on running. It just goes to show how ridiculously strong these specialist belts really can be. Indeed, Dunlop claims that it is not difficult to find operators who used to replace belts every three to six months but now only replace every four or five years after changing to UsFlex

The big advantage of specialist 'fit and forget' belts is that they are proven to provide up to four or five times longer operational life, especially when compared with imported belts. They are not cheap and many would say that they are expensive but compared with the alternative 'solutions' outlined above, their cost over their working lifetime is proven to be substantially less. It is not a matter of whether you can afford them – the real question is can you afford not to use them? ●

Leslie David is an independent specialist in conveyor belting solutions.