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MINING & QUARRY WORLD

A guide to conveyor belt selection

With operating budgets under continuous scrutiny from senior management, it is all too easy to make an expensive mistake when choosing industrial rubber conveyor belts. The following guide, put together by highly experienced specialists, explains the key selection factors.

PRIMARY SELECTION CRITERIA – always select belts based on their durability, suitability and longevity (whole life cost) rather than for short-term 'economic' or budgetary motives. Experience shows, without doubt, that the price of the belt will be reflected in both its quality of performance and the length of its working life. A good quality belt produced by a leading brand manufacturer can produce a working life of up to 400% or longer compared to low-grade belts that need frequent repairs and then have to be replaced after only a year or two, often less.

The biggest source of low-price, low-grade belting is, of course, the Far East, primarily China. The prices may be very tempting, but it is important to understand how they are achieved. Because labour costs accounts for as little as 5% of the production cost, the real reason for the difference in price is that raw materials make up some 70% of the production cost. Consequently, the only way to manufacture a low-price belt is to use low-price (low grade), unregulated raw materials. Cost-cutting practices include using insufficient amounts of important additives or even total omission of those additives. Other 'tricks' include using cheap, low-grade carbon black, the use of 'bulking fillers' instead of good quality polymers and low-grade inner synthetic plies. For conveyor belts, the lowest price can come at the highest cost.

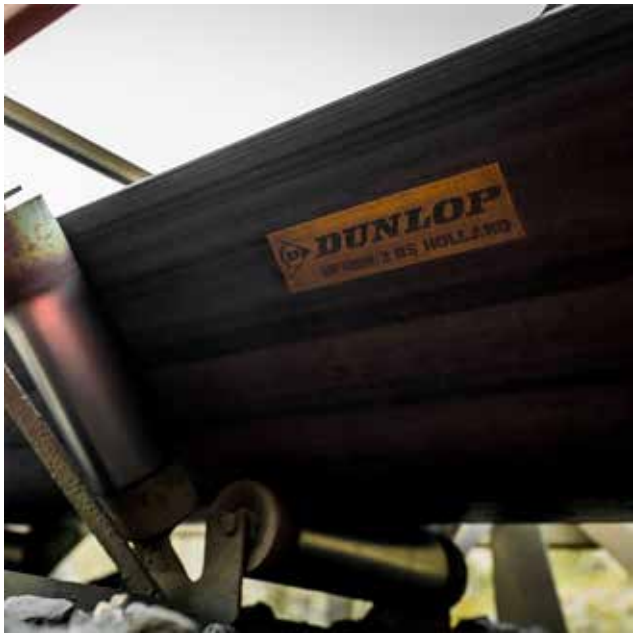
WHY ARE YOU REPLACING THIS BELT? Always consider why a conveyor belt needs replacing. Did the top cover wear very quickly? Did the belt require frequent interventions to repair damaged covers or splice joints? Did it delaminate or steer badly? Whether you are looking to solve a problem or simply improve performance, the first thing to look at is the belt specification.

THE CORRECT SPECIFICATION – never assume that the specifications of your conveyor belts are correct. Mistakes may have been made when calculating the original belt specification by the designers of the conveyor. Another reason to check is that a long established conveyors are likely to have been maintained and managed by several different managers and maintenance personnel during

Too soon on the scrapheap - the cost of a belt should be calculated on the duration of its working life.

Never assume that the specifications of your conveyor belts are correct.

A quality manufacturer's DIN Y can often be more durable and more wear resistant than another manufacturer's DIN X or even DIN W.



Super-tough belts like Fenner Dunlop UsFlex often last up to 400% longer than conventional belts.

that time. Attempts to solve problems may have resulted in unsuitable specifications of belt being fitted.

For example, 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 if the tensile strength is too high. 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 carcass of the belt may fail due to dynamic stress if this action has not been taken. Quality belt manufacturers and their service partners who supply and fit their belts, have experienced engineers who, when provided with sufficient information, will help calculate every aspect of the specification.

CHOOSING THE OUTER COVERS – the biggest influence on the performance and longevity of a conveyor belt is the quality and suitability of its outer rubber covers. The rubber is also the best opportunity for cost-cutting practices that help manufacturers win business by having the lowest prices but reduce performance and longevity. There are many different types of rubber outer cover but in quarrying and mining (above ground) the two key properties are resistance to abrasion and ripping & tearing. The abrasive wear properties of ALL conveyor belts should be at least DIN Y standard (ISO 4649 / DIN 53516 test maximum 150 mm^3 loss) to achieve reasonable economic longevity (whole life cost). If particularly sharp, abrasive materials are conveyed then higher-grade DIN X covers (maximum rubber loss under testing of 120 mm^3] may be more suitable because it is more resistant to cutting and gouging.

Faced with continual wear problems, increasing the cover specification may seem a logical solution but that is not necessarily the answer. One manufacturer's DIN Y (ISO 14890 L) can often be more durable and more wear resistant than another manufacturer's higher specification DIN X (ISO 14890 H) or even DIN W (ISO 14890 D), which are usually reserved for heavier-duty applications. Laboratory testing regularly exposes instances of belts claimed to be DIN X or DIN W that fail to achieve the DIN Y standard. As with all forms of cover damage, the answer lies with the quality of the rubber. One thing that can be guaranteed by increasing the cover specification is a higher price.

CARCASS TYPE SELECTION – carcasses with multiple layers of synthetic fabric (multi-ply) are traditionally the most common type of carcass in use in quarrying and mining, but that domination is now under considerable challenge from the lighter but stronger single and dual-ply belts (X Series) developed by Fenner Dunlop.

Always choose belts that are specifically engineered for the conditions they need to cope with, especially on conveyors where rip, tear and impact damage problems occur. Attempting to solve the problem by fitting belts with thicker covers and heavier carcasses is almost invariably a mistake. Simply using more of the same material will not provide the solution. As mentioned earlier, thicker, heavier belts can also cause other problems including lack of troughability, steering and handling problems and dynamic stress due to the pulleys and drums now being too small.

The most economical solution is to fit a conveyor belt that has been specially designed for the purpose, such as Fenner Dunlop's X Series range, which are proven to last up to 400% longer than conventional multi-ply conveyor belts. The initial buying price will be higher, but the cost will be substantially lower over the working life of the belt, with the added benefits of far fewer repairs, change-out costs and consequently, significantly less downtime.

Always select from the standard stock range if you can.

KEEP IT SIMPLE – whenever possible, always choose belts from within the manufacturers standard stock range. Having a belt made to order rather than supplied from stock significantly increases the price. It also increases the delivery lead time, which can be very bad news if a belt needs to be replaced in an emergency. It is usually easy to choose a standard specification in terms of belt width and cover grade (quality) but the same cannot be said for the cover thickness. Any deviation from the available range of standard specifications held in stock means that the belt must be made to special order, invoking higher production costs, minimum length order quantities and much longer lead times.

BELT EDGE TYPE SELECTION – over-specifying the type of belt edge can have a significant impact on belt costs, repairs, maintenance, lost production and lead times. Many years ago, moulded edges were the standard because cotton was used as the reinforcing fabric in multi-ply belts. A moulded edge (fully covered in rubber) was therefore essential to prevent moisture penetrating the cotton fabric and causing it to rot. Since the introduction of synthetic ply fabrics using polyester and polyamide, this problem effectively no longer exists. Despite this, many conveyor operators and their buying departments continue to specify moulded edges, often through habit, even though they do not provide any structural advantage and can be more susceptible to damage if the belt wanders off-track.

Sealed edge

Nowadays, the most commonly used type of belt edge is the ‘cut & sealed edge’ or simply ‘sealed edge’, which prevents moisture being drawn into the carcass from the edge by capillary forces. Although the synthetic fibre plies are barely affected, moisture can ultimately cause vulcanising problems when making splice joints. A sealed edge also enables a belt to be used in very wet conditions and better suited for long-term storage outdoors.

The reason it is important not to over-specify the type of belt edge is that manufacturers need to manufacture belts at the optimum width and length for cost and production efficiency. Consequently, standard width stock belts are usually made as wide as the manufacturing machinery will allow, creating huge rolls that are then cut and sealed to create a range of narrower widths. This is why the vast majority of rubber multi-ply belting held in stock by manufacturers, distributors and traders has sealed edges. Moulded edges can only be created when a belt is manufactured to an exact width so if the manufacturer is unable to achieve optimum production efficiency, the cost must be reflected in the selling price.

The first signs - small cracks appear in the surface of the rubber.

OZONE AND ULTRAVIOLET RESISTANCE – never order a conveyor belt without first obtaining written confirmation from the supplier/manufacturer that the belt being supplied is fully resistant to ozone and UV. At low altitude ozone (O3) becomes a pollutant that attacks the molecular structure of rubber. Ground level ozone increases the acidity of carbon black surfaces with natural rubber, polybutadiene, styrene-butadiene rubber and nitrile rubber being the most sensitive to degradation. The reaction that occurs is known as ozonolysis.

The first visible sign is when cracks start to appear in the surface of the rubber. Further attacks then occur inside the freshly exposed cracks, which continue to grow steadily until they complete a 'circuit' and the product separates or fails.

Ultraviolet light from sunlight and fluorescent lighting also has a similar, seriously detrimental effect on rubber because it produces photochemical reactions that cause the oxidation of the rubber surface resulting in a loss in mechanical strength and wear resistance. This is known as 'UV degradation'. The combination of ozone and UV seriously limits the operational lifetime of a rubber belt, regardless of geography or type of climate.

Although ozone and ultraviolet damage is easy to prevent, extensive laboratory testing shows that some 90% of belts tested according to EN ISO 1431/1 procedure B static ozone resistance test are not resistant. This is because the anti-ozonants needed to protect the rubber have been omitted from the rubber compound mix because of cost. In fact, the vast majority typically start to crack within the first 6 to 8 hours of the 96-hour test duration. This translates into cracking occurring within a few months, possibly weeks, from installation. The best advice is to make ozone & UV resistance a constant requirement when selecting any rubber conveyor belt.

ACCOUNTABILITY – always choose a supplier who you can rely on to be accountable, easy to reach and communicate with if you need technical advice or have a problem. It is important to use a supplier that will readily provide a high standard of professional technical support and who has a good reputation for quality. Finally, always demand a certificate confirming the origin of manufacturer and NOT simply the location of the warehouse it will be shipped from.

Bob Nelson, Jeremy Clark and James Okudoo.