Can you afford to buy cheap?

Getting the best value from your conveyor belts

Conveyors remain the most effective method of on-site cargo transportation, but their reliability can be critical factors in both productivity and cost management. The conveyor belts themselves are often the most vulnerable component because they have to cope with materials that can be very abrasive and, very commonly in cargo transshipment, products that can seriously damage the belt because they contain oil.

During recent years, the technology used to manufacture conveyor belts has advanced enormously and today's users of belts should rightfully expect a much higher level of performance and longer operational life. Apart from catastrophic accidental damage, conveyors used to transport coal, for example, should be able to run for many years before needing to be replaced. Sadly, this is often not the case. Getting the best advice and guidance is not always easy because for many suppliers and service companies, conveyor belts that last longer and require less maintenance are not good for business. All too often, their philosophy seems to be 'sell cheap and replace frequently'.

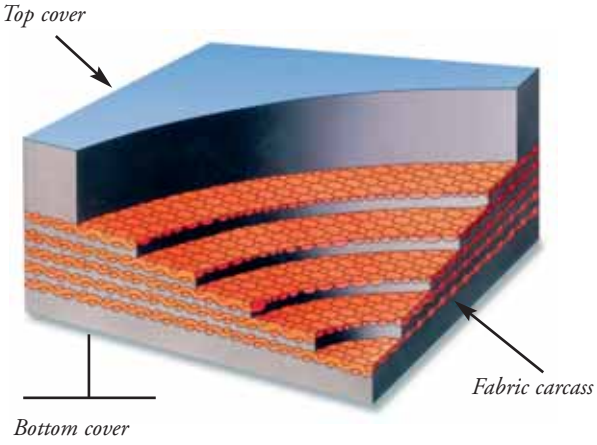
As if to confuse us even further, conveyor belt suppliers (and the companies that fit and maintain them) also seem to have developed a language all of their own. So, for the benefit of our readers who may not necessarily be conveyor belt experts, we asked for help from Netherlands-based Dunlop Conveyor Belting, one of the world's major conveyor belt manufacturers.

Below, Les Williams from Dunlop explains conveyor belt construction and gives some valuable guidance on how to select belts that will provide the maximum operational life and significantly reduce the amount of money that your company spends each year on conveyor belts.

Conveyor belts — the basic structure

Rubber belts with 'multi-ply' textile reinforcement are the most commonly used type and usually consist of two elements. Firstly, there is the carcass, which typically contain layers of extremely strong but flexible fabric embedded in the rubber. It is the carcass that provides the inherent characteristics of a conveyor belt such as its tensile strength and elongation (elasticity or 'stretch' under tension).

A conventional multi-ply conveyor belt



An outer cover of rubber protects the belt carcass. Different types of rubber compound are used for rubber multi-ply belting covers; each designed to withstand damaging effects such as

wear caused by abrasion (the most commonly used type), tearing and cutting, heat, fire and oil penetration. These different covers are generally referred to as 'cover grade qualities'.

Making the right choice

Selecting the best type of outer cover will largely determine the operational lifetime and ultimately provide the truest test of its value for money. The wear resistance quality of a conveyor belt is usually the single most important factor that will determine its life expectancy. As a general rule, 80% of conveyor belt surface wear occurs on the top cover of the belt with approximately 20% of wear on the bottom cover.

Wear on the top cover is primarily caused by the abrasive action of the materials being carried, especially at the loading point or 'station' where the belt is exposed to impact by the bulk material and at the discharge point where the material is effectively 'accelerated' by the belt surface. Contrary to popular belief, short belts (less than 50 metres) usually wear more rapidly compared with longer belts because they pass the loading and discharge points more frequently. For this reason, the selection of a belt that has the highest possible resistance to abrasion is even more essential than usual.

Wear on the bottom cover of the belt is mainly caused by friction contact with the drum surface and idlers. The rate and uniformity of this type of wear can be adversely affected by many other factors such as misaligned or worn drums and idlers set at incorrect angles. Factors such as ozone penetration or an unclean environment where there is a build up of waste material can also dramatically accelerate wear. Belt cleaning systems, especially steel edged scrapers, can also cause wear to the top cover surface.

Thicker is not always better

The difference in thickness between the top cover and the bottom cover should not normally exceed a ratio of more than 3:1. In theory, the more abrasive the material and the shorter the conveyor, the thicker the cover should be. In reality, the actual abrasion resistance quality of the belt cover is much more important than the thickness. Many conveyor belt suppliers offer belts with covers that are thicker than are actually necessary in an effort to compensate for the poor abrasion-resistant qualities of the belt rubber that they are using. Having belts that are thicker than really necessary can potentially cause other operational problems.

Different types of abrasion

It is a common misconception that a belt specified as being 'abrasion resistant' should naturally be expected not to wear quickly. In actual fact, because of the variety of materials that are carried on conveyor belts, there are a number of different causes of wear and abrasion. For example, heavy and/or sharp objects such as rocks can cause cutting and gouging of the belt surface whereas materials such as aggregate, sand and gravel literally act like sandpaper constantly scouring the rubber cover. For this reason, there are different types (grades) of abrasion resistant cover.

There are two internationally recognized sets of standards for abrasion, EN ISO 14890 (H, D and L) and DIN 22102 (Y, W and X). In Europe, it is the longer-established DIN standards that are most commonly recognized and accepted. Generally speaking, DIN Y relates to 'normal' service conditions and DIN W for resistance to abrasion, cutting, impact (from high drop heights), and gouging caused by large lump sizes of heavy and sharp materials.

Each manufacturer uses its own mix or 'recipe' of polymers to create cover compounds that have different abrasion (wear) resistance qualities. The main polymers used are SBR (Styrene-Butadiene-Rubber) and BR (Butadiene-Rubber). Both SBR and

BR have particularly good resistance not only to abrasion but also tearing, cutting, ripping and gouging. Many manufacturers try to minimize the use of natural rubber (NR) wherever possible in order to reduce costs.

To provide a longer lasting and therefore more cost-effective solution, Dunlop's approach has been to develop a range of abrasion-resistant covers specifically designed to deal with both specific and combined causes of wear. As a result, Dunlop belt covers exceed international quality standards by a very significant margin. An excellent example of this is their RA 'standard' abrasion resistant cover, which exceeds the DIN Y standard by more than 50%.

For extremely abrasive and/or sharp materials, Dunlop's RS cover exceeds the highest abrasion standard (DIN W) by nearly 30% and the equivalent ISO 'D' standard by more than 40%, which under normal operating conditions should directly be reflected in the working lifetime of the belt.

The importance of ozone resistance

At ground level, ozone is a pollutant. The level of ozone exposure can vary depending on geographical and climatic conditions and is usually most concentrated in cities and coastal areas. Conveyor belts being operated in ports can be particularly affected. Scientific research has shown that exposure to ozone increases the acidity of carbon black surfaces and causes reactions to take place within the molecular structure of the rubber. This causes surface cracking and a reduction in the tensile strength of the rubber, which has a direct impact on the performance of the belt and its working life. There can also be significant environmental and health and safety consequences, especially when conveying materials such as grain because fine particles of dust penetrate the surface cracks, which are then discharged (shaken out) on the return (underside) run of the belt.

Because of the growing importance of ozone resistance, Dunlop introduced mandatory testing to EN/ISO 1431 international standards using an ozone testing cabinet some years ago and by using special additives in its rubber compounds, it has ensured that every Dunlop belt exceeds international standards by a considerable margin.

Oil resistance

Conveying materials that contain oil and fat can also have a very detrimental effect on the performance and life expectancy of a conveyor belt because it penetrates into the rubber causing it to swell and distort. This, of course, is a common problem within the dry cargo industry. Because ISO or DIN standards do not exist for oil resistance, Dunlop applies the ultra-demanding American ASTM D 1460 standard.

Oil and fat resistance can be divided into two sources — mineral oils and vegetable and animal oils and fats. Dunlop uses a very special compound formula in the ROM cover grade quality, which is specifically designed to resist the penetration and therefore minimize the damage that vegetable oils and fats can cause. Mineral oils are the most aggressive, and therefore demand a particularly high level of protection. As a result, Dunlop developed a special compound to create the extremely successful ROS cover quality.

An offer you can't refuse?

It is important that buyers of conveyor belts remember that DIN and ISO standards are only the minimum benchmark of acceptability. Wear-resistant covers that conform to international standards still often have to be replaced after unacceptably short periods. Despite the claims of the manufacturers and traders, laboratory tests reveal that more than 50% of belts tested are found to be significantly below the minimum standards.

The direct connection between the quality of the raw materials used to make a belt and the selling price is highly significant. Although there can never be a fixed formula due to the wide variety of individual belt specifications, a general 'rule of thumb' is that raw materials represent approximately 75% of the production costs whereas labour costs

generally only represent around 15%. For this reason, prices that seem 'too good to refuse' should always be treated with considerable caution.

When a supplier is quoting a price that is significantly less than a competitor (often 25% lower or more) for apparently the same DIN or ISO-compliant specification, it is logical to conclude that raw materials of questionable quality and/or dubious origin have been used to keep that price as low as possible. In addition, materials such as essential (but costly) chemical additives needed to create vital physical properties such as ozone resistance will have either been used in insufficient quantities or most probably not at all. The chances are that the 'irresistible' offer will result in a belt that needs to be repaired, re-spliced or totally replaced significantly sooner than the seemingly higher-priced option.

Seek advice

What is clear is that there is a lot more to conveyor belts than meets the eye and that the days when conveyor belts just seemed to be long lengths of black rubber is certainly a thing of the past. The attraction of low prices can prove to be a very expensive mistake. As often as not, the quality of a belt is reflected by its price so it is always worth the effort to check the original manufacturers specifications very carefully and ask for documented evidence of compliance and the length of the warranty.