

WHAT'S THE CRAIC?

Have you ever wondered why some conveyor belts crack while others seem to wear until the canvas shows? Sometimes idle conveyors are hit worse than busy ones. We consulted Dunlop Conveyor belting in Holland to investigate why this happens and how to prevent it.

Conveyor belts are invariably a very significant purchase for any company that uses them; not only in terms of the actual capital expenditure but also the considerable impact of 'invisible costs' caused by belts that under-perform; require high levels of maintenance or simply need replacing prematurely. As a consequence, users of conveyor belts (and hopefully their suppliers) usually go to great lengths to make sure that full and proper consideration is given to a wide range of technical factors such as pulley diameters, tensile strength, troughing angles, lump size and much more besides.

Of course, these are all well recognised as being everyday considerations for those with the responsibility for selecting the most suitable and cost-effective conveyors belts to meet their company's needs. What is perhaps less well recognised (and publicised) within the world of industrial conveyor belts are the extremely harmful long-term effects of ozone on rubber conveyor belts.

From protector to aggressor

Ozone occurs naturally in the upper atmosphere, where it is formed continuously by the action of solar ultraviolet radiation on molecular oxygen. At high altitude, ozone acts as a protective shield by absorbing harmful ultraviolet rays.

Ultraviolet radiation causes chemical reactions to take place within rubber and the rapid decline in the ozone layer in the upper atmosphere over the past several decades is allowing an increasing level of UV radiation to reach the earth's surface. Ultraviolet radiation from sunlight can produce a photochemical reactions in rubber that can promote the oxidation of the surface of the rubber. This results in a loss in mechanical strength reducing the belts working characteristics.

Ozone also occurs in cities and industrialised areas, when it is formed by the photolysis of nitrogen dioxide from automobile exhaust and industrial discharges. Wind currents can also transfer natural ozone from high altitude to ground level. At



Dunlop's ozone testing cabinet.

low altitude, the ozone itself is a pollutant. 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 can have several consequences such as a surface cracking and a decrease in the tensile strength of the rubber. Belts that do not operate under shelter are especially prone to surface cracking, which can have very serious consequences in terms of the performance of the belt and its working life. There can also be significant environmental and health and safety consequences, especially when conveying materials with fine particles. These particles penetrate the surface cracks, allowing them to pass through any cleaner system, and discharging them as they are shaken out on the return run of the belt.

Hidden effects

At first glance, fine cracks in the surface rubber may not seem to be a major problem but over a period of time the rubber becomes increasingly brittle. Transversal cracks deepen under the repeated stress of passing over the pulleys and drums and, if the conveyor has a relatively short transition distance, longitudinal cracks can also begin to appear. Again, surface cracking may not initially seem to be a cause of concern but there are often hidden long-term effects.

One of those hidden effects is that moisture seeps into the

cracks and is able to penetrate through the belt covers down to the actual carcass of the belt. In multi-ply belts, the fibres of the weft strands of the plies expand as they absorb the moisture, which in turn causes sections of the carcass to contract (shorten) as the weft strands pull on the warp strands of the ply. This can often result in tracking problems that are difficult to pinpoint and where no amount of steering idler adjustment can compensate for.

Other negative effects include scrapers catching on the cracks and tearing off parts of the cover. This damage is then difficult to repair as re-splicing can become more and more difficult as the adhesion properties of the rubber diminish.

Going boldly beyond the DIN standard

The DIN 22102 is a long established standard and is still benchmark for conveyor belting in the quarrying and recycling industry today. It is often quoted when comparing belts to ensure that belts are "the same" as each other. However technology has moved on since it was established and today's belting user needs to look further to ensure that they are getting a high quality product. Ozone resistance is not specified in the DIN 22102 standard, and so many manufacturers ignore the issue as it is not specifically required and adds cost to their product. Dunlop Conveyor Belting have chosen a different path ensuring that a Dunlop belt performs to its full potential even after long term exposure ozone and sunlight.

New technology

Several years ago, Dunlop Conveyor Belting were amongst the very first to make use of new technology that enabled the effects of ozone to be tested and measured. As a direct result, special anti-oxidant additives that act as highly efficient anti-ozonants were introduced into all Dunlop rubber compound recipes to provide protection against the damaging effects of ozone, thereby further extending the operational life.

Because of the growing importance of ozone resistance, Dunlop has invested in the latest, state-of-the-art testing equipment in their research and development laboratory. Mandatory testing to EN/ISO 1431 international standards using an ozone testing cabinet has been introduced for all



A competitors sample showing typical ozone damage



Samples are placed under tension and tested for 96 hrs.

Dunlop belting products and comparison tests also applied to samples of belts made by other manufacturers.

EN/ISO 1431 testing

To scientifically measure resistance to ozone in accordance with EN/ISO 1431, samples are placed under tension (20% elongation) inside the ozone testing cabinet and exposed to highly concentrated levels of ozone for a period up to 96 hours. Every sample is closely examined for evidence of cracking at two-hourly intervals and the results carefully measured and recorded. Dunlop's technicians say that as a general rule, based on their experience, failure to exceed more than 8 hours under test without surface cracking will most likely correlate to less than 2 years in normal working conditions before the belt starts to deteriorate.

Users of conveyor belts may experience even shorter time spans before cracks in the belt surface start to appear. Because of the sheer size of industrial conveyor belts, it is common practice amongst manufacturers and distributors to store rolls of belting in open-air storage yards. Belts can often be held in stock for long periods, sometimes for several years, before they even arrive at their final destination and put to use. This, of course, means that they are exposed to the effects of ozone and UV radiation. A number of conveyor belt users have reported that surface cracking was apparent at the time of delivery.

Local Support

C & K Fitzpatrick are the Irish distributors for Dunlop conveyor belting. They provide local technical support and onsite service for the Dunlop product.

Mark Fitzpatrick comments on ozone resistance "This is just another great advantage of using Dunlop belting. Yet again Dunlop is not only meeting the standard but leading the industry with technical developments. Ozone damage can mean that your belts are deteriorating, even while standing still, so it's extremely important even when your plant is not busy."

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