

Rubber conveyor belts: are you being sold belts with a limited life expectancy?

CONVEYING ADVICE

Rubber degradation and decomposition caused by exposure to ozone (O₃) ultraviolet light (UV) and oxygen (O₂) is a prime cause of premature and premature wear damage and a serious reduction in both the performance and working lifetime of rubber conveyor belts. If the rubber does not contain sufficient protective chemicals, the decline begins as soon as the rubber is vulcanized during the production process. It is not, as some may believe, something that begins to happen years down the line. The short-term and long-term effects are something that all conveyor operators need to understand, but usually do not.

Although the damage is easily preventable, recent surveys show that more than 80% of rubber conveyor belts sold in Europe, Africa and the Middle East have no protection. The following looks at the science and asks why so many manufacturers and traders are selling conveyor belts that virtually have an inbuilt limitation on their working life expectancy.



The beginning of the end – cracks can occur within a few months, sometimes only weeks.

OZONE DAMAGE — CAUSES AND EFFECTS

Ground-level ozone (O₃), also known as tropospheric ozone, is a trace gas in the troposphere (the lowest level of the Earth's atmosphere) created by the photolysis of nitrogen dioxide (NO₂) from sources such as automobile exhaust and industrial discharges. Exposure is unavoidable because even tiny traces of ozone in the air will attack the molecular structure of rubber. The scientific name for this is ozonolysis.

When rubber polymers are attacked, the molecular weight drops steadily until very little strength remains in the rubber. The first sign is when cracks start to appear in the rubber surface, which is sometimes referred to as 'dry rotting'. Further attacks occur inside the newly exposed cracks, which grow steadily until they complete a 'circuit' and the rubber fails.

ULTRAVIOLET DAMAGE

Ultraviolet light from sunlight and artificial (fluorescent) lighting also has a seriously detrimental effect on rubber. Ultraviolet accelerates rubber deterioration because it produces photochemical reactions that promote the oxidation of the rubber surface resulting in a loss in mechanical strength. This is known as 'UV degradation'.

ENTIRELY PREVENTABLE

Ozone, ultraviolet and oxygen damage is entirely preventable. Several years ago, Netherlands-based Fenner Dunlop was among the very first in the world to make use of new technology that enabled the effects of ozone to be tested, measured and consequently preventable. The company introduced mandatory testing to EN/ISO 1431 international standards for all its rubber products. As a result, special antioxidant additives such as 2,2,4-Trimethyl-1,2-dihydroquinoline polymer (MQ), anti-degradants, antifatigue agents and antiozonants became compulsory ingredients in every rubber compound without exception.

EN/ISO 1431 TESTING

Resistance to ozone is measured in accordance with the EN/ISO 1431 test method in which samples of rubber are placed under tension (20% strain) inside an ozone testing cabinet and exposed to highly concentrated levels of ozone for a period of up to 96 hours (@ 40°C, 50pphm). The pass criteria needs to be that the rubber sample does not show any signs of cracking within the 96-hour period.

Worryingly, the vast majority of samples tested typically fail within only six to eight hours, which experience equates as a real time equivalent of within six working months. Despite its crucial importance, ozone and UV resistance is very rarely, if ever, mentioned by conveyor belt manufacturers and suppliers. This is because the ingredients needed to protect the rubber and prolong its working life cost money, thereby reducing the price competitive advantage. A more sinister but nonetheless valid aspect of the non-use of protective agents is that anything that prolongs the working life of belts is not good for business so, together, they explain the widespread absence of protection.

Eighty per cent of samples tested typically fail within only six to eight hours.



CONCLUSION
Exposure to ozone (O₃) ultraviolet light (UV) and oxygen (O₂) is far more damaging and costly, both in terms of performance and working lifetime, than most conveyor belt suppliers would have you believe. Always insist on certification that confirms that the belt you are being offered is fully resistant in accordance with the EN ISO 1431 test method. Without this essential protection, your belts will be more problematic and need to be replaced far sooner than they should be.