



Ozone and UV Damage to Rubber Conveyor Belts

The effects of exposure to ozone

Ozone occurs naturally in the upper atmosphere. At high altitudes, it acts as a protective shield by absorbing harmful ultraviolet radiation. However, at low altitudes, ozone itself becomes a pollutant.

Exposure to ozone increases the acidity of carbon black surfaces and causes reactions within the molecular structure of the rubber. This can result in surface cracking and a reduction in the tensile strength of the rubber.

Ozone concentrations at ground level, and therefore the level of exposure, can vary significantly from one location to another depending on geographical and climatic conditions. General ozone concentrations range from 0 to 6 parts per hundred million parts of air. Coastal areas can have particularly high levels of ozone pollution.

Ozone also occurs in cities and industrialised areas, where it is formed through the photolysis of nitrogen dioxide from vehicle exhaust emissions and industrial discharges. In these environments, ozone levels can range from 5 to 25 parts per hundred million parts of air.

Environmental and safety concerns

Belts that operate without shelter are particularly prone to surface cracking, which can severely affect both their performance and working life.

Even more significant are the environmental and health and safety consequences of ozone-related damage. Dust particles from the conveyed material can penetrate the surface cracks and are then discharged, or shaken out, during the return run on the underside of the belt.

At first glance, fine cracks in the surface rubber may not seem to be a major problem. However, over time, the rubber becomes increasingly brittle.

Transverse cracks deepen under the repeated stress of passing over pulleys and drums. If the conveyor has a relatively short transition distance, longitudinal cracks may also begin to appear.



Testing at Fenner Dunlop lab.



The effect of the exposure to ozone.



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Conveyor Belting



Again, surface cracking may not initially appear to be a cause for concern, but it can lead to serious long-term damage.

Moisture and other fluids can seep into the cracks and penetrate through the belt covers to the carcass. If the belt is carrying materials such as household waste, grain, wood waste or biomass, oils and resins can reach the carcass and cause the belt to swell and become severely distorted.

The effects of ultraviolet radiation

Ultraviolet radiation causes chemical reactions within rubber. The decline in the ozone layer in the upper atmosphere over recent decades has allowed increasing levels of UV radiation to reach the Earth's surface.

Ultraviolet light from sunlight and fluorescent lighting accelerates deterioration by triggering photochemical reactions that promote oxidation on the surface of the rubber, resulting in a loss of mechanical strength.

EN ISO 1431 international standards

To scientifically measure resistance to ozone, samples are placed under tension at 20% elongation inside an ozone testing cabinet and exposed to highly concentrated ozone levels for up to 96 hours.

At Fenner Dunlop, the pass criterion is that the rubber sample must show no signs of cracking after 96 hours at 20°C, 50 pphm and 20% strain. Each sample is closely examined for evidence of cracking at two-hour intervals, and the results are carefully measured and recorded.

As a general rule, based on experience, failure to withstand more than eight hours of testing without surface cracking will almost certainly mean that the belt will begin to deteriorate in less than two years. In many cases, particularly in coastal locations, deterioration can begin within a matter of months.

Fenner Dunlop was among the first conveyor belt manufacturers to introduce mandatory testing in accordance with EN ISO 1431 international standards.



Exposure to ozone may decrease the tensile strength of the rubber, which is crucial some industries.

As a direct result, special antioxidant additives that act as highly effective antiozonants were introduced into all our rubber compound formulations to provide protection against the damaging effects of ozone and ultraviolet radiation.

Always insist that your belt supplier provides written verification that its belts undergo stringent testing in accordance with EN ISO 1431 and are fully resistant to the effects of ozone and UV radiation.

Seek advice

More often than not, the quality of a belt, including its ability to resist wear, is reflected in its price.

It is always worth carefully checking the original manufacturer's specifications and requesting documented evidence of tested performance against the relevant international standards before placing an order.

