STEELCORD BREAKERS
TECHNICAL INFORMATION BULLETIN

A GUIDE TO THE USE OF BREAKERS IN STEELCORD CONVEYOR BELTS

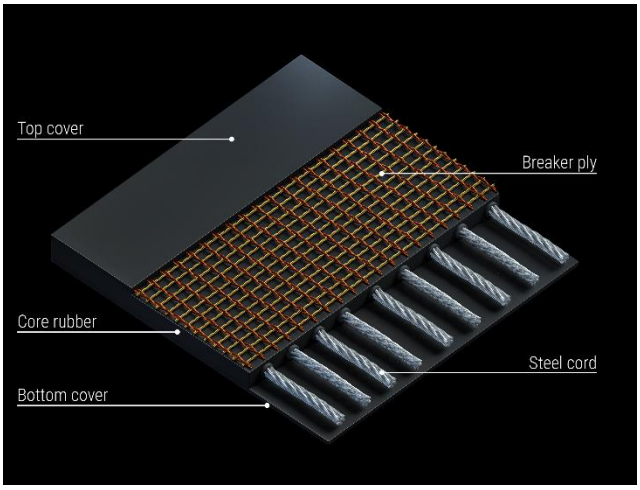
Because of its innate strength, good handling characteristics and low elongation (stretch), steelcord belting is primarily used to convey materials over long distances; in some cases over several kilometres. Compared to conventional multi-ply belting, steelcord belts are appreciably more costly to manufacture and, especially because of the longer lengths involved, they can be a very substantial financial investment.

Provided that the belt has been manufactured using good quality abrasion and ozone/UV resistant rubber, a steelcord belt should justify the initial outlay by providing a long working life. However, although the actual steel cords are naturally very strong, a steelcord belt can quite easily be ripped apart over its entire length by a trapped rock or foreign object that penetrates the rubber covers and rips the belt longitudinally between the cords. To prevent and minimise this kind of damage, 'breaker' plies that are integral part of the belt construction can be used.

USING BREAKER PLIES TO INCREASE RIP RESISTANCE

Breaker plies are embedded in the rubber covers during the manufacturing process over the full width and length of the belt, effectively creating a protective layer.

The breaker plies are designed to significantly increase resistance against longitudinal ripping and perform two distinct functions. Firstly, they can help prevent the penetration of the belt by trapped objects and secondly they act as a barrier if something does actually penetrate between the steel cords and starts to rip the belt.



For more extreme conditions, it is also possible to have two breaker plies with one located above and the other positioned below the steel cords. However, because of the increased cross rigidity, having two breaker plies can sometimes cause toughing problems in relatively narrow belts.

Above: Steelcord belt with breaker ply.
Below: Steel cord belt in operation

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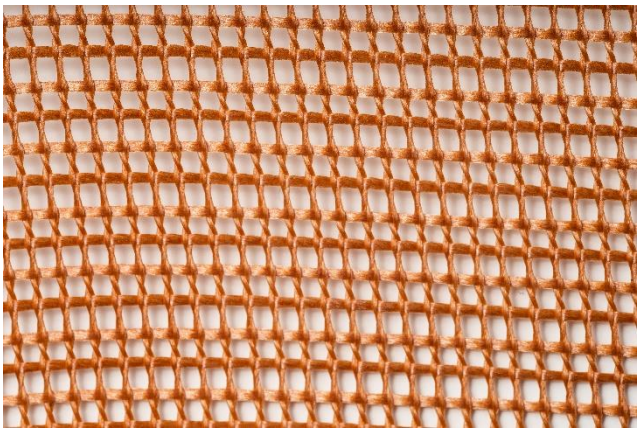
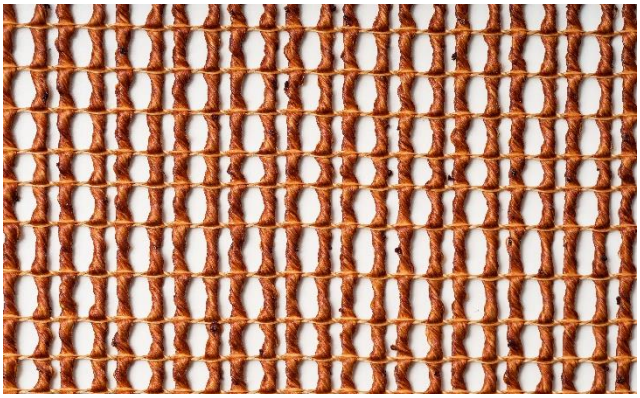
TYPES OF BREAKER

Breakers generally fall into two different categories or types. These are 'fabric breakers' (also referred to as textile breakers) and 'steel breakers'. A wide range of textile fabrics (mostly nylon) in various strengths and densities are used to make fabric breakers. Lighter-weight fabric versions (polyester/nylon) are designed to simply absorb and dissipate energy while stronger, heavier weight nylon breakers and steel breakers can actually stop the belt, which limits the amount of damage even more effectively. These are often referred to as 'Rip Stop' breakers.



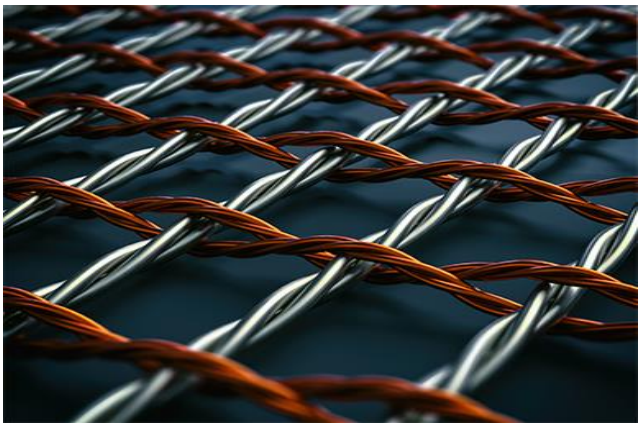
Standard nylon fabric breaker ply



Heavy-duty nylon 'Rip Stop'breaker ply

Depending on the application and the type of material being conveyed, nylon fabric breakers usually prove to be more effective in minimising the length of a rip compared to steel. The reason for this is that the nylon strands are able to stretch and pull together. As the trapped object is being pulled through the belt the strands of the breaker stretch and gather together into a bundle that can eventually become strong enough to stop the belt. Steel breakers are transversal steel wires held in position by longitudinal binder wires. As with fabric breaker plies, there are a wide range of strengths based on the size and pitch of the steel wires. Although having a steel wire breaker would logically seem to imply a much greater strength compared to a fabric ply breaker, this is not necessarily the case. Steel breaker wires do not stretch so they cannot pull together to create a thicker barrier in the same way that fabric plies can.

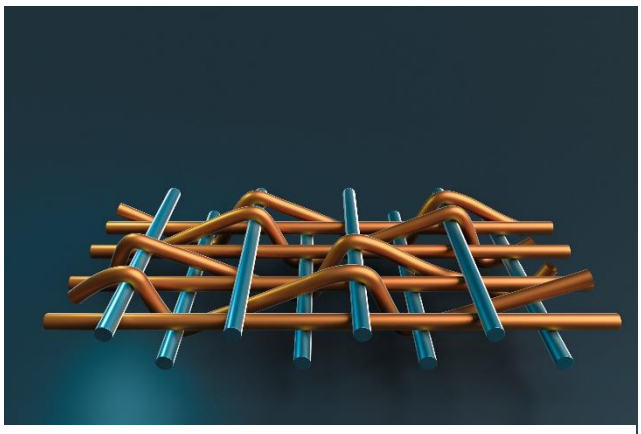
However, the advantage of a steel breaker is that very sharp trapped objects (dolerite rock or slate for example) do not cut through the steel wires as easily compared to conventional nylon fabrics.



Steel breaker ply

'STRAIGHT WARP' FABRIC BREAKERS

A third 'super-strength' type of breaker ply is also available. This is a specially adapted version of the unique Dunlop UsFlex® woven 'straight-warp' polyester/nylon fabric. UsFlex single and two-ply belts have a long and highly successful track record for handling some of the toughest materials imaginable. Laboratory testing and many years of practical experience has proved that the rip resistance of UsFlex fabric is up to 5 times greater than conventional fabric ply material. This makes it an exceptionally strong and effective breaker ply.



UsFlex woven 'straight-warp' super strength polyester/nylon fabric ply breaker ply

What creates these strengths is a very cleverly engineered ply construction that consists of extremely strong strands of polyester running longitudinally and heavy-duty nylon transverse strands held in position by a strong yarn. The strands are completely straight in both directions and are not interlocked in the conventional manner. As with conventional breaker plies, the UsFlex fabric layer is embedded just above the steel cords. This also provides extremely effective impact protection of the steel cords because the fabric dissipates the peak point of impact energy over a much wider area.

POSITIONING OF THE BREAKER PLY

According to ISO 15236-1, a breaker ply should be positioned at a distance of between 1mm and 3mm from the longitudinal cords. The width of the breaker ply should be at least 10mm from the belt edge but no more than 100mm less than the width of the belt. **On this basis, the breaker ply is regarded as part of the cover, which means that the cover thickness is measured from the cords.**

However, if the ply is less than 1mm distance from the longitudinal cords then it is considered to be a weft transversal reinforcement and therefore part of the actual carcass. **This means that the cover thickness is measured outwards from the surface of the ply.**

It is generally advisable to position the breaker as close to the actual steel cords as possible because it maximises the amount of rubber that would have to be worn away by abrasion before the breaker ply is reached the surface of the cover. When requesting quotations it is important to specify very clearly if the total thickness of the top cover should include the thickness of the breaker or not.

USING BREAKERS IN COMBINATION WITH RIP DETECTION SYSTEMS

When there is a particularly high risk of accidental damage, it is possible to use a rip detection system as well as using breakers. The breakers are fitted in the top cover and the detection loops are fitted in the bottom cover below the cords. It is important to bear in mind that rip detection systems use electro-magnetic signals so they cannot function if a steel breaker ply is fitted. This means that if a belt monitoring or rip detection system is going to be used then it is only possible to use fabric breakers.

CHOOSING THE BEST TYPE OF BREAKER

The primary factor to take into consideration when deciding on which type of breaker to use is the type of material being carried and how it is loaded on to the belt. Unless the materials being conveyed are particularly sharp (slate, granite, dolerite etc.) or there is a likelihood that it may contain sharp foreign objects (mining tools for example) then our recommendation is to use either conventional fabric breakers or the special UsFlex breaker ply.

This recommendation is based on extensive laboratory comparison tests and field experience, which show that transverse reinforcement with textile is more efficient in preventing longitudinal rip damage. Fabric breakers are also longer lasting than steel transverse reinforcement. If heavy materials such as large rocks are being dropped on to the belt surface then a full UsFlex breaker-ply layer is recommended.

When requesting a quotation, it is extremely important that potential suppliers are given a specification that is not subject to interpretation or misunderstanding. This is essential not only in terms of the anticipated operational lifetime of the belt but also to help ensure that all potential suppliers are providing quotations based on exactly the same specifications. Because steelcord belts are usually only made to order it is advisable to order at least 50 meters of belt in addition to the required length so that it can be kept on site for emergency repairs.

WE ARE HERE TO HELP

Dunlop customers are always encouraged to discuss their specific needs with our team of specialists to help find the most cost effective solution.

For more information on this subject please contact your local Dunlop sales representative or Dunlop's Application Engineering team on +31 (0) 512 585 555.