

TECHNICAL INFORMATION BULLETIN

PROFILED AND CHEVRON CONVEYOR BELTS

EXPLAINS THE DIFFERENT PRODUCTION METHODS USED TO MANUFACTURE PROFILED CONVEYOR BELTS; HOW THEY ULTIMATELY AFFECT RELIABILITY AND HOW TO SELECT CHEVRON BELTS THAT WILL PROVIDE THE BEST PERFORMANCE AND LONGEST, MOST COST-EFFECTIVE WORKING LIFETIME.

HIGH PROFILE CHEVRON BELTS

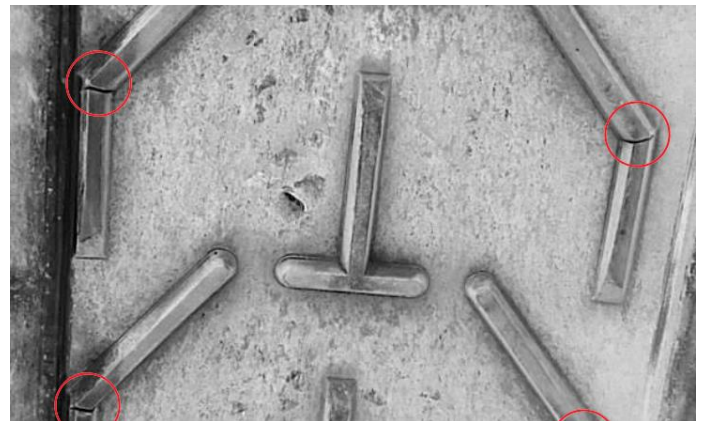
Belts with chevron-patterned profiles ranging from 15mm up to 32mm in height above the belt surface are the most commonly used profiled belts. The chevrons guide and control the flow of loose materials such as sand or small size aggregates for example. A common problem affecting high chevron belting is that the chevron profiles can split and ultimately become detached entirely.

CONVENTIONALLY PRODUCED CHEVRON BELTING

Because of the technical difficulties (and higher cost) involved in creating rubber compounds that will flow uniformly, most chevron profile belts are created using a two-step process. Firstly, a belt carcass consisting of layers of fabric reinforcing ply covered by a layer of uncured rubber compound on the top and bottom surfaces is placed in a vulcanisation press over a mould plate that has been filled with uncured rubber. Alternatively, the mould plate is extracted, filled with uncured rubber and then replaced back under the base structure. In both cases, the complete structure is then vulcanised to create the finished belt.

The first problem with this production process is that filling a hot mould with uncured rubber means that the rubber can start to vulcanise (cure) before the base belt is in contact and the press is closed. However, the biggest problem of all is that the uncured rubber compound used to construct the base belt structure cannot be the same as the rubber used on the top and bottom cover surfaces. This is because the rubber used to fill the chevron profile mould has to be more malleable so that it can flow and completely fill the mould cavities. In almost all chevron belts made in this way, the contact point where the two different rubber compounds join automatically becomes a point of weakness because chevron profiles constantly stretch and flex under tension each time they run around a pulley or drum. This means that unless the bond between the base belt carcass and the chevron profile is absolutely flawless then sooner or later dynamic stress fractures in the profile will begin to occur, eventually causing the profile to split.

This problem is magnified on conveyors with relatively small pulley diameters, especially mobile equipment, because smaller pulleys generate higher levels of dynamic stress. Failure will happen even sooner if one (or both) of the rubber compounds used are not fully resistant (as per ISO 1431 testing) to the effects of degradation



A common problem – profiles that split and eventually detach from the base belt

(surface cracking) created by chemical reactions in the rubber caused by ground level ozone and ultra violet light.

DUNLOP 'HOMOGENOUS STRUCTURE' METHOD

There are two essential requirements needed to avoid the inherent weakness previously described. The first is to use a single rubber compound that has been specially engineered for both the base belt structure and the chevrons, which can be vulcanised virtually simultaneously within the mould and the base belt structure. While being sufficiently malleable to allow it to flow smoothly and evenly into the moulds, the rubber also needs to have good wear resistance, tensile strength and durability. In addition, the compound also needs to be fully resistant to the effects of ozone and ultra violet light (for longevity of working life) and conform to European REACH regulations so that the end product is also safe to handle.



Constant flexing can cause dynamic stress fractures in conventionally produced chevron belts

The second essential requirement is to manufacture the belt as a single, homogenous structure using a one-step production process rather than a two-step process. This is because a belt with a completely homogenous structure, even if damaged or split, is significantly stronger and more resilient against spreading damage or having profiles shear off entirely compared to belts where two non-identical rubber compounds have been vulcanised (bonded) together.

To create such a structure a base belt comprising of uncured rubber is placed in the vulcanising press between the base plate of the press and a chevron mould plate positioned immediately below it. The base belt will already also have a specific quantity of uncured rubber on the top cover surface. This uncured rubber is in addition to the volume of rubber needed to achieve the minimum thickness of the top cover of the base belt once it has been vulcanised. The actual amount of 'extra' rubber needed depends on the design and depth of the chevron pattern. The compression of the upper and lower plates then forces the additional rubber to flow into and fill the mould cavities. Crucially, the vulcanisation of both the base belt structure and the rubber-filled moulds then takes place simultaneously to form a single homogenous unit.

Because of the technical complexity and higher costs involved, including a more advanced rubber compound, hardly any other manufacturer apart from Dunlop Conveyor Belting produces profiled chevron belt in this way.



The mould plate used to make a 'Single homogenous structure' chevron belt

LOW PROFILE BELTS

Belts that have low height profile patterns, usually 5mm high or less, are most commonly used for the transportation of packaged goods such as boxes, bags and baggage as well as bulk materials including agricultural products, oily materials, woodchips and wet sand. They can successfully be used on inclines as steep as 30° in some cases. Compared to high chevron belts, making single homogenous structures is easy to achieve because the rubber only has to flow into and fill much smaller mould cavities.

RAPID WEAR



Chevrons as high as 25mm or 32mm can wear almost completely flat in a very short time

The single biggest influence on performance and value for money concerning both high and low profiled belts is the ability of the rubber to resist abrasive wear and to resist abrasive wear as well as the effects of ozone. Research has shown that the rubber used to make the profiles in the conventional two-step production process almost invariably has an unacceptably low resistance to abrasive wear. It is not unusual, especially among so-called 'economy' profiled belts imported from Asia, that even chevron profiles as high as 25mm or 32mm can wear almost completely flat in a very short period of time.

Dunlop's approach has always been to develop a range of covers specifically designed to provide a longer lasting and much more cost-effective solution by exceeding international quality standards by a significant margin.

ALL DUNLOP CONVEYOR BELTS ARE FULLY OZONE RESISTANT (EN ISO 1431) AND REACH COMPLIANT (EC 1907/2006).



SEEK ADVICE - 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.

All information and recommendations in this information bulletin have been supplied to the best of our knowledge, as accurately as possible and updated to reflect the most recent technological developments.

We cannot accept any responsibility for recommendations based solely on this document.