

The background of the entire page is a high-contrast, black and white photograph of cracked concrete. The cracks are irregular and jagged, creating a network of polygonal shapes across the surface. The lighting is dramatic, with deep shadows in the cracks and bright highlights on the raised edges of the concrete.

BREAKING NEW GROUND

World Cement examines the development of a new innovation in belt construction that has been introduced into the market.

Conveyor belts perform an important function in the cement industry; they are also a very significant overhead. Although reliability and durability are very important considerations, the fact is that finding a belt that is both tough and genuinely good quality, but which is also competitively priced, might be regarded as looking for the Holy Grail. Until now, it seems. Just over a year ago Dunlop Conveyor Belting in the Netherlands, and its sister operation in North America (Fenner Dunlop Americas), quietly introduced a new type of belt, designed to be more durable and tougher than conventional ply belting, while also being competitively priced. In Europe, the company has branded this new belt construction Ultra X.

This article will discuss an innovation that some industry insiders believe will ultimately change traditional thinking on conveyor belt design.

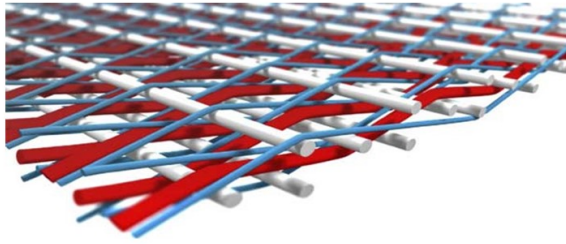


Figure 1. The 'breaker weft construction' fabric.

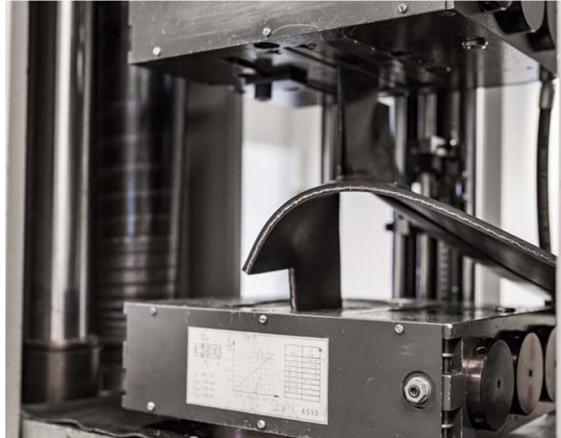


Figure 2. The EN ISO 505 tear test.

Table 1. The maximum tensile strengths of finger splice joints.

Number of plies	Maximum tensile strength (%)
1	90%
2	50%
3	67%
4	75%
5	80%

The conveyor belt market

It is important to first look at the market backdrop. The vast majority of rubber conveyor belts are simply required to be resistant to abrasion. With the possible exception of heat resistance, the vast majority of cement plants fit wear-resistant belts as standard. As so many manufacturers and traders compete for a share of the market, buyers are seemingly spoiled for choice.

The market is dominated by 'economy belting' imported from Southeast Asia. This market dominance is actually much greater than many might think because it is not uncommon for European belt manufacturers to import from Asia to supplement their own production, thus enabling themselves to offer low price belting to their customers in Europe.

In comparison, Dunlop focuses its approach on the lowest cost, rather than the lowest selling price. This is done by offering belting that provides a much longer operational lifetime, along with heavy-duty and specialist belting, such as heat, fire, or oil resistant.

Although this strategy has served the company well, its R&D teams have continued to search for a tough, high-quality belt that can also compete at the economy end of the market.

Thinking outside the box

It is a fact that even the strongest, heaviest belts can be ripped, torn, or punctured by heavy, sharp materials that either fall from height or become trapped.

"Accidental damage is something that all conveyor operators have to contend with" said Dr Michiel Eijpe, Development Director at Dunlop in the Netherlands. "Foreign objects get trapped and belts can often be destroyed within the blink of an eye. Using low grade 'sacrificial' belts invariably proves to be a false economy for a lot of reasons, including loss of production, high maintenance, and the high cost of frequently having to fit replacement belts."

According to Dr Eijpe, the problem of rapid wear caused by abrasion was solved long ago: "rubber covers are always the easy part for us. The biggest challenge was designing a belt that could really handle impact, ripping, and tearing that, at the same time, could be priced competitively."

Thus, it was important to forget convention and think outside of the box. The company's engineers went back to the drawing board to create a strong 'breaker weft construction' single-ply belt, based on a tough patented fabric that is exclusively made at its own in-house fabric weaving facility in the US (Figure 1).

It has been found that the fabric has more than three times greater longitudinal rip resistance and up to five times better tear resistance, as well as a superior resistance to impact, compared to traditional three-ply or even four-ply belting.

The big secret?

According to the engineers, Ultra X owes its strength to a specially woven carcass, which uses crimped warp polyester yarns to provide high strength and low stretch. These are combined with strong binder and filler yarns, which create strength and stability under load to give rip, tear, and impact resistance.

Throughout development, sections of the belt were repeatedly tested to destruction. The tear resistance of Ultra X is strictly measured according to the international EN ISO 505 standard (Figure 2).

Wear, ozone, and UV resistance

Protecting the carcass with hard-wearing rubber covers was the easy part. Ultra X belts are produced with Dunlop AA anti-abrasion covers as standard. "Using this grade of rubber ensures that the belt has excellent abrasion resistance that outperforms typical DIN Y requirements (with an average loss of less than 150 mm³) by as much as 20%," said Dr Eijpe. "The AA grade rubber is also extensively tested in compliance with EN ISO 1431 for ozone resistance (50 pphm, strain 20%, and 96 hours of no cracking) and resistance to the

damaging effects of UV light. We know from experience, especially in the cement industry, that these are essential characteristics, needed to avoid the premature replacement of the belt due to the cracking of the belt surface”.

A question of strength

Ultra X is available in abrasion-resistant rubber and in two strengths – Ultra X1 (Type 330), which is designed for users of EP315/2 and 400/3 conventional ply belts, and Ultra X3 (Type 550), which is designed to replace EP500/3, 500/4, 630/3, and 630/4 ply belts.

The very idea that conventional two-ply, three-ply, and even four-ply belts can be replaced by single-ply construction has raised quite a few eyebrows amongst traditionalists. The first question that seems to be on everyone’s lips is how a single-ply belt could provide sufficient tensile strength and yet still have high levels of rip, tear, and impact resistance.

“We keep coming back to the unique fabric,” said Rob van Oijen, Manager of Application Engineering in Dunlop’s Drachten headquarters. “Aside from being able to withstand the kind of punishment that would destroy a normal belt, Ultra X has excellent tensile strength. The longitudinal tensile strength of the X1 is 330 N/mm and the X3 has a longitudinal strength of 550 N/mm. The fact is that we stepped away from the conventional range of multi-layer belting for good

reason. A single-ply construction requires a finger splice joint to be made and the big advantage of finger splice joints is that they retain up to 90% of the belt’s tensile strength. In comparison, a two-ply step splice only retains a maximum of 50%, and a three-ply step joint can only achieve a maximum tensile strength of 67% (Table 1).

“When high levels of splice efficiency are combined with X1 and X3 tensile strength then, at the very least it effectively creates equivalent tensile strengths and belt safety factors that would be expected from comparable three or four layer conventional belting. Belt safety factors are one of the prime selection criteria.”

Finger splices do take longer to make (initially about 30% longer, although such a difference would be expected to reduce with growing experience). “There are many technical and economic arguments in favour of finger splicing,” continued van Oijen. “Finger splice joints are stronger and more durable. The result is an appreciably better performance compared to conventional ply belts, meaning that the need to repair and re-splice joints is much less frequent.

“To help customers, splice kits, including finger pattern templates, materials and tools, a guide manual, and a training film can be provided. Training and supervision can also be given where warranted”.

For those who still remain against the idea of finger splicing, the good news is that Ultra X has excellent

THE POWER OF LESS

DUNLOP

ULTRA

“SIMPLY UNBEATABLE”



3x

**MORE
RIP RESISTANCE**

Dunlop Ultra X has up to three times more rip and impact resistance compared to 3 or 4-ply belting.

5x

**MORE
TEAR RESISTANCE**

Dunlop Ultra X has up to five times more tear resistance compared to single and multi-ply belting.

Introducing the sensational
new single-ply carcass belt
from **Dunlop**

Come and find out more at Bauma!
Munich, April 8 -14 Hall B2 stand 239.

DUNLOP
CONVEYOR BELTING

Visit www.dunlopcb.com
or watch Ultra X in action on youtu.be/dunlopbelting/



Figure 3. Suited to run on mobile machinery despite small pulley diameters.



Figure 4. High levels of rip, tear, and impact resistance.

mechanical fastener retention. There certainly does not appear to be any question mark against the overall strength of Ultra X, because an Ultra X3 single-ply belt is able to pull up to 56 t in weight.

Endless opportunities

Another advantage of Ultra X is that it is flexible enough to be used on smaller drive pulley diameters, “The X1 drive pulley for over 60% rated tension can be as small as 315 mm dia. and the X3 drive pulley, again for over 60% rated tension, can be as small as 400 mm dia.” said Andries Smilda, Sales and Marketing Director. “This means that Ultra X is ideally suited to run on the kind of mobile machinery that has always been notorious for having small pulley diameters. The problem is that design tolerances and the dynamic stress placed on the inner carcass and the splice joint by continual flexing over small diameter pulleys seriously limits what can be fitted. Ultra X overcomes that problem”.

In Europe, the company is confident that Ultra X will prove to be a game changer, gearing up its endless belt production capacity, not only in Drachten but also at its service facilities in Poland and Italy.

Under the radar

Dunlop actually launched Ultra X more than a year ago. It was a deliberately low-key affair and under the radar of most of the market. The company had many reasons for taking such a cautious approach: “We knew from the years of research and intensive laboratory testing that went into the development of

Ultra X that we were onto something special,” said Smilda. “But we still wanted to prove it in the field, so we worked with several tried and trusted end-users. We have sold many thousands of metres in the past year and we have not had one single complaint or technical issue. Now we are ready to step up another gear”.

Successes within the European cement industry so far include the highly competitive Spanish region. In other industries, Ultra X is now the belt of choice in the biggest quarry in Europe, while at least one OEM has already found that Ultra X has more than doubled the average belt lifetime.

Competing on quality and price?

There is a surprising openness about the need to be able to “slug it out on price”, as well as why and how the company is able to offer prices that are at least comparable (and often lower than) multi-ply belting. “We would never compromise on quality for the sake of competing on price,” said Smilda “That is simply not our culture. Actually, there are several reasons why we can price the product competitively.

“Firstly, the single-ply carcass is made from fabric that is manufactured in-house. That is a big advantage both in terms of quality and cost. Having a single-ply construction also allows for the maximum efficiency of production because there are fewer calender runs. And having no rubber skim between the plies not only results in a thinner, stronger carcass, but it also keeps the cost down. Dunlop is making longer production runs at a maximum width of 2000 mm and is only selling Ultra X in full roll lengths of 300 m. Endless belts and also belts that have been ‘pre-prepared’ for splicing need to be ordered in multiples. “Selling and shipping short lengths creates additional costs that impact on the selling price – but for all customers starting out with Ultra X for the first time, we are of course trying to be as flexible as possible.”

A cultural change

There is no questioning the belief and enthusiasm that the company seems to have for Ultra X. It has a history of innovation when it comes to conveyor belts: from creating the very first fire resistant belts, through to heavy-duty application specialist belting. It is part of the company’s culture.

At the same time, what is also clear is that it is looking for something of a cultural change. To many, the very notion that a relatively lightweight, single-ply construction belt can provide the necessary tensile strength, together with higher resistance to ripping, tearing, and impact, as well as a much greater splice strength, is difficult to comprehend. To do this, while at the same time competing on price, is an even bigger ask. But if the market can take off its blinkers and look just a little beyond its long-held beliefs and preferences then this could be a game changer. ■