

Rubber has so much to offer



Multi contrast soling from Anthony Miles.

CREDIT: WALK THIS WAY

The use of rubber for footwear has come a long way both technically and aesthetically since South American Indians dipped their feet in latex from the *Hevea Braziliensis* tree and then smoke cured the resulting shell to produce a reusable foot covering. Unfortunately, rubber in this natural form (NR), it is not very stable and inclined to become sticky in hot conditions and stiff and brittle if too cold. Its first commercial application for footwear was in the USA in the 1820s and took the form of crude overshoes imported from Brazil under the name 'Fabricas'.

Despite the aforementioned limitations, natural rubber does have some remarkable properties. French company Reltex produces soles from rubber in its most natural form, *lactea hevea*. They are made by adding a number of special ingredients to pure hevea milk, which is then poured into a mould and left for around seven days to coagulate and dry. The water is removed by thousands of tiny ducts to leave a natural microstructure comprising millions of air cushions that act as tiny shock absorbers.

Tests carried out by French technology centre CTC have shown that these soles

absorb up to 50% of impact shock when the heel strikes the ground. They also showed excellent distribution of plantar pressure, resulting in 70% restitution of the energy expended by the wearer. The soles will therefore help to avoid joint damage while also providing a high degree of comfort, all from pure natural rubber. While the soles are naturally expensive, top-end comfort footwear producers like being able to market extreme suppleness and comfort combined with a totally natural product.

VULCANISED RUBBER

The real breakthrough for rubber in every sense came in the early 1850s with the discovery of the vulcanising process by Charles Goodyear in the US and Thomas Hancock in the UK. They found that heating natural rubber with a small amount of sulphur and a few other ingredients (vulcanisation) changed its properties to a remarkable extent.

Unvulcanised rubber consists primarily of long polymer chains entangled like a mass of elastic fibres which, when stretched, disentangle, slip over each other and tend to straighten out. The traditional method of vulcanisation using heat and sulphur forms cross-links between the polymer

chains which greatly decreases the amount of slippage. As well as making the rubber far more dimensionally stable and heat resistant, it also improves and stabilises its physical properties.

Rubber technology gradually developed over the next 50 years assisted by rapid expansion in the chemical industry. 1853 saw a vulcanised rubber sole with a fused leather edge which was stitched to a leather upper to produce the first rubber-soled work boot. In 1858, a machine for sewing shoe soles to uppers appeared and, ten years later, a sole/heel unit with embedded nails for direct attachment to leather uppers.

An early item of footwear that exploited the waterproof and hard wearing properties of vulcanised rubber was the wellington boot. Its reputation as a practical boot for adverse conditions was made in the trenches of World War One when more than 1.1 million pairs were produced. This brought it to the notice of the general public and by the mid-1920s it had become the accepted wet weather footwear. Since then, it has acquired steel toe-caps for workers' safety, synthetic rubber soles for oil and chemical resistance, neoprene linings

for comfort, as well as fancy colours and is made and sold all over the world. In the UK, the Hunter 'green wellie' has even become a status symbol and style icon.

The combination of a fabric or leather upper with a rubber sole spawned a number of footwear products by the early 1900s including two that can be considered to be as globally influential as the wellington boot. The first of these was the 'Bean Boot' first produced in 1912 by L.L. Bean. As the promotional literature stated, 'Heavy wet boots were a hunter's only option'. So, the Maine Hunting Shoe design was pure inspiration; a waterproof rubber galosh sewn to a leather top and a concept still widely used as an alternative to wellies.

The second one led directly to the sports shoe phenomenon we know today. This was the plimsoll, first introduced in the late 1800s and later developed into the famous US 'Keds' mass-produced sports shoe in 1917. The concept was basic, a flexible rubber sole bonded to a simple canvas upper. The name 'sneakers' allegedly came about as they were so quiet compared to leather soles that you could sneak up on someone without them knowing. They were also cheap, comfortable and, due to the tough rubber sole, extremely hard wearing.

The concept has since been adapted to specific sporting applications but all with the same simple basic construction. Possibly the most famous of these is the Converse All Star introduced in 1921 as a boot for basket ball players. By the 1960s it had become a favourite item of footwear for generations of Americans. A stage on from the original plimsoll, it nevertheless combined the same virtues of comfort, practicability and value for money—an all time style icon that is still going strong.

TECHNICAL VERSATILITY

So far, we have only considered the use of vulcanised rubber as a basic material on basic products even though these still comprise the major proportion of the global market. It can however be engineered to produce highly sophisticated rubbers offering varying combinations of grip, resistance to slippage and abrasion as well as playing an important part in the overall design package. Creating the modern sole is therefore often a complex process involving many stages before it finally enters the market. The result however, is a sole that can in many respects be superior to almost any other.

Vibram was founded in Italy by Vitale Bramani in 1937 to produce a climbing boot sole with better grip after losing close friends in climbing accidents. The result was the famous Carrarmato sole which had wedge-shaped lugs with a wide base and narrower tread surface. This prevented them from becoming clogged by snow and losing their grip. It not only established the company's reputation but remains a best seller even today.

A major reason for this—besides the fundamental soundness of the original design—is that the company has been able to exploit the flexibility of vulcanised rubber in terms of compound mix. Soles can be made to be firm or soft, rigid or flexible and with a wide range of other physical properties. The Carrarmato has been kept up to date by changing the compounds used so that its range of applications has spread to include climbing, industrial,



Hunter boot.
CREDIT: HUNTER BOOT.



Inspirational Bean Boot.
CREDIT: LL BEAN



Converse All Star, an American icon.
CREDIT: CONVERSE



Carrarmato sole.
CREDIT: VIBRAM



Geox breathable outsole system.

CREDIT: GEOX

casual and even luxury footwear. Today, Vibram is the world's principal producer of high performance soles for every application imaginable and all because of the technical flexibility of vulcanised rubber.

Another Italian company to use vulcanised rubber in a highly sophisticated way is Geox with its breathable sole technology. The concept is, like most successful ideas, in fact quite simple. The sole is moulded with a series of small holes through the bottom corresponding to the highest concentration of sweat glands under the plantar surfaces of the feet. Covering the inside is a section of protective breathable membrane similar to that found in outdoor walking boots.

When founder Mario Polegato first came up with the idea in the early 1990s, his aim was not to increase water resistance but to improve sweat dispersion on conventional everyday footwear. Nobody believed a sole with holes in it could possibly work as it defied all logic. The simple fact is that it works extremely well helped by the dimensional stability of vulcanised rubber and the company has become a

highly successful global brand that uses its clever rubber soles to produce a huge range of comfortable and extremely stylish footwear for everyday wear.

DESIGN POTENTIAL

Vulcanised rubber soles have traditionally been black or various shades of brown and almost always just the single colour. Modern chemical dyes have changed all that and now almost anything is possible from clear and fairly transparent to shades all through the colour spectrum. This has given rubber a fresh lease of life as far as design potential is concerned and led to footwear ranges where startling sole treatments are the main focus of the styling package.

A good example comes from UK company Walk This Way Limited, which makes its Anthony Miles brand in its own factory in China. Here, vibrant colours and multi-part mouldings are combined with clever in-mould mixing during the actual vulcanising process to produce truly startling results as witnessed by the title and closing images of this article.

The sole in the title image is made of two separate mouldings which have locating lugs so that the two parts can be accurately bonded together before being attached to the lasted shoe bottom in the conventional way. Any colour combination is possible plus this clever treatment in the translucent main moulding which has small coloured balls imbedded in it. This is done by sprinkling granules of a much denser

rubber on top of the main biscuit of semi-cured rubber before the mould is closed. Being heavier than the main compound, they sink and disperse as the process of vulcanisation takes place.

The sole on the second image is made by using a mix of small lumps of compound in varying colours instead of a single biscuit. The separate lumps then fuse together as vulcanising takes place. Combined with traditional upper cuts and materials the soles create an exciting new look. Despite being made in China, the cost of the extra moulds and labour involved still makes these soles expensive. According to Walk This Way this has not however proved to be a problem for the style conscious young men who are buying ever bigger quantities since the brand was launched last year.

We can see from all this that not only does rubber as a soling material have a strong heritage but that it possesses a remarkable combination of physical properties that still allow it to be developed further. It also has another big plus in its favour; it is widely perceived by the consumer as being a 'natural' product in the same way that leather is. As a result, it is also regarded as being of superior quality to any other non-leather soling. While this is not always strictly true, it is nevertheless a good cachet to have and one that also means it can command a higher price point at retail. Rubber can look forward to a bright future as, even after all these years, it still has so much to offer. 🌀



Multi-colour sole made by in-mould mixing during the vulcanising process.

CREDIT: WALK THIS WAY