

FOOTWEAR TECHNOLOGY: SELF-LACING SHOES



Video calling, virtual reality headsets and autonomous vehicles – Nike’s newest innovation means self-lacing shoes could be the next science fiction prediction that becomes a reality. While this would certainly be an interesting development, the real focus of the project is to provide athletes with the perfect fit.

If the shoe fits

There can be no doubt that basketball is deeply engrained in the heritage of sportswear giant Nike. Its most famous foray into this market is its Air Jordan range, first conceived for, and endorsed by, US basketball legend Michael Jordan. It remains a crucial part of the brand’s offering more than 30 years after it was first introduced, with the 33rd version of the Air Jordan model released towards the end of last year. It also has partnerships with some of the sport’s modern superstars; the likes of Kyrie Irving, Russell Westbrook and LeBron James have all had basketball shoes released in their honour.

It has not become the market leader in this segment through high-profile athlete endorsements alone. It has always tried to push the boundaries of design with new technologies and innovations in an effort to help basketball players of all levels perform at their best on the court. It has labelled its latest invention, an adaptive lacing system, its “most advanced fit solution to date”.

Stranger than fiction

The issue of fit is one that Nike has focused on for a number of years, starting back in the early 1990s with its Air Huarache model that had a special construction to offer dynamic fit.



There are two buttons on the side of the shoe: one tightens the lace system and the other loosens it. The wearer can also operate it via a smartphone app. The laces are wound by a mechanism in the base of the shoe. The intricate configuration beneath the upper has been designed to offer a comfortable fit.

 Nike

Developments in the years since have included its Flyknit upper construction and an “adaptive lacing system” that was first unveiled in the HyperAdapt 1.0 shoe in 2016.

Many reports at the time drew comparisons with the self-lacing shoes worn by Michael J. Fox’s character in cult science fiction film, ‘Back to the Future Part II’. Released in 1989, the film was set in a fictional version of 2015, where

wearable technology, flat-screen televisions and tablet computers were already in widespread use. One scene shows Marty McFly, portrayed by Fox, putting on a pair of Nike-branded shoes that automatically tighten once his feet are inside. The brand subsequently developed and released a shoe that bore a striking resemblance to this futuristic design.

The motorised lacing system of the HyperAdapt 1.0 was operated by a button on the side of the shoe. Nike said it was also working on a version that could do this automatically. This is where its latest creation, the Adapt BB basketball shoe, comes in. Unveiled in January, it is the first product to feature Nike Adapt, the company's new fit technology that works using an advanced lacing system and an accompanying smartphone application.

A smart solution

The heel of the Adapt BB shoe contains an accelerometer and gyroscope, a Bluetooth sensor and a battery that can be charged wirelessly and is said to last between 10 and 20 days. A motor in the middle of the shoe winds the intricate lacing system at the touch of a button. Nike has said the underfoot lacing can pull around 32 pounds of force, equal to the force of a standard parachute cord. This is enough to secure the foot through a range of movements. There are two buttons located on the side of the shoe, one tightens the laces and one loosens them. The configuration of the laces was chosen to ensure the shoes tighten in a way that does not squash the toes or rub the instep, for example.

Using the smartphone application, the wearer can record how tight or loose they prefer their shoes to be. Their preferences will be saved, allowing the tightness level to be recreated at the touch of a button or the tap of a smartphone screen. There is also a custom fit option.

The technology embedded within the shoes can work out the perfect fit for that specific wearer. Once this has been locked in, when the player puts their foot inside the shoe, a custom motor and gear train senses the tension needed and adjusts accordingly to achieve the right fit.

The shoe's upper is made from Nike's Flyknit knitted material. Recent advances in the use of this technology have seen the use of a new knitting process that allows the upper to be

Nike chose basketball for the first use of its Adapt technology because of the dynamic range of movements required in this sport.

 Nike



created in a 360-degree form that wraps the whole foot. This is designed to offer greater support and control for the wearer. It also offers a lighter, more breathable shoe. In the Adapt BB shoe, the upper encases an inner mesh shell. The midsole contains the company's proprietary cushioning foam.

Dynamic demands

Nike chose to apply its Adapt lacing system to basketball first because of the moves that the sport requires. This variety makes fit especially important. The frequent time-outs that occur were also a factor, because they mean periods of high intensity are interspersed with rest periods when the demands on the shoes change.

"We picked basketball as the first sport for Nike Adapt intentionally because of the demands that athletes put on their shoes," explains Eric Avar, Nike's creative director. "During a normal basketball game the athlete's foot changes and the ability to quickly change your fit by loosening your shoe to increase blood flow and then tighten again for performance is a key element that we believe will improve the athlete's experience."

With these factors in mind, it has been made possible for users to input multiple different fit settings into the smartphone app, allowing them to define their preferred tightness in different situations. For example, they can pre-set a specific tightness for warm-ups. The button system for operating the laces also makes it easier to loosen the shoe during a time-out, before tightening it again once the game restarts.

The ultimate test

The Adapt BB shoe is the "most tested" shoe in its history, according to Nike. It has offered a reasonable amount of detail about the tests the product underwent during development. Among the specific trials it has mentioned are: 2,900 continuous lacing cycles from tight to loose, 40,000 button presses, 300 miles of running, testing in 140°F (60°C) and 85% humidity, and being doused with nearly 80 gallons of water in three minutes.

The final product has been put through its paces by a number of high-level players, including Boston Celtics small forward Jayson Tatum, who wore it during workouts and practice games at Nike's headquarters in Oregon. The company describes positive feedback from athletes such as Mr Tatum as "the ultimate stamp of approval".

Nike believes the Adapt BB can be the first "continually updated performance product" in its catalogue. Its explanation is that by releasing frequent firmware updates for the technology it will be able to hone the quality of the fit. In



Puma platform prioritises performance

Just a few weeks after Nike presented the Adapt BB shoe, rival sportswear maker Puma unveiled its own performance fit platform. It calls this technology Fit Intelligence (Fi) and is initially launching it in a training shoe designed for workouts and light running. It employs a micromotor that operates a specially configured cable system that tightens the shoes. This can be activated by simply swiping up or down over a module located on the top.

The brand has said the technology comes with "a smart sensing" feature that is capable of learning the shape of the foot of individual wearers and then adapting the fit to that specific foot. Athletes can also monitor, adjust and finetune the fit using an accompanying smartphone application.

Puma has long been exploring the issue of laceless shoes. In 1968, it unveiled its first sports shoe that fastened with Velcro straps and in 1991 its Disc model featured the first cable closure. It describes the AutoDisc shoe, released in 2016, as "the first ever wirelessly connected adaptive fit shoe". This model is the predecessor of Fit Intelligence. The difference now is that the technology is smaller and lighter. In addition, Puma has incorporated a breathable upper and a support system that is positioned so as to offer more control.

Fit Intelligence was unveiled at an event in Hong Kong. The next stage of development will see Puma invite "tech-savvy" customers to test the technology. The testers will be asked to give feedback on the usability, design, engineering and wearability of the shoe, which will help the system's development.

addition, it says the data the brand receives from the shoes and its smartphone app will help it make better products in the future.

It hopes to apply the Adapt system to a wider range of sports and lifestyle products, each of which will have their own unique demands in terms of fit. Michael Donaghu, Nike's vice president of innovation, says: "Our long-term vision for innovation at Nike is a world in which intelligent products adapt at the speed of sport to improve an athlete's performance." 