

## RISE TO THE CHALLENGE: RS SCAN AND MATERIALISE

Advances in 3D printing mean two Belgian companies are now able to bring their knowledge and expertise together to form a new joint-venture company and produce personalised insoles that have already won the admiration of world record marathon runner Paula Radcliffe.

# Gait-crashers can help bring Paula Radcliffe back to the party

**E**arlier this year, on a mild autumn morning, at a low-key event in Worcester in the West Midlands of England, Paula Radcliffe holder of the women's marathon world record, did something she had not done for more than two years: complete 10 kilometres in a competitive race. She finished third, but winning the 2014 Worcester Road Race was far from her main objective on the day: Ms Radcliffe is on the comeback trail.

One of the great home hopes for a medal at the London 2012 Olympics, Paula Radcliffe had to withdraw after a persistent injury problem in her left foot flared up in the weeks leading up to the event. "No-one tells us in advance where the limits of our own bodies lie," she said on announcing that she was unable to take part. "Pushing these limits is the only way we can ever achieve our highest goals and dreams. My sport is a beautiful sport. It gives me so much fun and enjoyment. The downside is that it can break your heart and spirit many times over."

It sounded as though, having reached her late 30s and less than confident about regaining full fitness, she had decided to end her career. However, a partnership between two Belgian companies, advances in 3D printing techniques and a new method for making personalised "dynamic" insoles that match the feet and running style of the individual, plus a desire to make the London Marathon in 2015 her swansong, have combined to convince her to start competing again.



### Help from Belgium

A key element in this story is RS Print, a new joint venture set up earlier this year by 3D printing services provider Materialise and an existing long-term partner, specialist foot scanning technology provider RSscan International. RS Print has created customised insoles that are supporting Paula Radcliffe's comeback programme and are about to become much more widely available to athletes in all sports and of all levels of ability.

The scanning method is the one RSscan International has been using for some time, explains RS Print chief executive, Dennis Vandenbussche. Pressure sensors are inserted

*RS Print says its new dynamic insoles take personalisation to a new level.*

 RS Print



*Paula Radcliffe racing in the 2011 Berlin Marathon, part of a preparation for the 2012 Olympic Games in London that ended in tears. After more than two years, she is now making a comeback, thanks in part to new-generation insoles from RS Print.*

 *Ramon Smits / Wikipedia*



*Pressure sensors in the floor can help build up high-frequency measurement of the dynamic movement of an athlete's feet.*

 RSscan International

into a plate or floor, and just by inviting an athlete to run or walk over the surface, the system can build up what he calls "high-frequency measurement of the dynamic movement of the feet". You can cover the plate with wood, plastic, tarmac, synthetic grass or any other surface you like to get as close as possible to imitating competition conditions. "This gives us a big advantage in analysing the gait of any runner," Mr Vandebussche says. "The user can run like he or she does outside and we can get much closer to a real application than you can with a treadmill, for example."

### In-store analysis

RSscan International's business model is to set up testing facilities like this in the shops it runs in three locations in Belgium: at its headquarters near Beringen, in Antwerp and in Ghent. Members of the public can come in, have their gait analysed and have staff in the shops recommend shoes that will fit best and work best for their particular needs. The shop in Antwerp has a facility called the ProLab, in which elite athletes can receive dedicated help with particular foot and footwear challenges. This, in fact, was how the company came to have contact with Paula Radcliffe.

Around 200 elite athletes from all parts of the world avail themselves of the services on offer at the Antwerp facility every year. Other big names who have made use of the ProLab in recent years include Olympic men's triathlon champion, Alistair Brownlee, women's triathlon silver medallist in 2012, Lisa Nordén, Belgian basketball star Ann Wauters and high-jumper Tia Hellebaut. Often, prominent athletic footwear brands are instrumental in pointing

their sponsored athletes in the direction of the RSscan International ProLab in times of injury and the Belgian company has paid many of the brands back by supplying important, detailed product development information.

### A long wait for the market to be ready

The company began talking to Materialise about developing a 3D printing project for insoles in 2008, but it was only in 2014 that they set up RS Print together; the market is now ready for products of this type, the joint venture's chief executive says, and 3D printing techniques are mature enough now for production to be viable.

RS Print insoles are in two parts: the first is the 3D-printed part, which comes out as a thin, lightweight, hard plastic polyamide after filtering through the Materialise 3D printing system in powder form. The second part is a top layer, which is typically in polyurethane or EVA and is there for comfort. Glue them together and you have your insole.

*RS Print insoles are in two parts, a top layer for comfort and, the clever part, a thin, lightweight 3D-printed layer underneath.*

 RS Print



### Personalisation goes further

"It's not new to carry out a dynamic analysis of a runner's gait," Dennis Vandebussche explains. "But what is new, what is happening here for the first time, is that we are using all the information from the scans in a very controlled way to make a product that has intelligence inside the insole. We can link the information we build up about a particular person and about a particular foot to the digital design of each 3D-printed insole, putting all the information the scans have made available inside the insole. Each insole is a completely personalised product. Personalisation here goes much further than before."

The way we bring our feet into contact with the ground can clearly say a lot about us, if you know how to analyse the data. Officer candidates for the UK army provided RS Print with an interesting case study for its business idea. Young people selected as potential officers have to undergo an intensive period of physical training and RS Print carried out gait analysis on one group before the training programme began. It used the information to put the candidates into three groups: high risk of dropping out before the end owing to physical problems, medium risk and low risk. "The pre-assessment was confirmed by the fall-out rates in the three groups," Mr Vandebussche says. "Then we did a follow-up study, providing some of the people in the high- and medium-risk groups with personalised insoles to use during the physical training. This resulted in a 65% improvement in drop-out rates."

### To mimic a bicycle

RS Print will continue to focus on feet, but the chief executive says an idea to have emerged recently from the work his company has done is that it will also be able to analyse fully what happens when a cyclist rides a bike in a race. And by mimicking what is going on on the bike, the company will be able to develop cycling-specific insoles. He is also interested in developing products for sports such as tennis and badminton, which he says are characterised by "very short movements often on a very aggressive surface". His company will be able to make a difference to athletes at the top

of those sports by providing them with special, targeted, personalised support in a very thin insole. "We understand athletes," he says. "We have a good, young team here and almost all of them are runners themselves, and that helps us."

### International expansion

RS Print's customers are retailers rather than individual runners or sportspeople, with the RSscan International shops in Belgium the most obvious examples. Other retail groups in Belgium and the Netherlands have begun to use

RSscan International technology. "What we want now is to help those retailers upgrade," says Dennis Vandebussche, "to allow them to order insoles for their clients from RS Print. They are using the scanning technology to help their customers choose shoes already and they will be able to use the same technology to order personalised insoles too. They can have the insoles in two weeks. We will expand the service to these other shops in Belgium and the Netherlands before the end of 2014 and, next year, expand it further to retailers in other countries too." 



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