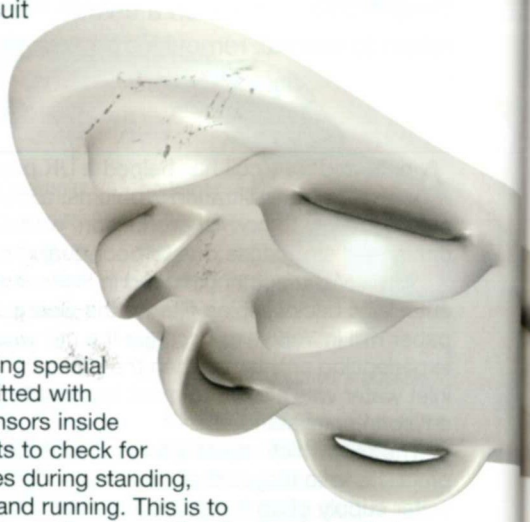
Rapid prototyping scores well on all fronts

The goal of mass customising manufactured goods to suit individual tastes is nearing reality. One firm is using laser sintering technology to tailor the design of football boots for individual players. Dean Palmer reports



The term 'mass customisation' stands for the idea of creating bespoke products in the price range of competitive, mass-produced products. Many manufacturing firms are acheiving this target with the help of IT and software.

The same concept can be applied to three-dimensional products by driving manufacturing direct from 3D CAD data.

The idea is that you create a basic design of a product – equivalent to the basic letter, or in 3D, a basic design of sports shoe outsole – the personal data is then integrated, for example, the shape of a foot and the name of a person. Finally, the two are linked to produce the 'individualised' outsole by laser sintering, with the person's name already written into it.

For Prior2Lever (P2L), laser sintering was the last missing link in the company's puzzle to make its business idea fly – the production of bespoke, high performance footwear for professional athletes. The vision of the founders is to allow for individualised, functional footwear to improve performance and at the same time to prevent injuries.

The firm has harnessed layer-by-layer fusing of plastic powder in an EOS laser sintering machine to manufacture the soles of the bespoke boots.

One leading Premiership player has already benefited. The individual, who unfortunately has to remain nameless for legal reasons, underwent an operation in 2003 for a foot injury and was subsequently injured several more times. Since wearing the P2L boots he has noticed an improvement in performance and is back training and competing for a first team place. P2L will also be working closely with Olympic athletes in a number of different disciplines.

The unusual name of the bespoke footwear manufacturing firm hints at the manufacturing process. It starts with the first director, Trevor Prior, consultant and podiatric surgeon and a globally renowned foot and biomechanics expert who treats Premiership players.

Prior assesses players at his London-based clinic using special insoles fitted with force sensors inside test boots to check for anomalies during standing, walking and running. This is to identify the optimum position for the person's feet for any given sport. By scanning a sequence of plaster of Paris casts of the feet, which are more accurate with each iteration, orthoses are prepared and tested. Finally, each foot, together with the orthoses, is digitally scanned.

From CAD to prototype model

The resulting point cloud data is passed to Prior's colleague, creative director Greg Lever-O'Keefe, who holds a masters degree in performance sportswear design at the University of Derby and whose PhD dissertation will be based on this work.

He converts the data into a solid CAD model, which in turn is used to CNC-machine a wooden or plastic last around which the boot is made.

The top part of the CAD model is flattened and post-processed to laser-cut the leather upper, which is stitched to the bespoke outsole that has been laser sintered.