3D Printing in the Apparel Sector: How Environmentally Sustainable is it?

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INTRODUCTION

3D printing is a process of making three dimensional (3D) solid objects from a digital file. The object is made using an additive process, which means that successive layers of material are laid down until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. The process enables complex shapes to be produced, using less material than in traditional manufacturing methods.

3D printing processes are being used in manufacturing, medicine, architecture, custom art and design. Applications in textiles range from fashion and sportswear to medical devices and aerospace.

3D PRINTING IN THE APPAREL SECTOR

USA-based Alvanon is a company which specialises in garment fit, and the company did some research into how fashion businesses are using 3D technology to improve their processes. It discovered that, although companies hoped 3D would help to shorten lead times, this did not happen initially. Also, it was hoped that the use of the technology would result in the elimination of physical sample production. It is true that fewer samples are now being produced, but this stage has not been completely eliminated.

3D PRINTING COMBINED WITH AUGMENTED REALITY (AR)

Augmented reality (AR) is a type of technology which superimposes a computer generated image on to a user's view of the real world. Through the use of advanced 3D AR, samples can be produced digitally, and users are able to try garments on virtually. A number of apparel brands, including Burberry, are using the technology.

3D PRINTING COMBINED WITH ARTIFICIAL INTELLIGENCE (AI)

USA-based Body Labs is a tech company that develops artificial intelligence (AI), which was purchased by Amazon in October 2017. The company creates 3D models of real people from photos, and claims to achieve "better than 2 cm accuracy" from the images it produces. The Body Labs demo shows people using a selfie to connect them to "shape doppelgangers" on Instagram in clothes which "look good".

Footwear brands which use 3D printing include:

- **Adidas** - In 2015 the company launched Futurecraft 3D, a 3D-printed running shoe midsole which can be tailored to the cushioning needs of an individual's foot;
- **Nike** - In 2013 Nike Football debuted the Nike Vapor Laser Talon with a 3D printed plate which, the company claims, improves a footballer's "zero step" (the step taken when gaining control of the ball);
- **New Balance** - In 2013 New Balance announced the use of 3D printing to produce spike plates customized to the individual needs and desires of their elite athletes.

It should be noted that:

- 3D Printers use a lot of energy – although not as much as, for example, a clothes dryer in your home;
- 3D printers can release toxic chemicals in the air – ultra fine particles which can be breathed in. However, building an enclosure will keep the fumes from being emitted into the air; and
- 3D printing on demand and rapid prototyping can potentially lead to an increase in the number of disposable consumer products, which is not environmentally sustainable.

However, in terms of environmental responsibility, 3D printing has a number of advantages including:

- reduced waste – additive manufacturing means no offcuts of materials;
- reduced cost – fewer wasted materials;
- reduced water pollution – due to no dyeing, or finishing processes;
- reduced air pollution – in contrast with traditional textile processing;
- reduced capital required – set up costs are lower and less complex;
- faster innovation – reducing lead times;
- faster prototyping – enables design amendments to be made quickly and cost effectively;
- on-demand production and small runs – in contrast with traditional manufacturing;
- simplified supply chain and logistics – new parts can be made onsite;
- revolutionized retail experience - products can be made and repaired onsite; and
- reduced emissions and distribution costs – garments can be manufactured on site.

3D printing also enables:

- functionality in a single garment – such as water- and stain-repellence;
- smart functionality in a garment – such as heart monitors in sportswear;
- customization in small quantities – in contrast with traditional manufacturing; and
- smaller manufacturing operations to compete – localizing production facilities.

CONCLUSION

The benefits of 3D printing have some way to go in the textile and apparel industry before they are fully realized – but brands are innovative. Those which use technology to improve their environmental sustainability will benefit not only from increased efficiency and reduced costs, but also from an enhanced reputation among their workforce and their consumers. 3D printing is not yet mainstream, but its place is secure in the more sustainable textile and apparel sector of the future.