



The Future of Footwear

Technology and innovation create new possibilities every day, but few industries are as prone to such high speed development as the footwear industry.

Smart technology, material innovation, connective fabrics and sustainable alternatives to the materials known to us today - these are just a few developments that are conceived in the footwear industry on a daily basis. Be it known and respected brands or young brash and innovative new brands, they all contribute to an industry that often sets the standard for other industries to follow.

At Stahl we work closely with OEM's in the footwear industry on a wide range of projects for example, committing to Manufacturing Restricted Substances Lists (MRSL) for textile and leather processing, or creating new innovations and material collections for cutting-edge footwear labels.

This is why we follow developments and trends in the footwear industry with great interest. One of our partners is the SLEM international innovation and education institute for footwear and its founder, renowned trend forecaster Nicoline van Enter. She has recently developed a trend forecast for footwear, where technology and innovation shape the future. Here are some of Nicoline's future trends in footwear:

1: Soft sensor networks

In the near future shoes will basically evolve to become wearable data centers that monitor our body and arrange its interaction with the outside world. This is done through so called soft sensor networks: circuits of flexible sensors that are embedded in the upper and/or (in) sole and are programmed to measure specific data, which is then sent to an external device, such as a watch or a mobile phone. This way we cannot just monitor injuries but also prevent them from happening, which is especially useful for diseases that greatly affect the feet, like diabetes.

2: Footwear internet of things

Shoes will become part of the Internet of Things: the network of physical objects that are embedded with electronics, software, sensors, and network connectivity to enable them to collect and exchange data. Shoes are highly useful for this, since most people wear them during the day and they can offer more space for electronics than a mobile device. For now, we mostly find interactive shoes that have GPS, heating, pedometers, musical or massage functions and automated fastenings, but we are expecting more advanced options that, for example, stimulate the nerves in the feet to improve health.

3: Alternative leathers

Leather is still the most popular material for footwear, but in some cases its environmental footprint can be improved. That is why designers are looking for different kinds of leather and new ways of tanning and finishing. For instance, we see interest in using parts of the animal that are usually discarded, such as the stomach (top row). Or we find new fish leathers, which some consider to be more sustainable, since fish skin is considered waste of the fishing industry. These scaled leathers are very fragile though. That is why natural tannins and dyes could be a better option, like prints made with algae that change color over time.

4: Leather alternatives

The search for leather alternatives that do not involve any killing of animals is growing. Alternatives that are mainly derivative of the plant based family with these earthy options of fruit, palm, mushroom, pineapple. Also the seductively named `insect wood` made from sericin, a natural glue that silk worms produce. Many of these plant-based leathers are not always very suitable for footwear though, because they can tear easily and will need backing. Having to glue them to a backing does not improve sustainability, so more alternatives are needed.

5: Biologically interactive

The biggest promise for the future, however, are materials that are biologically interactive. This means they use bacteria or other natural components to generate interactivity. For instance, MIT and New Balance came up with Biologic (top left), a material infused with bacteria that release or contract influenced by heat. When your body gets hot and sweaty the panels open and when you cool down they close. Another MIT scientist, Neri Oxman, creates 3D printed materials using bacteria so they actually have their own metabolism and can convert daylight into consumable sucrose.

6: 3D printed flexible fabrics

It will be a while before we see new biotech materials on the market, until then there is still more than enough to explore with regular 3D printing. For instance, as we find more flexible materials for 3D printing we also find printers used to create all kinds of stretch materials that look like new kinds of knitwear. They can either be printed in sheets or these 3D structures can be used to construct an entire shoe. At SLEM we are generating a lot of these materials to create shoes with and also experiment with 3D printing directly on textile, not just for aesthetic but also for functional reasons.

These are just a couple of examples of innovations from the SLEM Future of Footwear forecast, if you are interested in the full forecast you can download it [here](#) or contact Nicoline van Enter from SLEM at nicoline@slem.nl. If you would like to discuss chemical technology to support those concepts then we will be more than happy to join you in your search for the best solution possible. We would love to hear your thoughts and ideas.