

Development of shoe tree prototypes using 3D printing



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Sector: Consumer goods

Challenge: Using 3D printing techniques to manufacture shoe trees and avoid current subtractive manufacturing techniques.

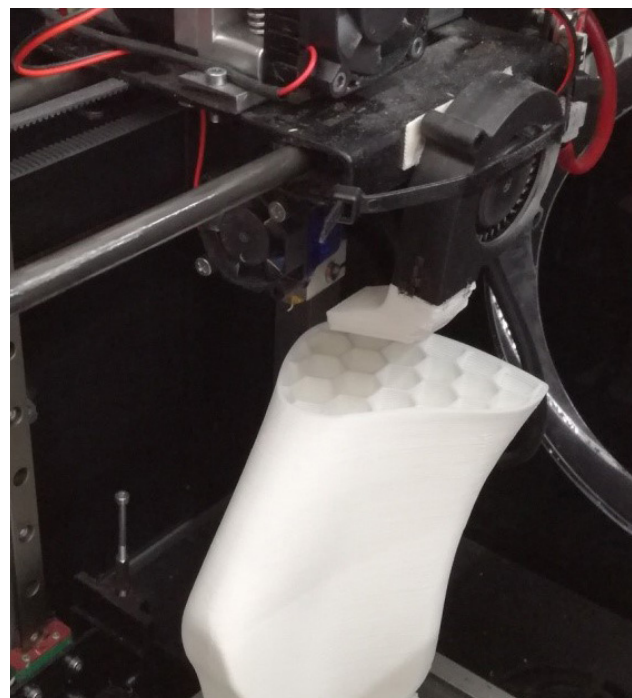
Solution: Introduction of 3D printing techniques in shoe factories to produce shoe trees for samples, thereby reducing costs and time.

CHALLENGE

Subtractive techniques consisting of numerical control lathes and special milling machines are the current traditional method used to manufacture shoe trees for shoe production. Although the manufacturing processes have been refined and improved with automation and new materials, they continue to be based on a subtractive technique. This technique generates waste material by stripping shavings from the initial dowel until the desired shape is obtained.

However, there are new additive manufacturing technologies, which consist in manufacturing objects by depositing material in layers that then solidify and shape the object to be manufactured. These techniques only use the necessary material and generate very little waste.

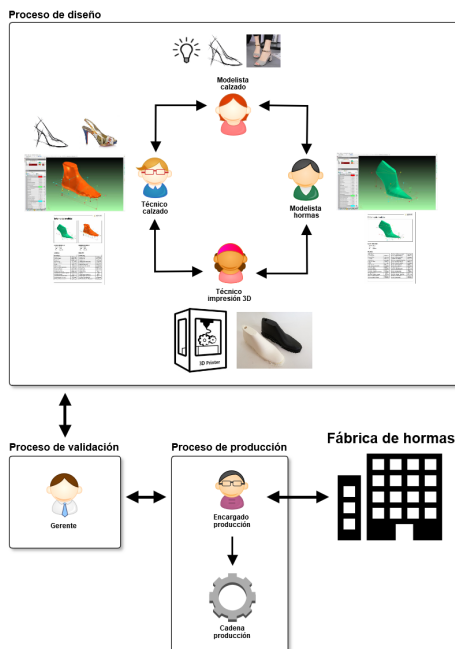
Therefore, the challenge consists in implementing 3D printing techniques in technical shoe designing departments to enable the manufacture of shoe trees that can be used to develop shoe samples. This process proposes a new work scenario and redefinition of the relationship between shoe and shoe tree manufacturers.



SOLUTION

3D printing techniques applied to shoe trees can contribute high value to the shoe manufacturing process. The inclusion of 3D printers and qualified staff in technical shoe manufacturing departments currently makes it possible for the design team to use physical shoe trees on which to design their models quickly and reliably, without having to leave the office.

This can be done by providing shoe manufacturers with CAD tools to view their shoe trees and modify them virtually and with tools to design models. A printing machine and filament are also needed. INESCOP offers the option of working with two interconnected systems: the ICadFOR system for dimensional control of shoe trees and the ICad3d+ system to design virtual models.



ICadFor can export shoe tree shapes that meet the necessary technical requirements for 3D printing, offering polygonal meshes that follow the general guidelines set out below:

- All the objects must be solid and have volume.
- All normals must point to the exterior of the object.
- All elements must be connected, without gaps. There can be no bare edges inside a mesh or between the meshes that form the closed object.
- There can be no duplicated or overlying triangles.
- Part thickness cannot be over 0.8 mm in FDM printing.

ADVANTAGES

The characteristics of this technology make it possible to obtain shoe trees for samples that are completely functional, with tests performed in suitable companies of the sector. Both normal and articulated shoe trees undergo all types of pressure, temperature changes and impacts derived from the assembly process without suffering damage.

However, this new manufacturing process is not currently a suitable replacement for traditional manufacturing using machining units and polyethylene, but a supplement that benefits shoe manufacturers and makes communication with shoe tree manufacturers more efficient. To begin with, these are the main advantages derived from using additive manufacturing for shoe trees:

- Streamlining the model and sample development processes.
- Improving decision-making.
- Preventing mistakes in more advanced stages of production.
- Saving production time and transport costs.
- Improving environmental sustainability.
- Generating skilled jobs by moving "shoe tree" experience to shoe manufacturing companies.
- Moving the footwear industry towards new technologies.
- Modernising companies with a low investment and very fast return on performance.

