Investigation of the peculiarity of creation of cylindrical design elements for 3D printed heels

Rugilė Kemžūraitė, Raimonda Cvilkaite, Edita Gelažienė, Daiva Milašienė
Kaunas University of Technology, Faculty of Mechanical Engineering and Design, Department of Production Engineering

Introduction

- Recently, shoe designs have become even more complex and unique in appearance.
- When creating a product with a more geometrically complex design, it is necessary to take into account the peculiarities and possibilities of 3D printing technology.
- The aim of this work is to investigate the influence of geometrical parameters of cylindrical design elements for footwear heels on the resistance to compressive loads.

Materials and Methods

- The design elements that were investigated were designed using the “SolidWorks” software with “Simulation” function (static analysis).
- The polymeric material Polylactic acid PLA+
- Design elements were loaded with 600N, 800N, 1000N and 2000N force.
- The finite element mesh was created using element size of 1.25 mm, and a tolerance of 0.0625 mm.

Results

- A theoretical compression simulation was performed to examine how the investigated cylindrical design elements would respond to compressive loads during wear.
- The increase in pillar height from 20 mm to 40 mm does not influence the distribution of the von Mises stress.

Conclusions

1. This study showed that by creating cylindrical design elements for 3D printed heels, one needs to know that the influence of geometrical parameters on the values and distribution of the von Mises stresses and displacements differs in the case of straight and concave pillars.
2. It was found that in the case of concave models, both the height and diameter of the concave pillar at the thinnest point influence the zones of distribution of von Mises stress and displacements.

Influence of compressive load on the results of static analysis of created pillar design elements of different heights and variants of pillar concave

Influence of compressive load and pillar heights on the results of static analysis of created pillar design elements (variant A)

Results of the static analysis of concave pillar design elements for heels (the load force of 600 N) with different column heights (20, 30, 40 mm)