FUNCTIONALIZATION AND SUSTAINABILITY OF CONTEMPORARY KNITTED PRODUCTS

Alenka Pavko Čuden

University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Textiles, Graphic Arts and Design, Aškerčeva 12, 1000 Ljubljana, Slovenia, e-mail: alenka.cuden@ntf.uni-lj.si

Abstract: Modern technologies and sustainability concepts play an important role in today's knitting industry. Knitted products are no longer »just« knitted products. The synergy of function and appearance is of great importance. The functionalisation of knitted fabrics and knitwear aims to both improving the original properties and adding new functions to the material and the end product. Functional properties can be achieved either through material, structural/mechanical or chemical functionalisation. At the same time, the movement towards sustainability is an important shift that affects all industries, including the textile and apparel industry and the knitwear industry within it. Contemporary knitting materials are designed for reuse or recyclability. After the first life cycle is over, the second can begin through upcycling. Materials such as wool, which have not been used for sportswear for a long time, are revived. The use of natural resources, energy and chemicals has also been minimised. Materials that were inseparable from knitted structures for decades, such as elastane, are now problematic due to recycling difficulties. New solutions to achieve the stretchability and elastic recovery of knitted structures must be achieved in a different way, without additional elastane, by so-called “mechanical stretch”. Modern knitting machines are designed to work efficiently with sustainable and environmentally friendly materials and to knit materials that were previously impossible to knit. Another focus is the reduction of waste in the knitting process. This can be achieved through the specific features of the knitting machines for the production of seamless or all-in-one knits, i.e. waste-free knitted products on the one hand and additional quality assurance and fabric fault prevention through the use of artificial intelligence on the other. Therefore, three-dimensional knitting technology is on the rise and enables the production of integral and seamless products and intricate 3D structures, resulting in less waste and more comfort and performance of the finished products. Intelligent functions, e.g. sensors and data analysis based on artificial intelligence, are used for quality control and process optimisation. The space required for manufacturing and storage in knitting production has been reduced, e.g. by merging production phases and processes such as hybrid spinning-knitting. Automation is increasingly being integrated into knitting machines to rationalise the production process and improve efficiency. Robotisation has also been introduced, initially in sock finalisation and more recently in flat weft knitting. Efforts to reduce energy consumption in manufacturing processes have influenced the design of knitting machines. Manufacturers are looking for ways to make machines more energy efficient without compromising performance. Sustainability always involves the issue of fair production and fair trade.

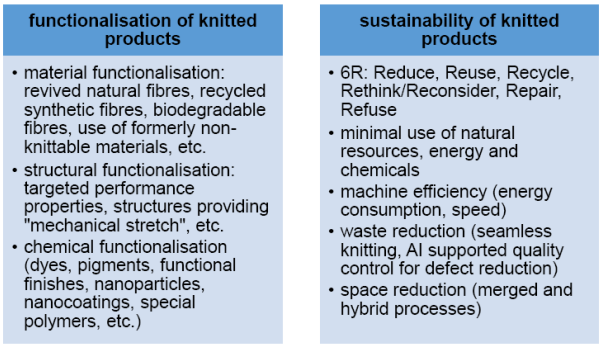

Figure 1 Functionalization and sustainability in contemporary knitting

The paper provides an overview of the versatility and complexity of knitting today, the trends towards functionalisation and the potential for sustainability, based on a literature review and presentations at recent trade fairs: Itma, Techtextil, Ispo and Performance Days.

Keywords: *knitting, knitted fabric, knitwear, functionalisation, sustainability.*

REFERENCES

[1] Kumar Singh M. Textiles Functionalization - A Review of Materials, Processes, and Assessment [Internet]. Textiles for Functional Applications. IntechOpen; 2021. Available from: http://dx.doi.org/10.5772/intechopen.96936

[2] Maity S, Singha K, Pandit P. Functional and technical textiles. San Diego: Elsevier Science et Technology; 2023.

[3] The loop [Internet]. PERFORMANCE DAYS. [cited 2024 Apr 3]. Available from: https://www.performancedays.com/loop/focus-topic/2020-12-nothing-to-waste.html

[4] The loop [Internet]. PERFORMANCE DAYS. 2024 [cited 2024 Apr 2]. Available from: https://www.performancedays.com/loop/material-blog/material-stories.html