

UDC
687.11

GALYNA RIPKA, OLEXANDR VOROBIOV, DMYTRO
IGNATOV, VITALIY NIZIN
Volodymyr Dahl east ukrainian national university, Ukraine

RESEARCH ON THE CURRENT STATE OF RUNNING SOCK MANUFACTURING ISSUES

Purpose. *Enhancing running socks through the implementation of nanotechnology.*

Keywords: *Knitwear, running socks, odor-reducing fibers, sports activities, nanotechnology.*

Introduction. To analyze contemporary challenges in the use of running socks and investigate functional zones to determine their placement and purpose. Additionally, to conduct research on fibrous nanotechnologies.

Methods of research. Evaluation of changes in operational characteristics was performed following established standards and using TI-1M and PR-2 devices.

Research results. Running socks help establish a connection between the feet and running shoes. Therefore, they should possess several special features: reinforcement in areas of high wear and tear, fibers with moisture-wicking properties, breathable knitting, and a unique design to support the arch. Blisters typically occur after extended running sessions or on long distances, primarily in areas prone to friction, heat, and moisture. The main task of running socks is to address these three factors. Socks are made from synthetic fibers such as nylon, acrylic, polyester, Coolmax, or with the addition of Merino sheep wool.

Additionally, running socks should incorporate antibacterial fibers to prevent unpleasant odors after sports activities, reduce the proliferation of bacteria on the feet, and minimize bacterial growth. For example, silver ions integrated into the fibers inhibit bacterial growth when the temperature rises inside the shoe.

The authors of this work examined the quality of the functional zones of Marathon running socks produced by X-Socks (Switzerland) [2-3]. It was determined that these socks feature innovative technology for foot envelopment,

which softens the effects of pronation and supination. They do not slide down, do not constrict, and adapt to any size thanks to self-regulating elastic bands. Ventilation and rapid drying are achieved through ventilation channels on the inner side. The toe, instep, and toe-tip protection system warms and softens the impact of loads while running.

The socks have an anatomically-shaped insole for a secure foot fit, and the Achilles tendon protector reduces the risk of chafing and pressure points from footwear. A special protector on the heel reduces the risk of blisters. The transverse channel system on the sole effectively ventilates and wicks moisture away. In all models of X-Socks socks, approximately 15 technologies are utilized. Each technology serves a specific function, and their combined use results in an effective outcome. Marathon running socks incorporate 12 patented technologies (Fig. 1).



Fig. 1. Schematic Placement of Technologies in Marathon Socks:

- 1) self-adjusting cuff; 2) airconditioning channel; 3) supronations bandage;**
- 4) instep protector with airvent zone; 5) airflow ankle pads; 6) toe protector;**
- 7) toetip protector; 8) lambertz-nicholson achilles tendon protector; 9) heel protector;**
- 10) aircool stripes; 11) traverse airflow channel system; 12) anatomically shaped footbed [3]**

Running socks X-Socks Marathon are ideal for individuals whose feet tend to roll inward (pronation) or outward (supination) during running, as well as for those with a neutral foot placement. The supination bandage supports the ankle and

protects it from twists. They are suitable for long training sessions and marathon distances.+

Conclusion. Running socks have several quality and functionality requirements. They are primarily made from synthetic fibers, which must include antibacterial properties to prevent unpleasant odors after sports activities and reduce the proliferation and spread of bacteria on the feet. They should also dry quickly, maintain their shape through multiple washes, keep feet dry and warm, offer effective thermoregulation, remove moisture, provide comfort (e.g., through flat seams or cushioned areas), have reinforced sections (e.g., heel, arch, toe), offer high breathability, prevent blisters in various areas of the foot, provide elasticity, and protect the ankle.

This problem remains relevant and requires further research, as achieving a long-lasting deodorizing effect will enhance the durability of running socks during prolonged training sessions.

References

1. Development of elements of an automated technological design system for products manufactured on circular hosiery machines: Abstract of dissertation for the degree of Candidate of Technical Sciences: 05.19.03 / L. Halavska; State Academy of Light Industry of Ukraine. Kyiv, 1999. 20 p.
2. Ripka G.A. Analysis of design and engineering technologies for modern knitwear. / Ripka H., Vorobiov O., Sheludchenko H., Filippov D. // Proceedings of the V International Scientific-Practical Conference "Current Issues of Modern Design," Kyiv, April 27, 2023: Kyiv National University of Technologies and Design, 2023. Vol. 1. P. 249-251.
3. Official website of X-Socks company. Available atURL: <https://www.x-bionic.com/de/x-socks>.