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RuDiNe – Circular knitted, diagonally reinforced high-performance mesh structures

Objective

In standard circular knit mesh structures, the reinforcing weft thread runs in a zigzag pattern and changes direction after a certain number of mesh connection points. At the deflection points, it undergoes considerable bending or kinking, depending on the net binding and tension. High performance fibres are characterised by high tensile strength and tear resistance with low elongation. In order to exploit their full potential, a linear application of force is essential. Bending or buckling results in lateral forces that cause a significant loss of tensile strength. In order to exploit the full potential of high-performance fibre fabrics, the weft thread must therefore be as straight as possible.

Approach and results

As part of the research project, a technology for the production of high-performance mesh structures with diagonal weft threads was developed. The focus was on the development of the necessary machine technology and the production of new mesh structures. In the course of the project, various test samples were produced using different materials on a circular warp knitting machine. A 0.25 mm fibre optic cable was integrated into a polyester net as a diagonally circulating standing weft thread and compared with a zigzag thread pattern.

A microscopic analysis revealed a higher light density at the deflection points in the conventional course, whereas the straight thread path enabled a uniform light output and damage-free integration of sensitive fibres. Test samples made of aramid and Dyneema® showed up to 35 % higher tensile strength with the same net fabric mass. The steeper force-extension curve indicates lower structural elongation, allowing high-performance fibres to develop their full strength.

Aramid net with stretched weft thread

The developed technology offers companies in textile machine engineering and construction new opportunities to expand their portfolio and increase competitiveness. Manufacturers of technical textiles benefit from more efficient, resource-saving production of knotless nets with greater strength and material savings. In addition, the damage-free integration of standing weft threads opens up new application possibilities.

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