

## Project partners



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SPINNOVA®

**10** Organizations  
**5** Countries  
**7.63M** Project Budget

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Funded by  
the European Union

Funded by the European Union under the  
GA no 101130000



# PENGUIN



Bioinspired and  
advanced fibres  
and materials for  
sustainable  
outdoor textiles  
with biomimetic  
functionalities

### Project details

Start date: MAY 1, 2024

Duration: 4 YEARS

Project Budget: EUR 7.63M



## Our fibers

### Biocelsol fibers

Biocelsol fibres are classified as **man-made cellulosic fibres (MMCF)** that are produced by dissolving a cellulose-based feedstock, typically wood pulp, and regenerating the biobased polymers into textile fibres through a spinning process, where the fineness can be adjusted. In terms of fibre properties, Biocelsol fibres are similar to commercial viscose fibres.

Main properties:

- **Unique porous structure** that gives it excellent natural moisture absorption capacity and, in turn, facilitates the efficient absorption of chemical dyes and finishes.
- The production process naturally yields a pure, uncoloured fibre that eliminates the need for a bleaching step, significantly reducing chemical usage, water consumption, and overall process complexity.

What have **PENGUIN** been working on?

- Develop **Biocelsol** fibres better suited for applications currently dominated by synthetic fibres, such as insulation materials.
- Including alterations in the cross-sectional geometry of the fibres and testing of novel biobased finishing chemistries and covalent fibre modifications to enhance fibre hydrophobicity.
- Biobased finishing chemistries
- Enhance hydrophobicity without compromising tenacity, processability or soft handfeel of the fibres.



*The PENGUIN project seeks to create high-performance, sustainable textiles inspired by nature (biomimicry). Instead of synthetics, we use advanced cellulose fibers (SPINNOVA® and Biocelsol) and enhance their properties to replicate nature's efficiency, such as water repellency and thermal insulation.*

### How our fibres differ

Unlike synthetic fibres derived from nonrenewable fossil resources such as polyester or nylon, our SPINNOVA® and Biocelsol fibres are made from cellulose sourced from wood pulp, a renewable and biodegradable material with a significantly lower environmental footprint.

### What we aim to achieve?

Both technologies seek to offer sustainable alternatives to synthetics without compromising performance. SPINNOVA® focuses on producing cellulose fibres through a purely mechanical process, eliminating harmful chemical solvents, while Biocelsol focuses on enhancing cellulose properties to reach specific functionalities, such as hydrophobicity for insulation applications.

### Key differences

SPINNOVA® represents an innovation in how the fibre is made: through a clean, mechanical spinning process. Biocelsol represents an innovation in what the fibre can do: by chemically and physically modifying cellulose to provide new technical properties.



### SPINNOVA® fibers

SPINNOVA® fibres are a sustainable textile fiber made from wood pulp or waste materials like agricultural or leather waste, using a chemical-free, mechanical process. This process involves refining the raw material into **microfibrillated cellulose (MFC)**, which is then pushed through nozzles to form a continuous fiber, resulting in a material with a feel similar to natural fibers like cotton.

Main properties:

- Based on the mechanical refining of the raw material, technology is the only process in the world that converts cellulose into textile fibre in this way.
- Minimal CO2 emissions and water use, as well as being biodegradable and recyclable.
- Adjustable moisture management is contributing to comfortable, dry and warmer feeling

What have **PENGUIN** been working on?

- Replace synthetic insulation layers with materials made from **bio-based cellulose fibers**
- Improved **water repellence** for advanced fabrics and higher structural integrity