



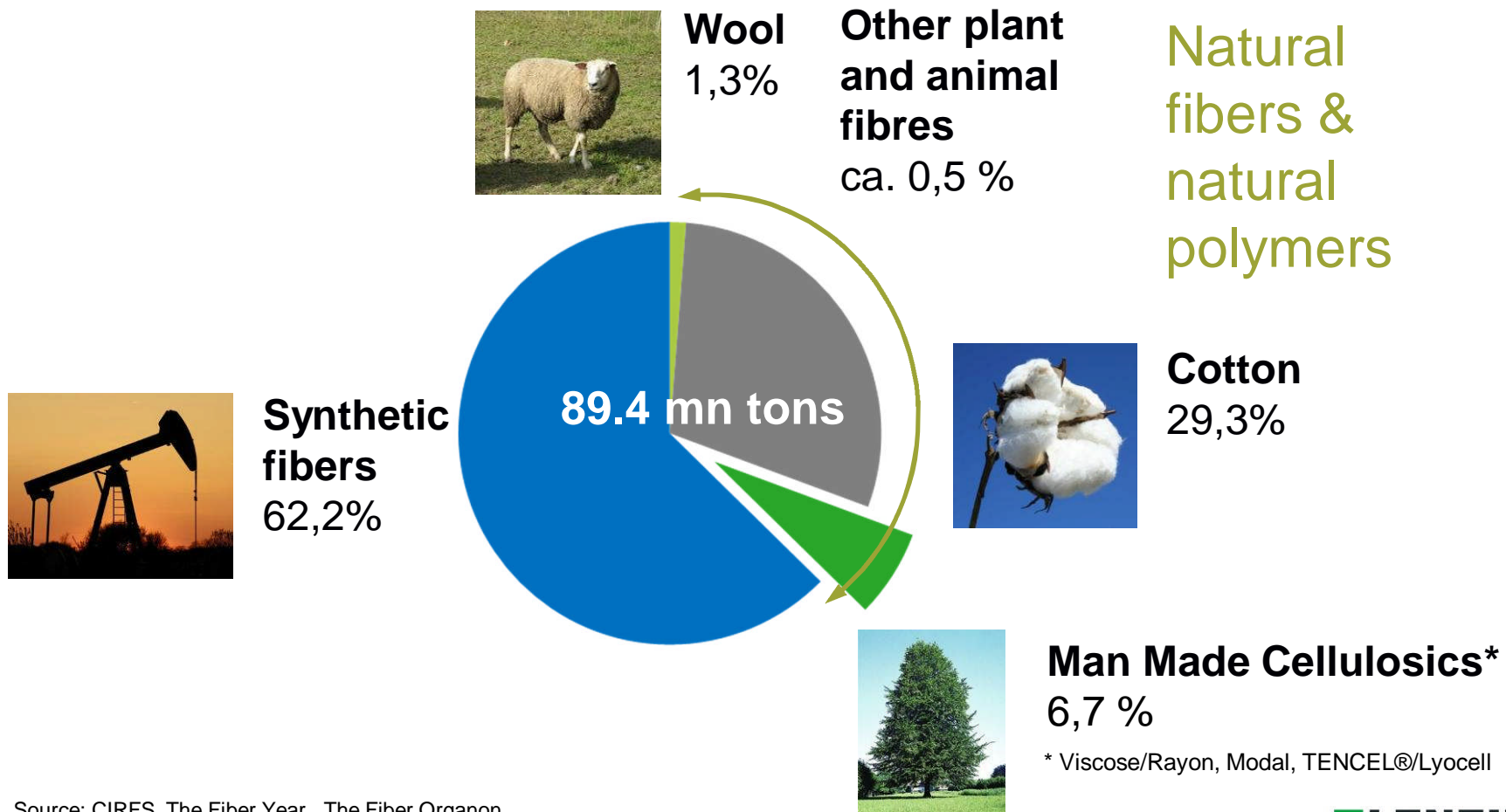
Comfort + Function with Natural Materials

Performance Days, Munich, November 2015

Textile Fibers

Fibers					
Natural fibers		Man-made fibers			
		From natural polymers		From synthetic polymers	From anorganic substances
Proteinbased	Cellulosebased	Cellulosebased	Proteinbased		
Wool Silk Angora Cashmere etc.	Cotton Flax Hemp Jute etc.	Viscose Modal Lyocell Cupro Acetate etc.	Casein Collagen Ardein Zein	Polyester Polyamide Polypropylene Polyurethane (Elastan) Acrylic Polytetrafluor-ethylene	Carbon Ceramics Glass Metal

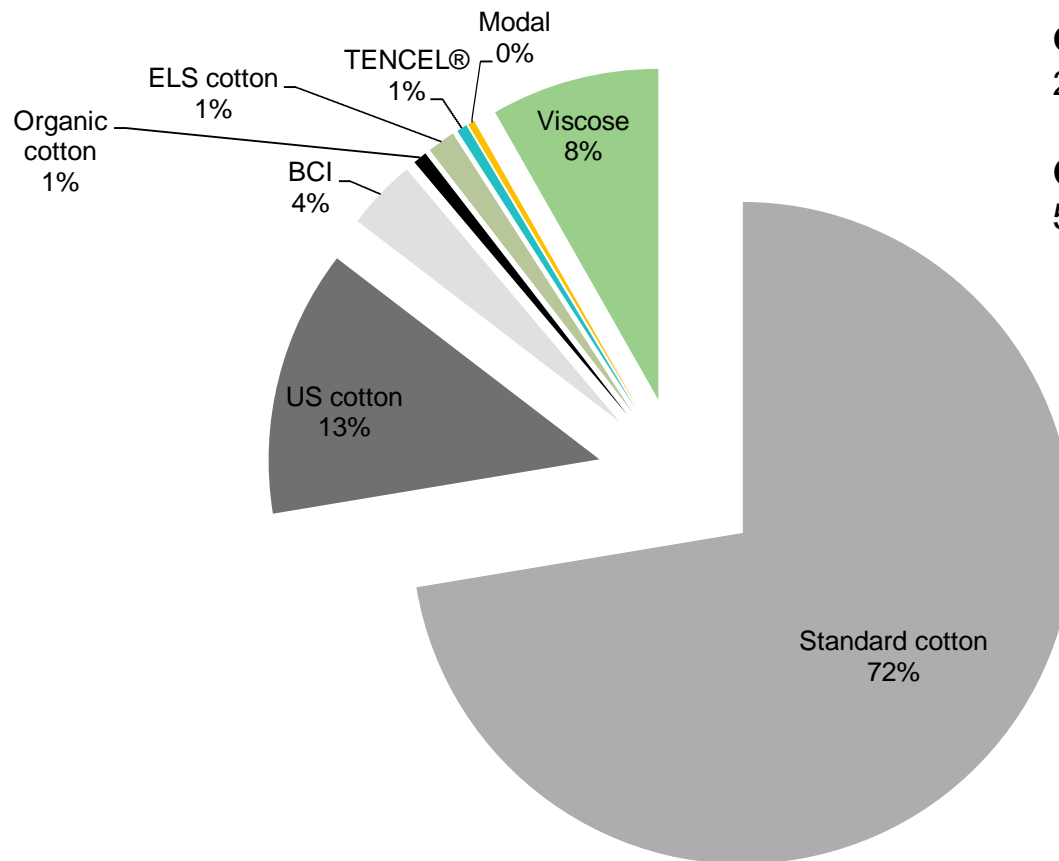
Global Fiber Production in 2014



Source: CIRFS, The Fiber Year, The Fiber Organon, Lenzing estimates

Cotton and Man Made Cellulosics

■ Standard cotton ■ US cotton ■ BCI ■ Organic cotton ■ ELS cotton ■ TENCEL® ■ Modal ■ Viscose



Global cotton production 2013:
25.7 mn tons

Global MMC production 2013:
5.8 mn tons

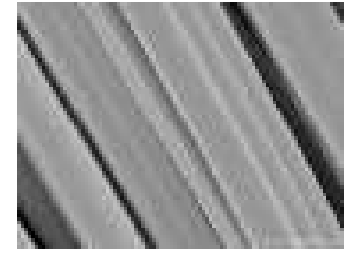
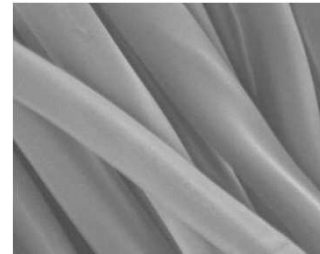
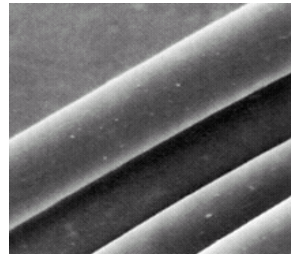
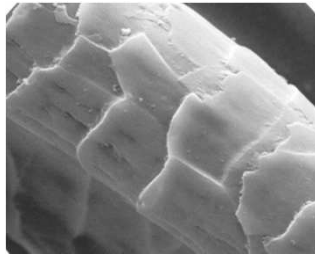
Comfort + Function of Natural Fibres

- Comfort
- Breathability
- Temperature regulation
- Moisture absorption
- Reduced bacterial growth
- No electrostatic charging
- Renewable resources



Fibre Surface

Less friction on the skin due to smooth fibre surface and high moisture absorption



Wool

Cotton

Polyester

 **TENCEL**
THE NEW AGE FIBER

 **Modal**
LENZING

Smooth Surface

-

+

++

++

++

Moisture absorption

++

+

-

++

++

Wet Cling Behaviour

Reduced wet cling index due to smooth fibre surface



The lower the value the less clinging.

A value higher than 16 means uncomfortable in wear.*

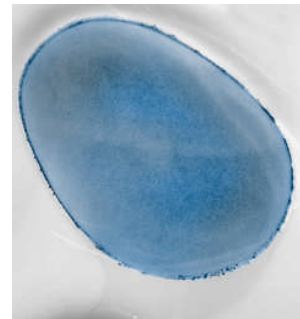
Moisture Absorption

Cotton

Moist. regain % 8
Moist. retention ability % 50

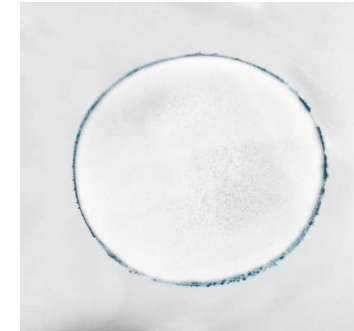


11
70



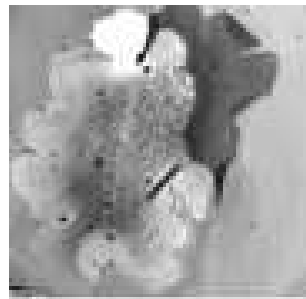
Polyester

0,5
2-5

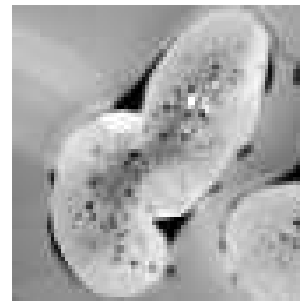


Viscose

Moist. regain % 11
Moist. retention ability % 90

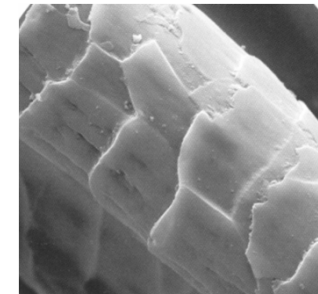


11
60

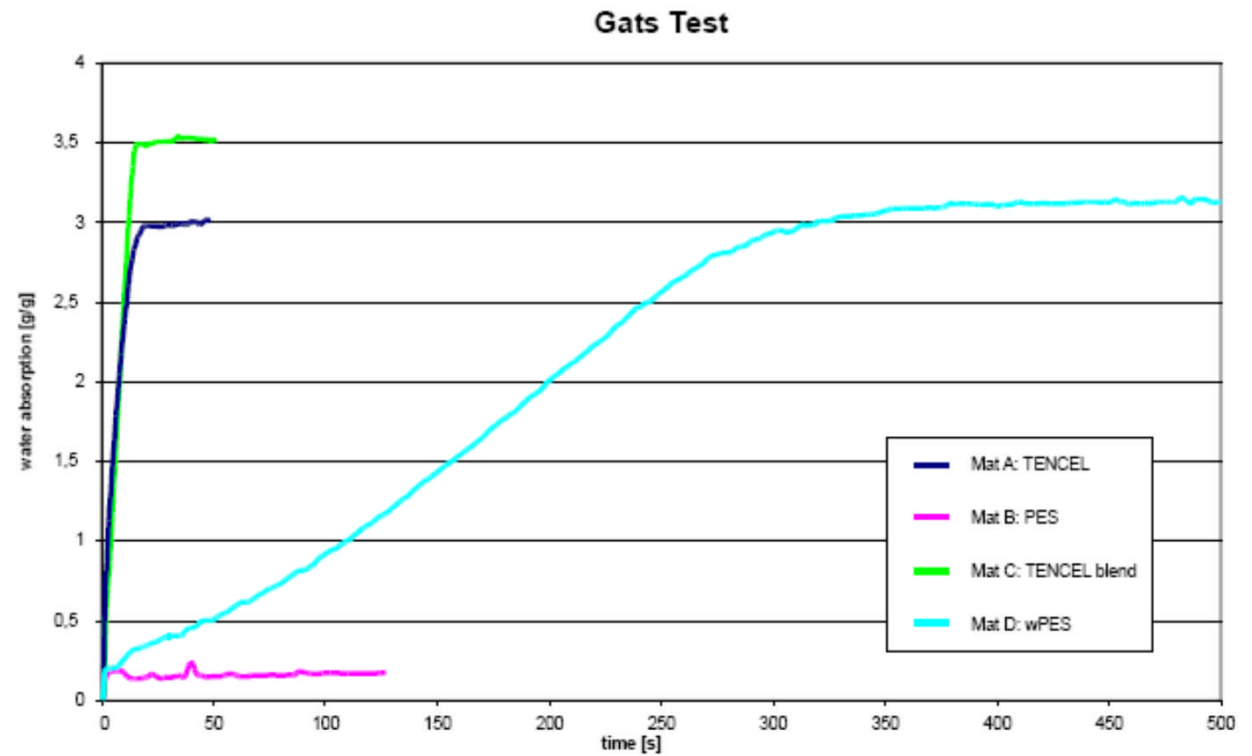
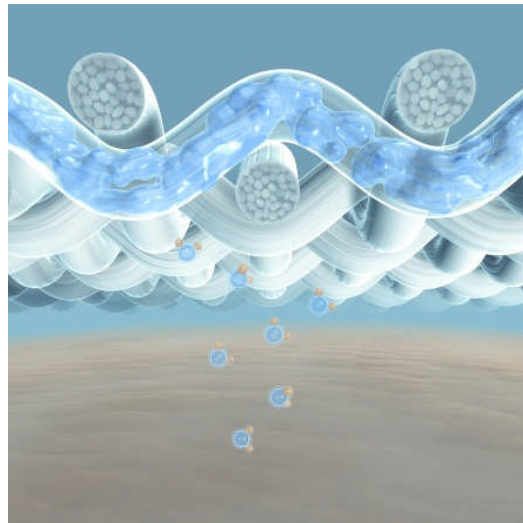


Wool

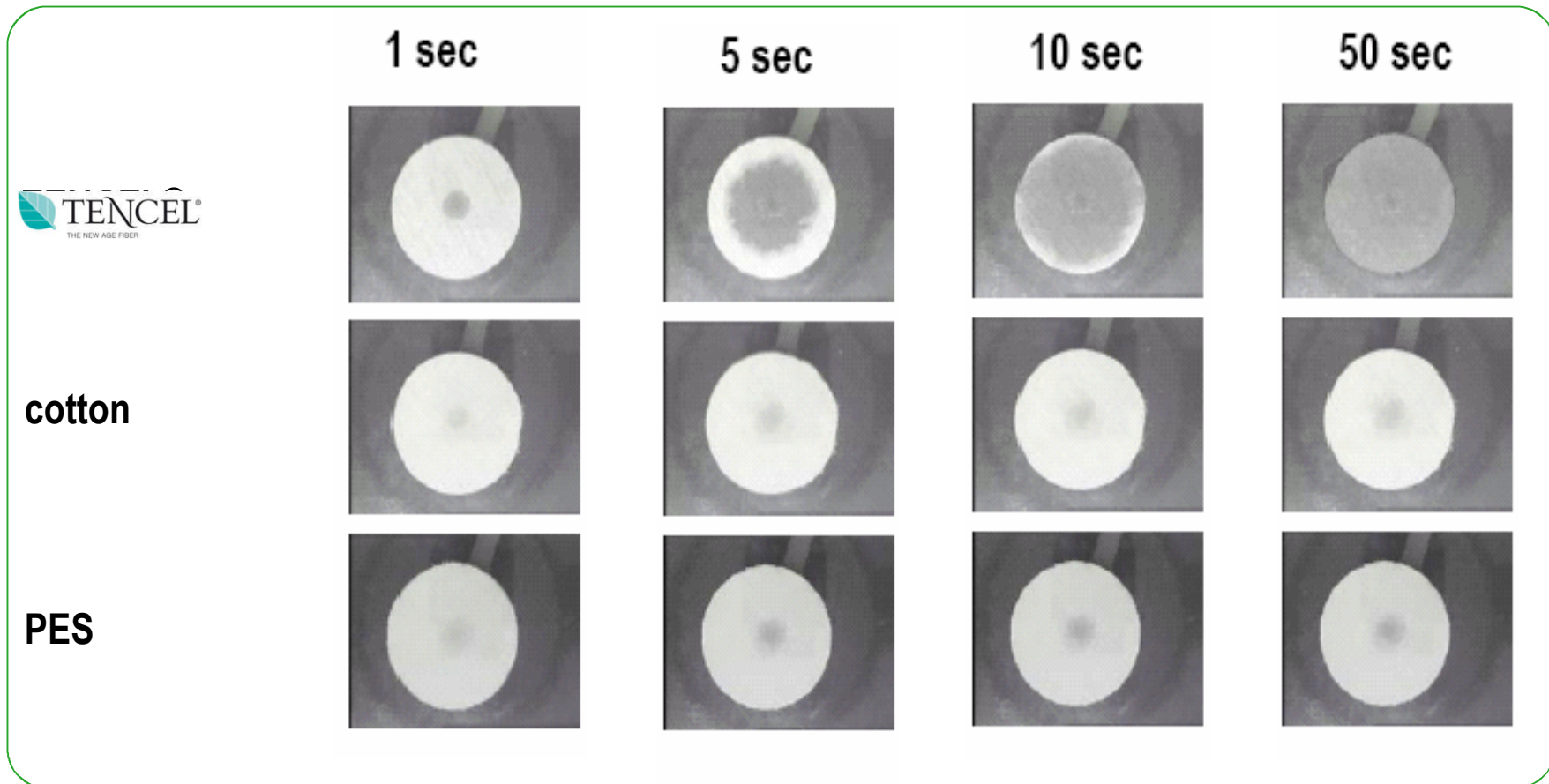
14-15
40-45



Moisture Absorption



Wicking Behaviour

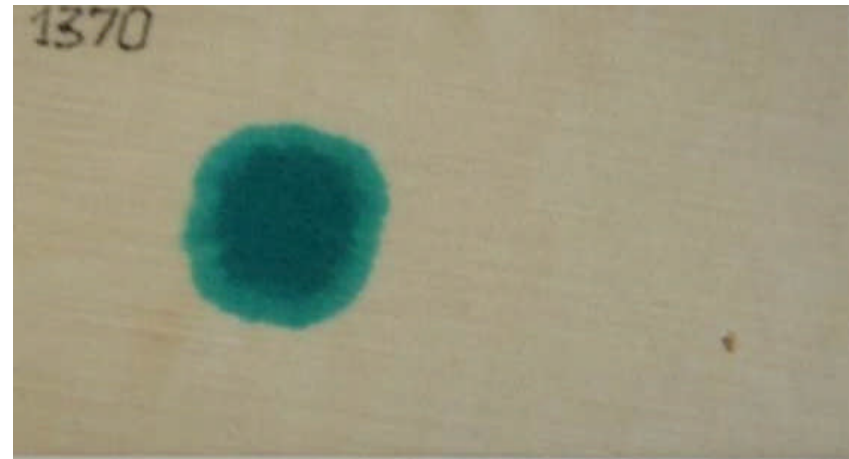


Wicking Behaviour



100% wool, 18,5 μ

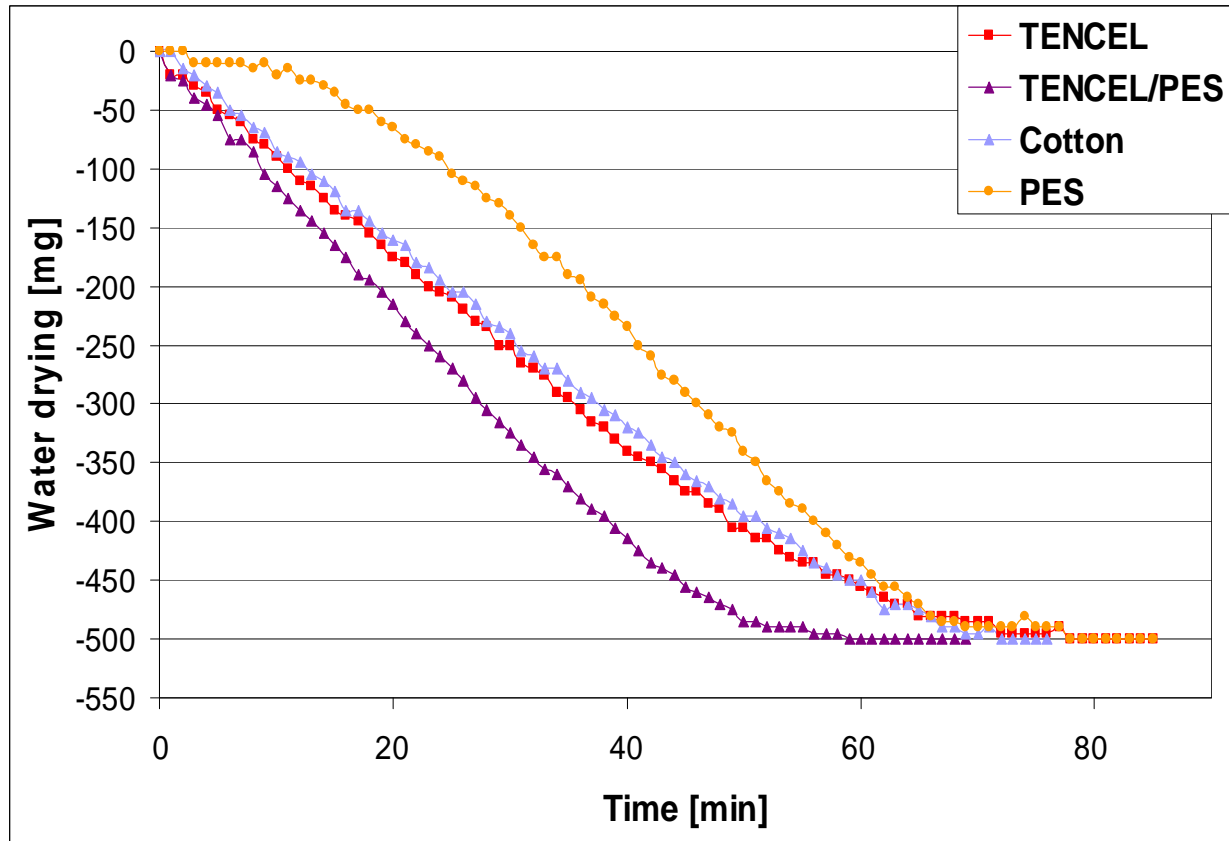
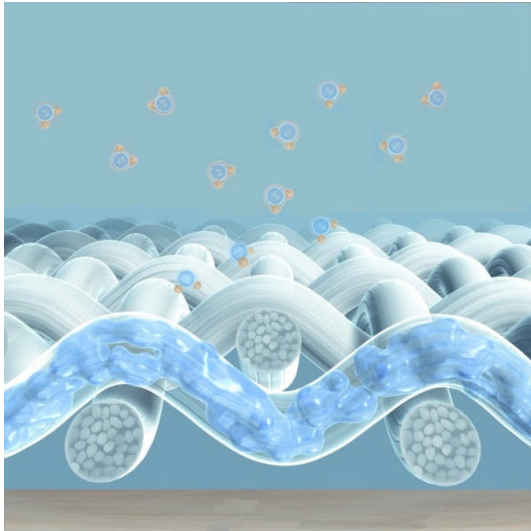
After 1 sec.



50% TENCEL[®] / 50% wool 19,5 μ

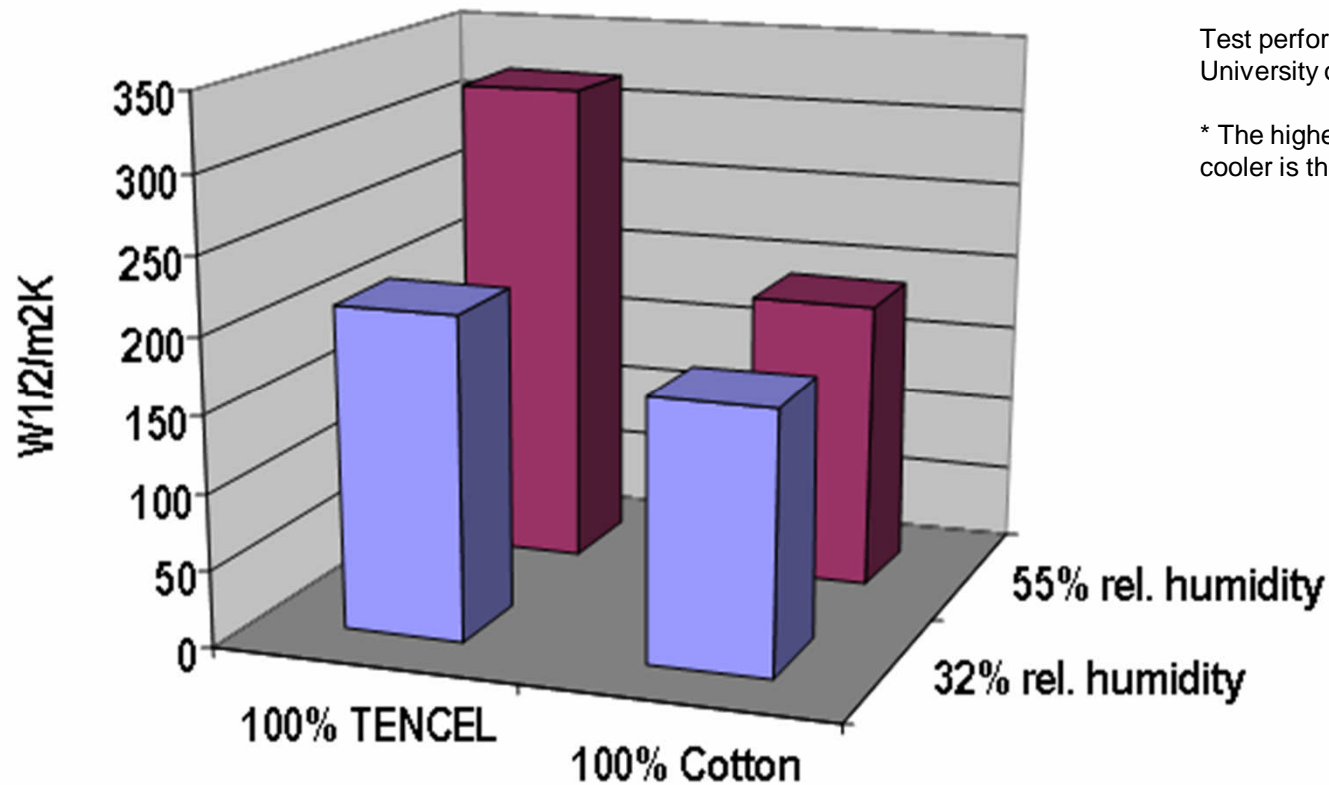
After 1 sec.

Drying Time



Thermoregulation

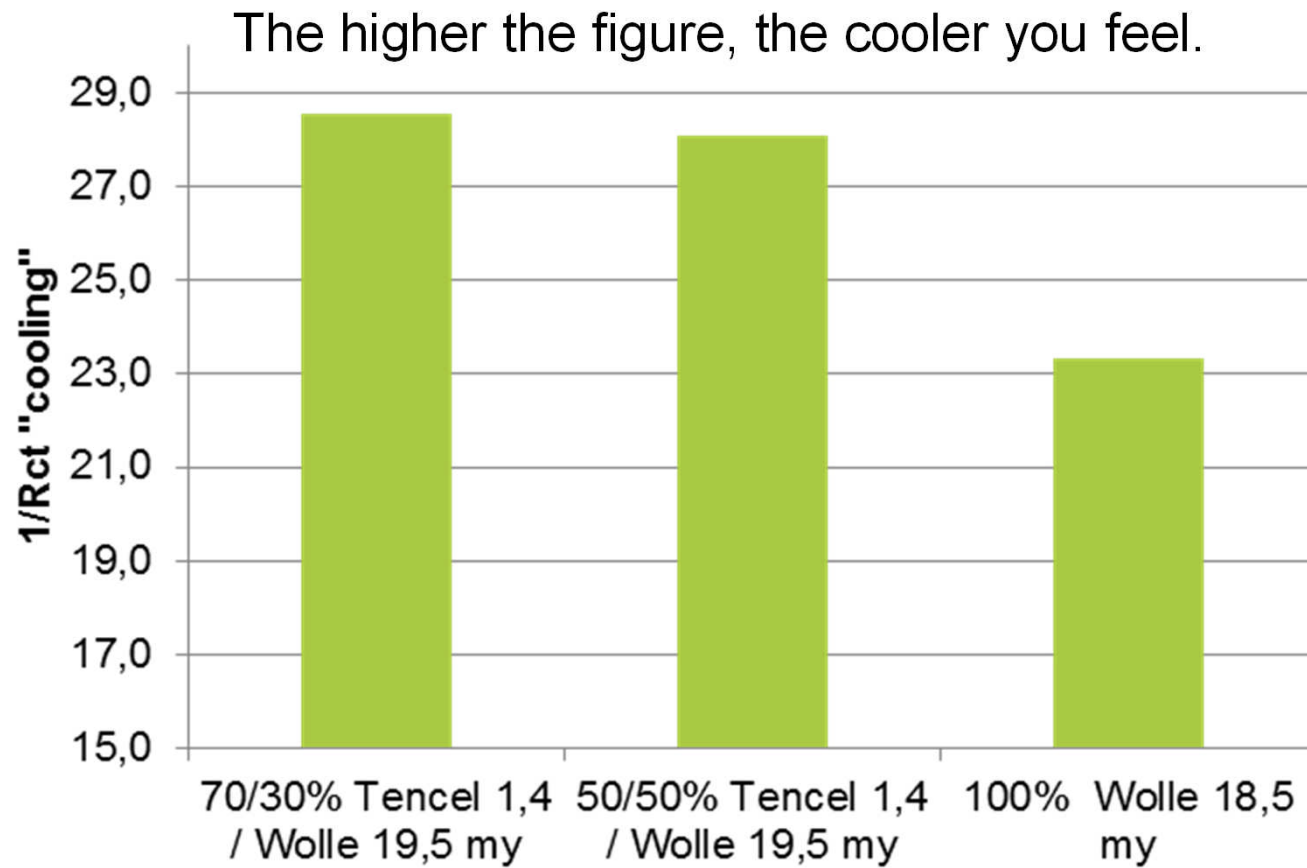
The higher the figure the cooler the feeling



Test performed by Prof. Dr. Lobos Hes,
University of Liberec/Czech Republic

* The higher the thermal absorptivity the
cooler is the touch

Thermoregulation

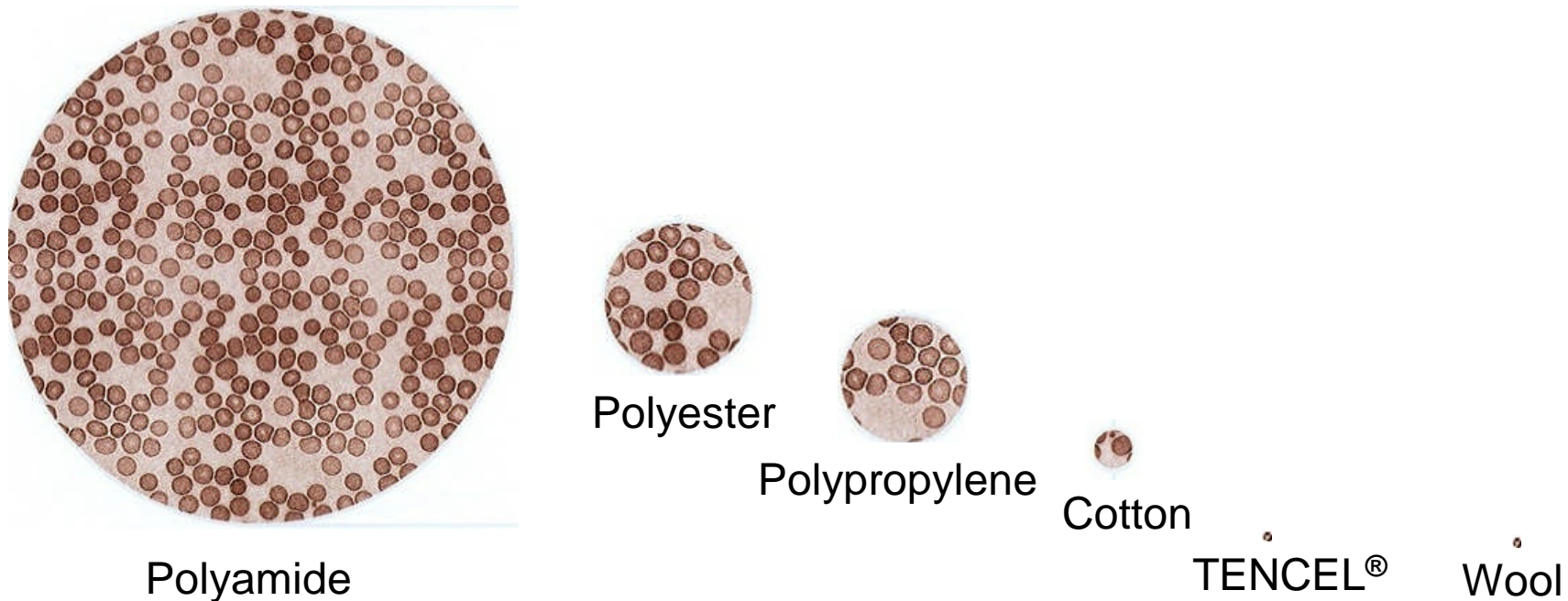


Heat retention (1/m² K / W) |



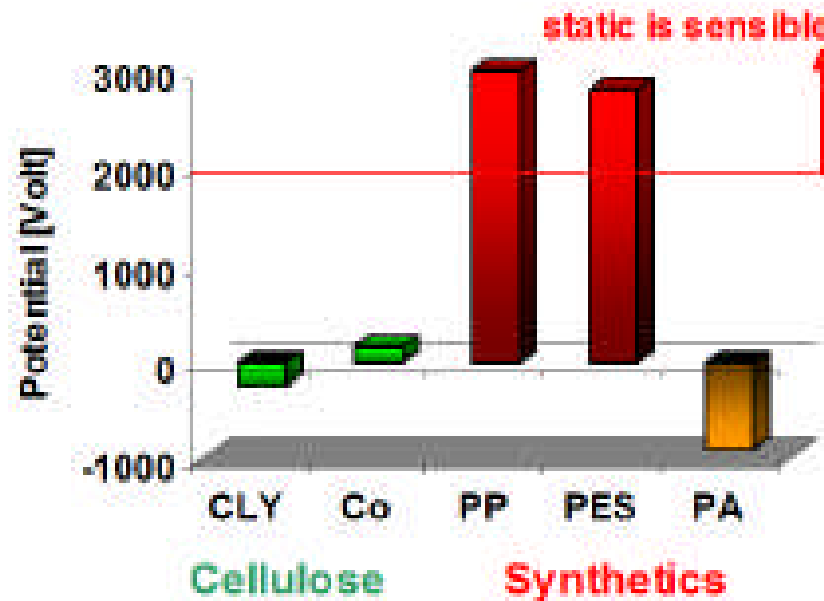
Bacterial growth

Natural materials show reduced bacterial growth and less odour creation



Electrostatic Charging

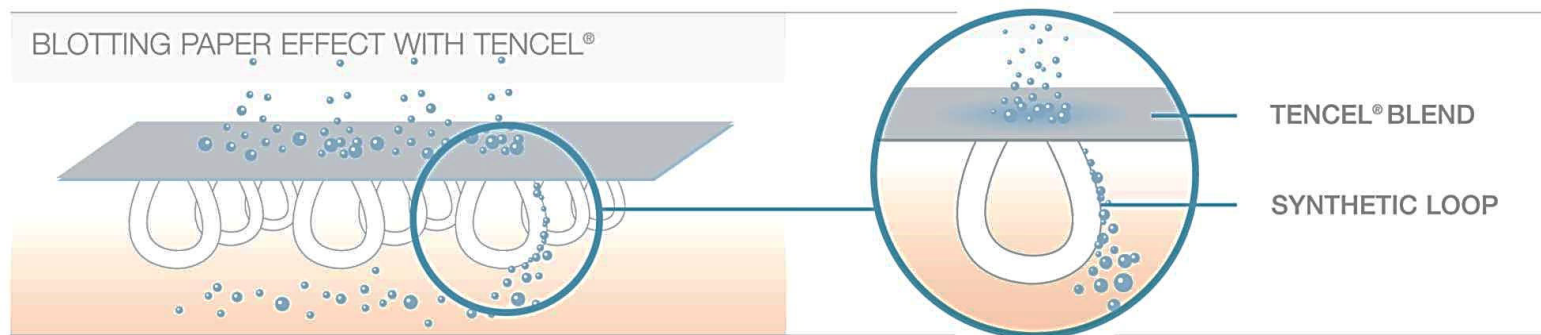
Cellulosic fibres have almost no electrostatic charging due to higher moisture regain which leads to higher conductivity



Blends with synthetic fibres

System Blends, Double Layer Constructions

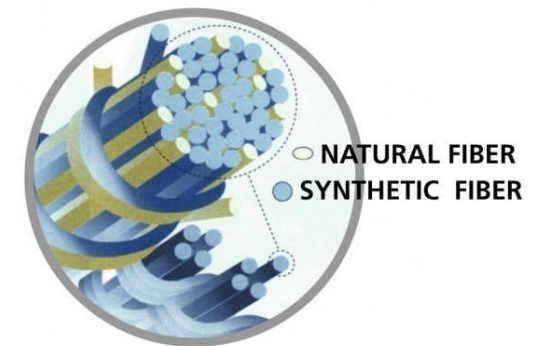
- Synthetic fibres on the skin side don't absorb moisture
- Natural fibres on the outer side absorb moisture
- Improved moisture transport from the skin to the outer side
- Faster Drying time
- Better cooling effect
- Natural touch on the outer side



Blends with synthetic fibres

Intimate Yarn Blends

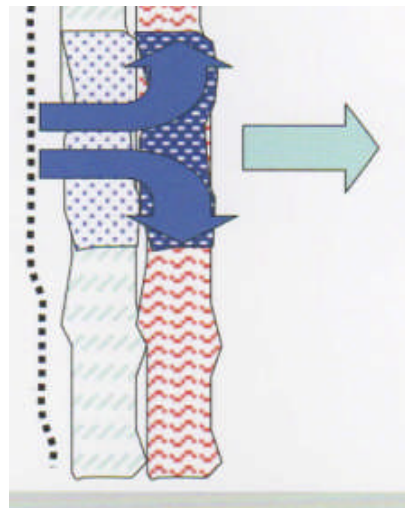
- **drirelease[®]**
- Patented yarn technology
- Blends of 10-15% natural, hydrophilic (water absorbing) fibers and 85-90% synthetic, hydrophobic (water repelling) fibers
- Available with cotton, merino, silk, linen and TENCEL[®]
- Permanent moisture wicking, fast drying, cooling
- Soft, natural touch for superior comfort



Functional Treatments

- SkinDry® (by Spinnerei Feldkirch): Yarn with hydrophobic treatment on hydrophilic fibre MicroModal®
- Permanent hydrophobic effect to keep body dry, water repellent, fast drying, soft and natural touch
- Blends with hydrophobic SkinDry® on the skin side and hydrophilic fibre on the outer side for better moisture transport

Liquid sweat moves to the outer side and evaporates

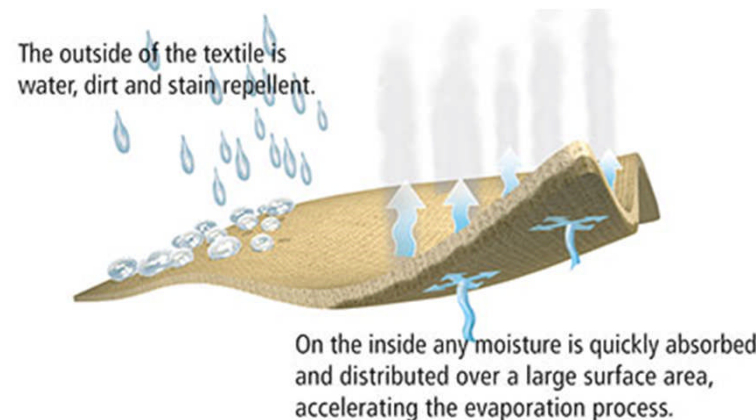


Hydrophobic/ hydrophilic: less moisture on the skin side, evaporation on the outer side

Source: Spinnerei Feldkirch, Austria

Functional Treatments

- 3xDry® (by Schöller): combination of water repellent and water absorbent treatment
- Water repellent treatment on the outer side keeps body dry over a longer period, is dirt repellent, prevents noticeable perspiration marks on the outer side
- Water absorbent treatment on the skin side for comfort and cooling effect



Source: <http://www.schoeller-tech.com/textil-technologien/3xdry/#all>

Man Made Cellulosic Fibres

with incorporated active ingredients

- SeaCell™ (by Smartfiber): lyocell fibre with incorporated seaweed
- Soft lyocell for comfort
- Seaweed has a skin protective and caring effect and protects from premature ageing of the skin due to vital substances such as minerals and trace elements



Source: www.smartfiber.info/seacell

Man Made Cellulosic Fibres

with incorporated active ingredients

- smartcel sensitive™ (by Smartfiber): lyocell fiber with integrated zinc oxide
- Cosmetic and regenerative properties, effective protection against environmental influences and antibacterial/ anti odor effect
- Zinc oxide has direct effect on the skin: cell regeneration, skin renewal, better healing of wounds or inflammation, UV protection, against premature skin aging , natural antibacterial, odor-reducing



Source: www.smartfiber.info/smartcel-sensitive

Man Made Cellulosic Fibres

with incorporated active ingredients

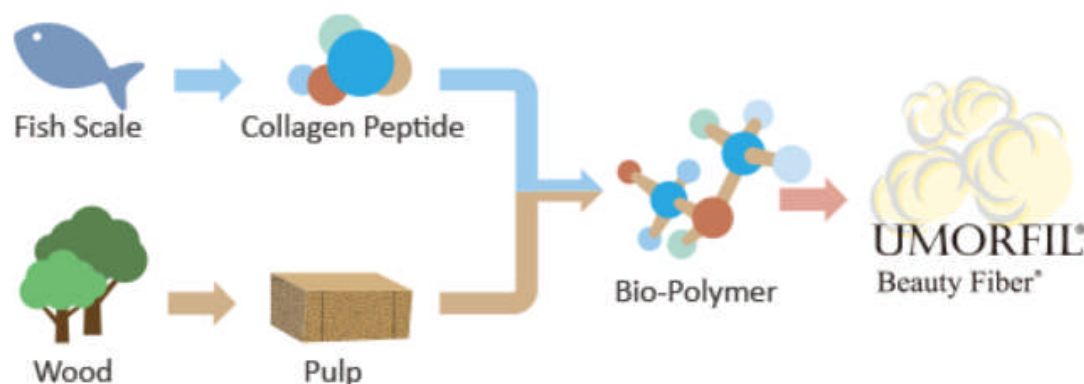
- TENCEL[®] C (by Lenzing): Lyocell fibre with integrated skin care complex (chitosan)
- TENCEL[®] C for maintenance of optimal moisture content, better elasticity and protective barrier of the skin and stimulation of skin cell renewal
- Compared to cotton, the moisture loss with TENCEL[®] C is considerably lower



Man Made Cellulosic Fibres

with incorporated active ingredients

- Umorfil[®]: Viscose with integrated collagen peptide amino acid
- Provides moisture for the skin, natural deodorizing and antibacterial effect, UV protection
- Skin-friendly feel
- Made of natural materials, biodegradable



Source: <http://umofil.com/feature.html>

Sustainability Standards and Labels

- **GOTS (Global Organic Textile Standard):** voluntary, comprehensive standard, that covers ecological and social aspects of the production of all natural, organic fibres including textile processing and manufacturing
- **OE Standards (Organic Exchange/ Textile Exchange):** voluntary, well known chain-of-custody standards for organically grown cotton, don't cover use of chemicals or other aspects during production, two versions: OE 100 Standard and OE Blended Standard
- **BCI (Better Cotton Initiative):** voluntary multi-stakeholder initiative, membership based, committed to developing production that is economically, environmentally and socially sustainable, capable for mainstream demand
- **Cotton Made in Africa:** initiative to sustainably improve the living conditions of cotton farmers in Sub-Saharan Africa

Source: <http://signs.europeanoutdoorgroup.com/> <http://www.global-standard.org/>
<http://www.cottonmadeinafrica.org/en/>



Sustainability Standards and Labels

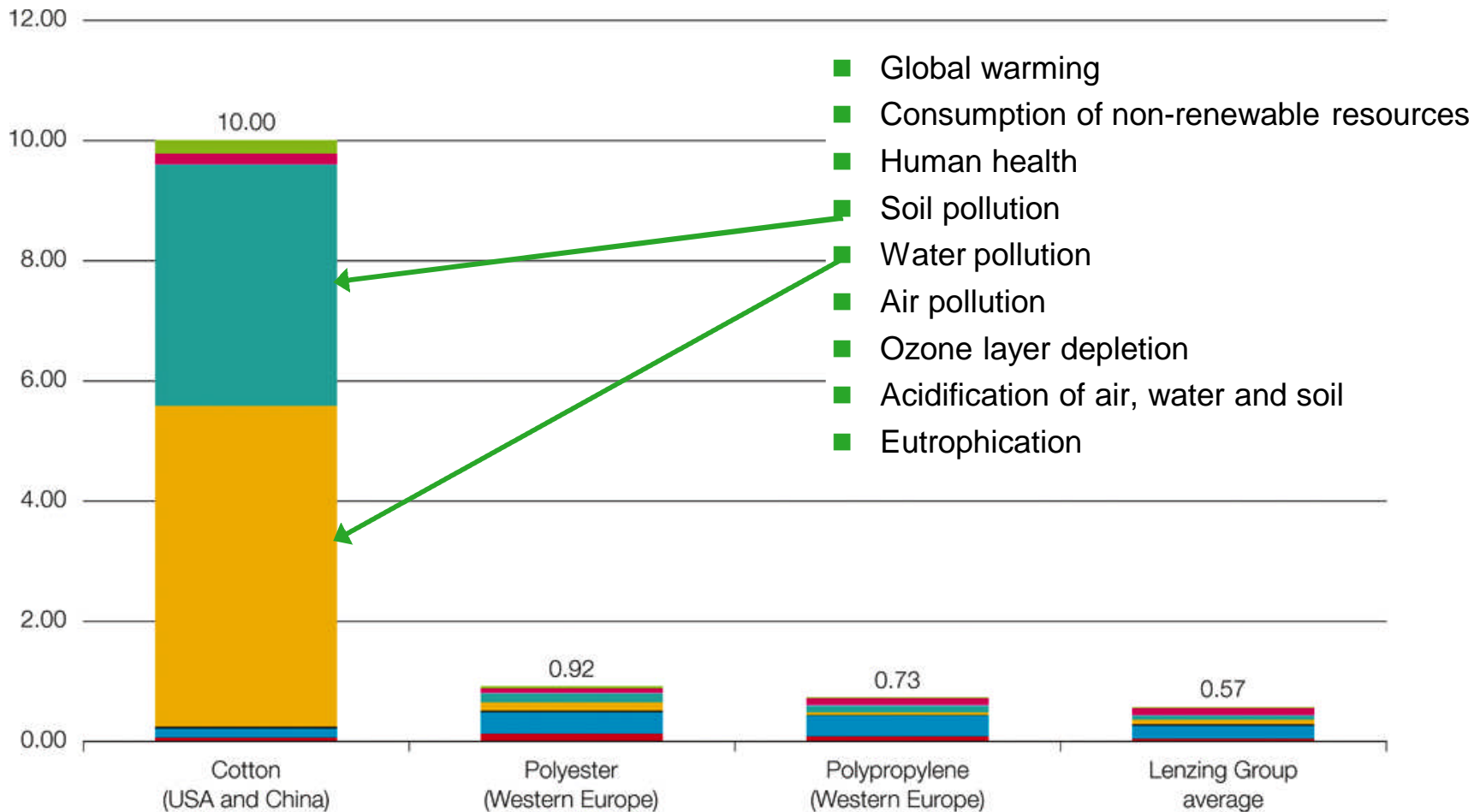
- **Bluesign®** : voluntary textile industry standard involving the entire supply chain to eliminate harmful substances, to set and control standards for an environmentally friendly and safe production
- **Made in Green by OEKO-TEX®**: independent textile label for all levels of the textile chain. Materials are tested for harmful substances, environmentally friendly processes and safe and socially responsible working conditions
- **EU Ecolabel Textiles**: voluntary eco-labelling scheme from the European Commission for clothing, bed linen and indoor textiles, assessing sustainable practices in textile manufacturing

Sustainability Standards and Labels

- **Higg Index:** developed by SAC (Sustainable Apparel Coalition). A set of sustainability assessment tools to evaluate facility, brand and product impacts
- **Made-By Benchmark for fibres:** compares environmental impact of most commonly used fibres based on 6 parameters. 5 classes from A (more sustainable) to E (less sustainable)
- **FSC** (Forest Stewardship Council): voluntary, market-based tool that verifies a forest product comes from a responsibly managed forest
- **PEFC** (Program for the Endorsement of Forest Certification): international non-profit organisation that promotes sustainable forest management, offers chain of custody certification for wood harvested from sustainably managed forests

Life cycle analysis

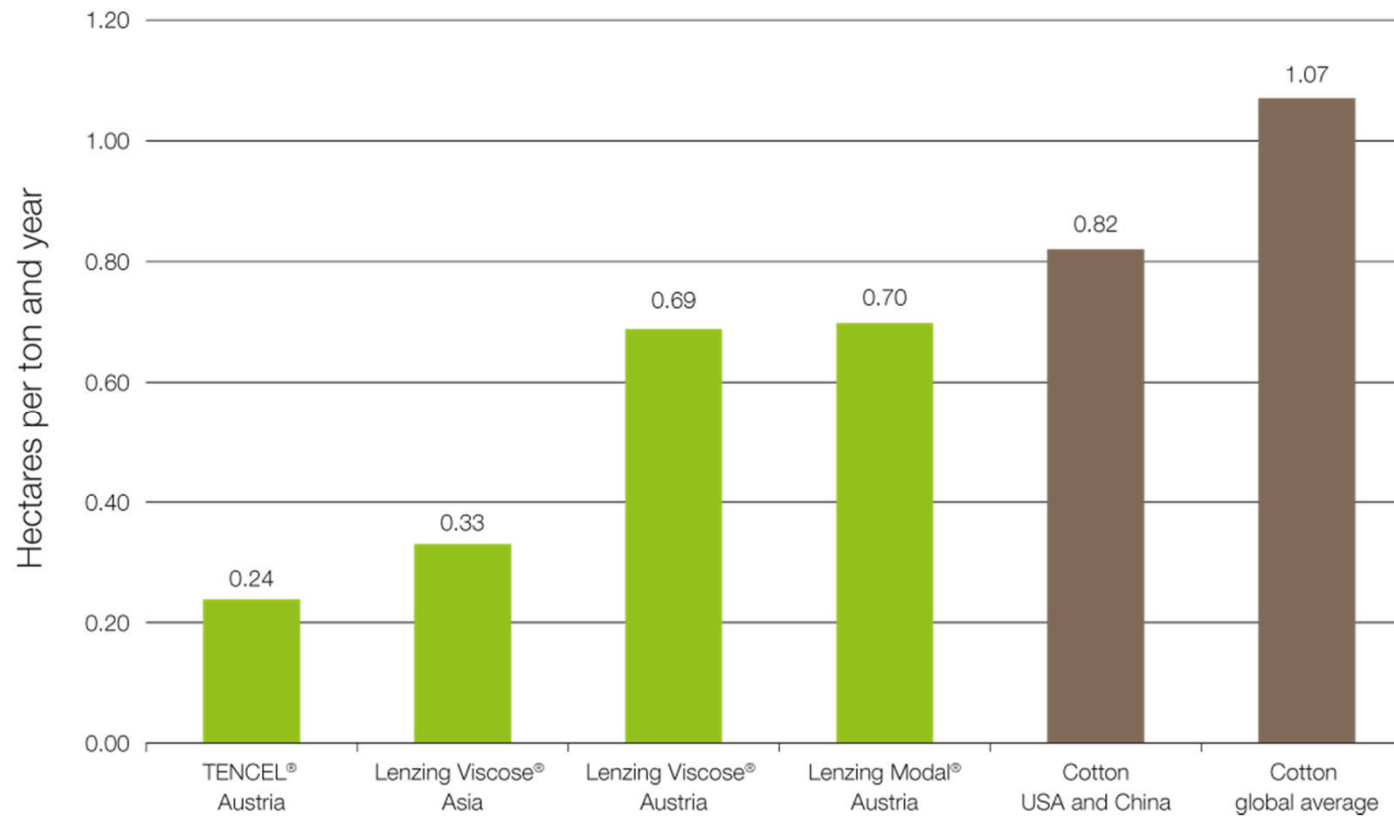
relative environmental load per ton of fiber



Life cycle analysis

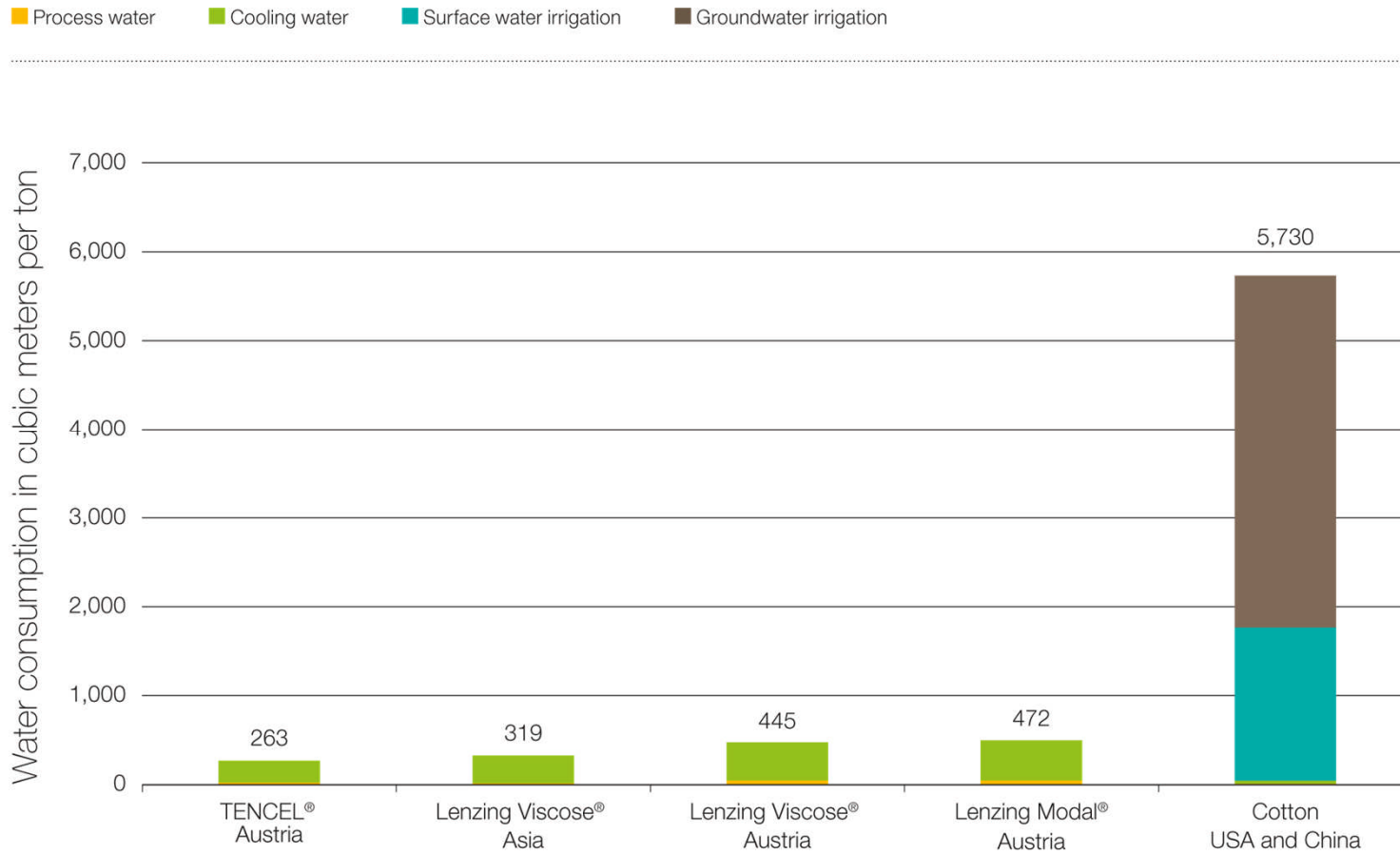
Land Use

Required acreage for the production of 1 ton of fiber



Life cycle analysis

Water Consumption



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Thanks for your attention

