





# WELCOME

to today's Expert Talks Live Webinar Series

# "THERMALREGULATION WITH FOCUS ON COOLING"

An intro on thermalregulation in general leading to the question: What are the newest materials and technologies that help to keep the body cool?

by PERFORMANCE DAYS & FUNCTIONAL FABRIC FAIR
August 04, 2021

#### **INTRODUCTION**



# **OVERVIEW WEBINAR:**

- THERMALREGULATION IN GENERAL
  - HOW DOES COOLING WORK?
    - CONDUCTION OR DIFFUSION
      - CONVECTION
    - EVAPORATION / VAPORIZATION
      - (THERMAL) RADIATION
    - ABSORPTION SYNTHETIC FABRICS
    - ABSORPTION PHASE CHANGE MATERIALS
- ABSORPTION NATURAL THERMALREGULATION / COOLING
  - ORGANIC- & MINERAL BASED INGREDIENTS
- GLOBAL COOLING FABRICS MARKET



#### WHAT IS HOT? WHAT IS COLD?\*

In very simple terms:

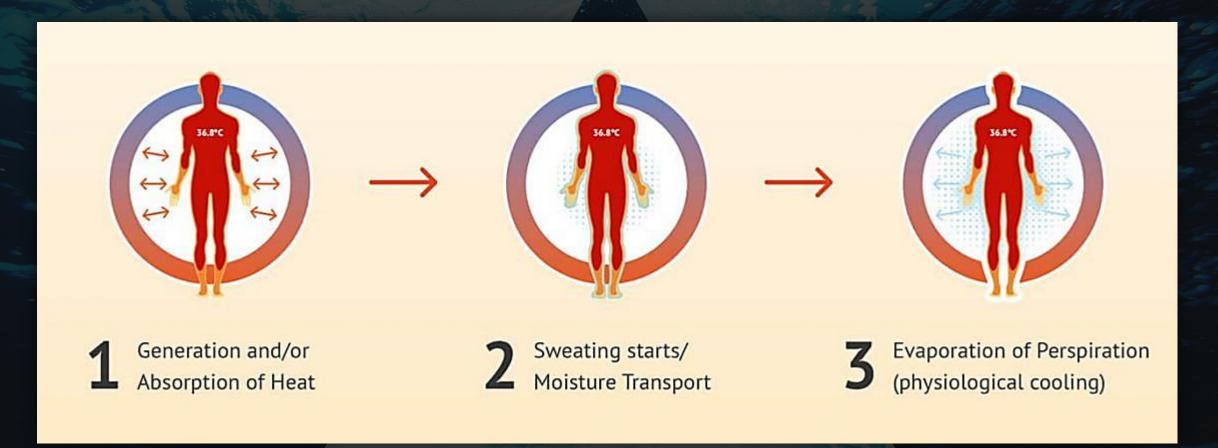
Heat is energy and cool is the absence of energy.

The human body generates heat and is constantly trying to regulate the core temperature in the range between 36.5–37.5°C which corresponds 97,7-99,5° Fahrenheit. Heat can be generated directly from the human metabolism (= metabolic heat) and by the effect of environmental conditions on the human body (like air temperature, radiation, humidity, wind). When more heat is generated, e.g. from sports activity, the body reacts by producing sweat to regulate temperature and to cool down.

by PERFORMANCE DAYS & FUNCTIONAL FABRIC FAIR

**TOPIC** 

## THE STAGES OF COOLING\*



TOPIC



#### **HOW DOES COOLING WORK?\***

Evaporative cooling is the most effective method to draw heat from the body. To conduct away body heat, i.e., to effect the cooling process, perspiration should evaporate directly on the skin surface. Only fabrics that have been properly engineered can help support the body's own cooling mechanism. The extent to which clothing is able to help the wearer stay cool and prevent overheating is the subject of physiological testing at renowned institutes like Hohenstein and Empa as well as by service providers like Inside Climate.

**TOPIC** 



### **HOW DOES COOLING WORK?\***



# **HEAT GAIN**

- Environmental condition: Heat
- Metabolic heat (sports activity or cold shivers = motion = heat)

# **HEAT LOSS**

- Environmental condition: Cold
- Metabolic cold (cooling from sweating and evaporation)
- Conduction
- Convection
- Evaporation
- Radiation

For cooling purposes, the "Minus" (factors leading to heat loss) needs to outweigh the "Plus" (factors generating heat).





# **CONDUCTION OR DIFFUSION**



COOLING – CONDUCTION OR DIFFUSION



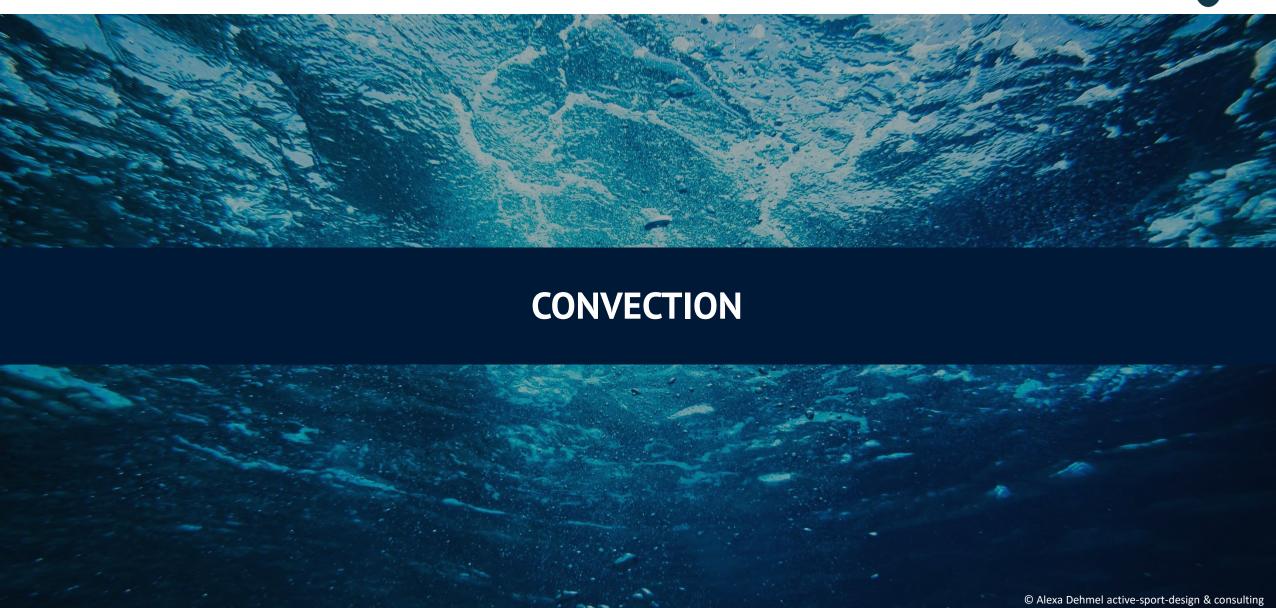
#### **CONDUCTION OR DIFFUSION\***

Heat always flows only in the direction of the lower temperature – from warm to cold – unless the heat transport is prevented, e.g. by the insulating air.

## How is the principle used in textiles?

- Avoid heat retaining fibre cross sections and, instead, use fibres that are especially good at dissipating the heat like round or flat cross section fibres: non-textured, especially smooth twisted yarns give the feeling of being cool.
- Use thermal conductor material like metals (silver, copper, aluminum) for prints. Important: Metals must have direct contact with each other, otherwise the flow is interrupted. Prints with carbon materials (graphite, graphene, jade) are also conductive. Unfortuantely, there are no measured values for a single print. Presumably these values are less than the ones of metals as metals are better conductors. Prints usually don't cover enough of the surface in order to conduct the warmth as well.





**COOLING - CONVECTION** 



#### **CONVECTION\***

Warm air or water vapor is transported within or out of the clothing system. This type of transport can also be forced, e.g. by the motions of the wearer.

## How is the principle used in textiles?

Use of ventilation slots or mesh.

COOLING - CONVECTION





#### ECLAT TEXTILE CO., LTD.

RT1909247

Baselayer 198 g/sm 5% LYCRA®, 95% Polyester

Eclat Aerojaq
Aerojaq is designed to release moisture away
from the body. At the core of this single-mesh
jacquard, there is a dual yarn system
engineered to aid cooling. The inner yarn
carries moisture from the skin onto the outer
yarn, which allows natural evaporation.

https://www.performancedays.com/product-detail/26091.html



#### **ECLAT TEXTILE CO., LTD.**

RT2005061

Baselayer 97 g/sm 100% Polyester

Eclat Drylight
Our airy quick dry fabric is the next level of breathability. Its textured-back can whisk sweat and reduce the stickiness of the fabric caused by moisture. Ideal for rapid movement and excessive sweating.

https://www.performancedays.com/product-detail/26121.html



#### **ECOSENSOR** by AsahiKASEI

ESS2-13495

Shirts 145 g/sm 80% recycl. Polyester, 20% Cupro

This is made by recycled polyester which is certified by GRS and cupro, Bemberg(R) which has biodegradability. Loops in the weave of this fabric open up by absorbing moisture and sweat from produced by the body during exercise. This enables heat and moisture inside the garment to escape and reduce, reducing the sense of "hotness" felt by the wearer.

https://www.performancedays.com/product-detail/19181.html



#### N-STARS FASHION

NK001514/QS

Baselayer 135 g/sm 77% Cotton, 23% Polyester

Super soft double knit with functional mesh construction. Face is soft Poly/Cotton blend while backing is cooling yarn with excellent wicking. Natural X Function.

Cooling Back (QMAX:0.14)

https://www.performancedays.com/product-detail/24967.html





# **EVAPORATION / VAPORIZATION**



COOLING – EVAPORATION / VAPORIZATION



#### **EVAPORATION / VAPORIZATION\***

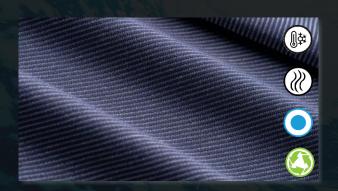
Liquids are transformed through the absorption of energy into the aggregate gaseous state, for example, perspiration into water vapor. The greater the contact area of the liquid on the heat source, the more sweat can evaporate, the required energy is drawn from the body and cooling is achieved. In accordance with our human physiology and physics, evaporating sweat is the best and most effective method to draw heat out from the body (2.4 kJ/g at skin temperature, Hohenstein Institute) – and that is why people sweat!

### How is the principle used in textiles?

Combine the benefits of absorption/wicking and evaporation with good breathability.

#### COOLING - EVAPORATION / VAPORIZATION





# POLARTEC, LLC DELTA™ (60018RO)

Baselayer 254 g/sm 75% Polyester, 26% Lyocell

Delta Cooling Fabrics optimize sweat with evaporative cooling in-sync with your body. The new Heavyweight Rib Jersey style offers a substantial shirting solution for high-intensity activities in hot conditions, providing thermoregulation and technical performance all summer long.

https://www.performancedays.com/product-detail/24819.html



HeiQ MATERIALS AG HEIQ SMART TEMP

Treatment 100% HeiQ Smart Temp

HeiQ Smart Temp is a revolutionary dynamic cooling and moisture management technology providing garments with the ability to respond to temperature conditions and achieve optimal comfort and performance. The cooling effect is triggered by sweat and rising body temperature and is specifically designed for next-to-skin textiles. Applicable and customizable to fit any fiber type: natural, synthetic and blends



CHT GERMANY BESO COOL

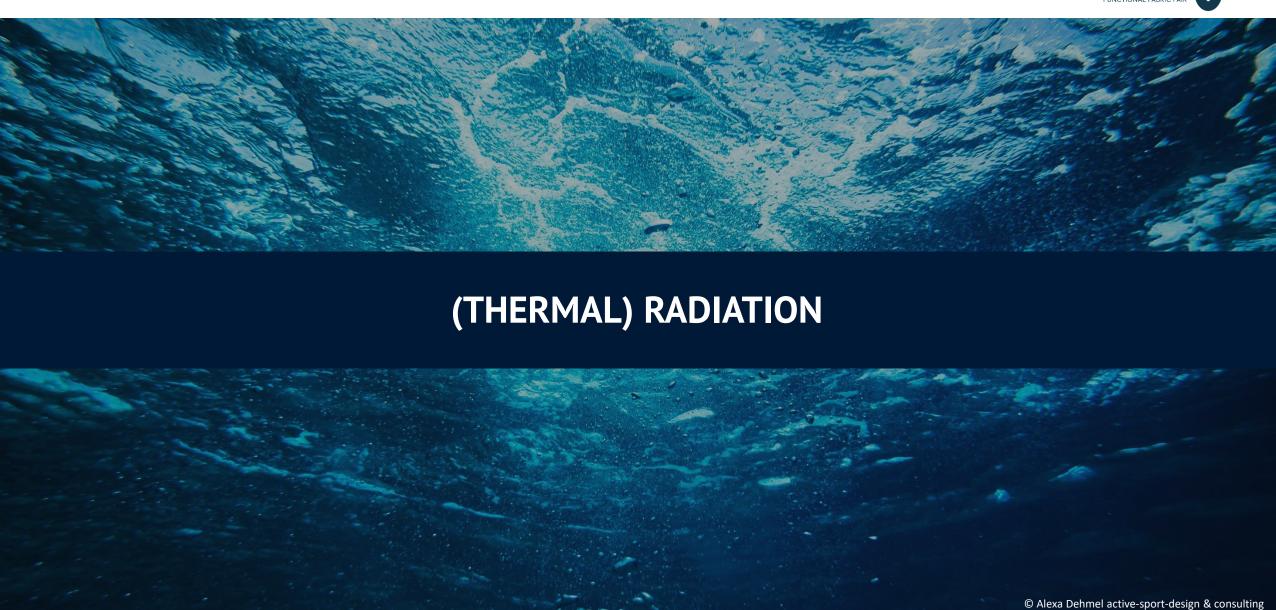
Treatment 100% other Compositions

BeSo®COOL – activates when you get active With BeSo®COOL your workout will feel so much more comfortable. BeSo®COOL boosts moisture transport and fast evaporation, resulting in a significant temperature reduction and cooling sensation. Even at high temperatures, BeSo®COOL provides relief. With BeSo®COOL, comfort, style and functionality come together. Beat the heat with CHT's best solution for temperature regulation.

https://www.performancedays.com/product-detail/16736.html

https://www.performancedays.com/product-detail/26581.html





COOLING - (THERMAL) RADIATION



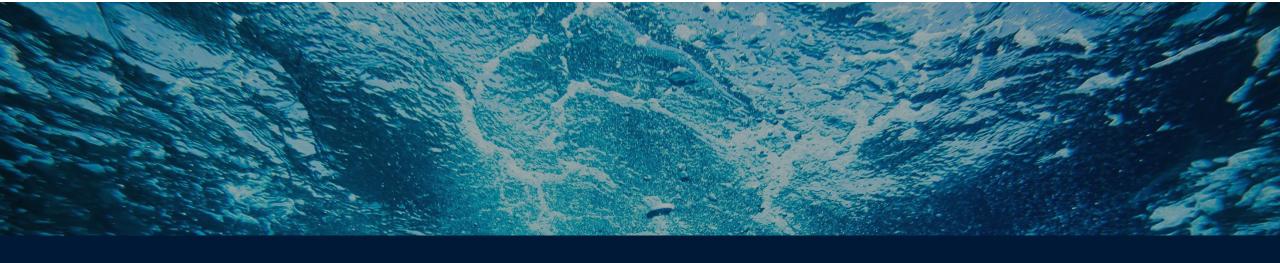
## (THERMAL) RADIATION\*

Heat is thermal energy in the form of electromagnetic waves. The wavelength can vary. The shorter the wavelength, the more energy it has (Joule) – thermal radiation may extend from short wavelengths (NIR) over mid-range (MIR) to long wavelengths (FIR). The strength of this radiation/the wavelength is variable.

## How is the principle used in textiles?

- Avoid the use of NIR/FIR (Near and Far-Infra-Red) reflection.
- Ensure the material does not warm up/absorb heat in the range of visible light (MIR), but rather reflects light with its heat energy. The influence of UV protection from the fabric and/or from treatment on the core body temperature is unknown.





# **ABSORPTION – SYNTHETIC FABRICS**



COOLING - ABSORPTION



#### **ABSORPTION\***

A medium can absorb heat and sweat. In the case of textiles, the absorbent medium is a knit or woven fibre design. Tests have shown that the degree and speed of the moisture transport is critical: The body needs to have the moisture close to the skin for rapid vaporization/evaporation!

COOLING – ABSORPTION – SYNTHETIC FABRICS



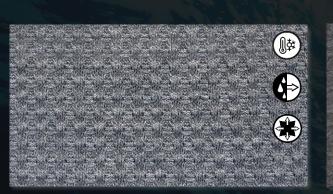
#### **ABSORPTION\***

## How is the principle used in textiles?

- Sweat is transported by means of (fibre and fabric) designs. This direction of transport can be along the width of the fabric (2-dimensional/lateral wicking) and/or vertically, i.e., away from the skin to the outer surface of the fabric (3-dimensional).
- Sweat can be repelled (hydrophobic) or attracted (hydrophilic) like a magnet. If a hydrophobe (moisture repellent) fabric on the skin is combined with a hydrophile (moisture absorbent) one on the outside, the moisture will effectively be transported to the outside. A fabric can have natural moisture transport properties or these can be created by the application of chemical treatments in or on the fibre.

#### COOLING - ABSORPTION - SYNTHETIC FABRICS





#### drirelease / OPTIMER DR LYOCELL 190

Lifestyle 210 q/sm 2% Elastan/Spandex, 88% Polyester, 10% TENCEL™ Lyocell

drirelease® Lyocell is SOFT SIDE OF PERFORMANCE, is where fashion and eco meet performance with comfort. The benefits are non-chemical moisture wicking, fast drying (4x faster), permanent performance, natural cooling, extreme comfort, easy-care, hasslefree, pilling resistance, soft and smooth hand, together with sustainable responsibility to develop an eco-friendly product.



#### YUANTEX COMPANY

YTGP-392

Baselayer 145 g/sm 40% Polyester, 60% Ecomade Coolmax®

Melange Jacquard P/D+Wicking

https://www.performancedays.com/product-detail/24583.html



#### **ALIGN TEXTILE**

AT20-4J017

Shirts 240 g/sm 6% LYCRA®, 38% Polyester, 56% recycle. Coolmax®

4 Way Stretch Pixel Jacquard COOLMAX@ **ECOMADE** Hydrophilic

https://www.performancedays.com/product-detail/22633.html



#### NILIT ECO 349AX - MAGLIFICIO RIPA

Baselayer 130 g/sm 5% Elastan/Spandex, 95% recycl. Polyamide

# Sensil® Breeze ECOCARE

Wide surface area achieved with flat cross section structure allows for quick transfer of heat away from the body Unique polymer which contains inorganic micron particles further increases surface area and forms small channels to promote cooling. Special texturizing process creates a low-bulk yarn which gives garments maximum breathability and ventilation.

https://www.performancedays.com/product-detail/26679.html

© Alexa Dehmel active-sport-design & consulting





# **ABSORPTION – PHASE CHANGE MATERIALS**



COOLING – ABSORPTION – PHASE CHANGE MATERIALS



### **ABSORPTION - PCM (Phase Change Materials)**

## **Definition Phase Change Materials\*:**

Substances that undergo the process of phase change are also known as phase change materials (PCMs). These materials store, release or absorb heat as they oscillate between solid and liquid form, giving off heat as they change to a solid state and absorbing it as they return to a liquid state. Some PCMs change phases within a temperature range that is just above and just below human skin temperature. This property now is being used in fabric and foam to store body heat and then release it when needed. PCMs in the form of microcapsules can be incorporated within fibers or foams, or may be coated onto fabrics.

COOLING - ABSORPTION - PHASE CHANGE MATERIALS



## **ABSORPTION-PCM (Phase Change Materials)**

### **How to incorporated PCMs into Fabric?**\*

The micro encapsulated PCM can be combined with woven, non-woven or knitted fabrics. The capsules can be added to the fabric in many ways such as:

Microcapsules of different shapes: round, square and triangular within fibres at the polymer stage. The PCM microcapsules are permanently locked within the fibre structure during the wet spinning process of fibre manufacture. Micro encapsulation provides a softer hand, increased stretch, more breathability and air permeability to the fabrics.

Matrix coating onto fabrics during finishing: the PCM microcapsules are embedded in a coating compound like acrylic, polyurethane, etc. and applied to the fabric.

#### COOLING - ABSORPTION - PHASE CHANGE MATERIALS





## **DEVAN CHEMICALS NV**TONES OF COOL BIO

Treatment 165 g/sm 100% TENCEL™ Lyocell

Tones of Cool® Bio is a patented cooling technology that stimulates the textile to dissipate redundant heat from the body and to instantly reduce the body temperature. The PCMs used in Tones of Cool® Bio are derived from sustainable, natural sources. The PCMs have the form of a crystalline wax or oily liquid (depending on temperature) and are 100% plantbased. The bio-source of the technology is higher than 85% and is certified by independent labs (DIN & USDA).



# **37.5 TECHNOLOGY / COCONA LABS.** 3514419 (DANMAO)

Woven Twill 174 g/sm 2% LYCRA®, 68% Merino Wool, 30% 37.5® PET + EB additive

This woven twill uses 37.5® PET + EB additive to enhance biodegradation. 37.5® yarns + EB additive break down to naturally occurring materials over decades. 37.5 Technology works with your body to determine if you need warming or cooling based on the amount of humidity next to your skin, removing heat & moisture when you're hot and retaining warmth when you're cold.



#### SCHOELLER TEXTILE AG

E63270

Softshell & Outer Midlayer 170 g/sm 21% LYCRA®, 79% Polyester

Ready for print materials with perfect and durable elasticity and shape retention. High wearing comfort. Lightweight water- and wind repelling warp-knit fabric ideal for body mapping. For tops and patches. With coldblack® technology.

https://www.performancedays.com/product-detail/26585.html



#### drirelease / OPTIMER 233-P0515/21

Baselayer 140 g/sm 6% Elastan/Spandex, 94% organic Cotton

OPTIMER ADAPT utilizes natural Phase Change Material designed to reuse, restore and recycle the body's thermal energy. As the body heats up, the ADAPT material liquefies and stores this energy assisting the body in its efforts to cool down. Reacting to a cold environment, the material solidifies and releases the stored energy back to the body for warmth providing thermal balance.

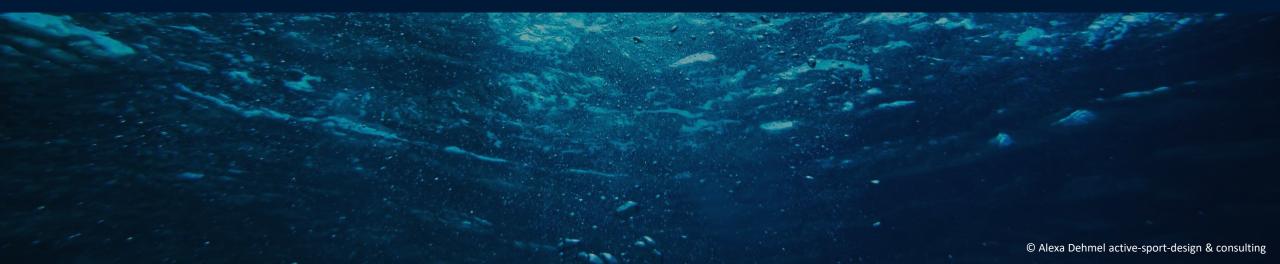
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https://www.performancedays.com/product-detail/22197.html





# ABSORPTION - NATURAL THERMALREGULATION / COOLING



COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



#### ABSORPTION\* - NATURAL THERMALREGULATION / COOLING

- For cotton, moisture settles in the crystal structure or in the core of the fibre and evaporates very poorly. Polyester retains only about 5% of its own weight as moisture; for the hydrophilic polyamide it is approximately 2-3%, and it is even < 1% for polypropylene.
- The term endothermic reaction applies when a fabric draws heat out of its environment (e.g. in contact with water). Wool is endothermic, but so is the sugar alcohol "xylit", which draws heat from the environment in contact with moisture.
- Endothermic effects are designed to keep the body in a comfortable temperature range to avoid sweating. They are (only) useful where the body is not yet generating enough heat to produce sweat. Therefore the effects are not measured as -xy°C cooler.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



#### NATURAL THERMALREGULATION / COOLING WITH ANIMAL FIBERS\*

#### WOOL / GOTS OR RWS / MERINO WOOL

Wool is an <u>excellent insulator and regulates the body's temperature</u>. Wool is hygroscopic and hydrophobic at the same time. Wool can easily absorb and release moisture and can absorb vapor at up to 36% of its dry weight without feeling damp or clammy (which is twice as much as cotton and thirty times as much as polyester). It allows moisture (perspiration) from the body to evaporate (wick) through the fabric. This helps keep the skin dry and comfortable.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



#### NATURAL THERMALREGULATION / COOLING WITH ANIMAL FIBERS\*

#### **ALPACA**

Alpacas are free-running animals living at 4,000 meters (13,000 ft.) altitude in the Andes. Here they are exposed to 40°C (104°F) temperature differences in the course of the same day. To survive, the South American Alpaca has evolved an adaptable semi-hollow fur, enabling it to remain cool in the scorching mornings and warm during the freezing nights. This insulating fiber also has wicking properties, transferring moisture outwards where it is spread over the surface of the fibers, accelerating evaporation.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



### NATURAL THERMALREGULATION / COOLING WITH ANIMAL FIBERS\*

#### YAK

The yak is a long-haired cow native to the Himalayas, Mongolia and Central Asia. Its wool is naturally soft and has evolved to protect them from the region's frigid temperatures. As a clothing textile, it feels sumptuous, looks sublime and is 30% warmer than sheep's wool.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



## NATURAL THERMALREGULATION / COOLING WITH PLANT FIBERS\*

#### **ORGANIC COTTON**

Cotton clothing is soft and stretches easily, making it a comfortable fabric to wear. The high moisture absorbent effect of cotton generates a great cooling effect. However, since moisture is absorbed to the inside of the fiber, drying times are low, which can cause a chilling effect. Cotton is hypoallergenic, which is ideal for sensitive skin. It's also easy to wash, and won't produce static cling.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



## NATURAL THERMALREGULATION / COOLING WITH PLANT FIBERS\*

#### **KAPOK**

Kapok fiber is a natural and soft silky cellulosic fiber with a significantly homogeneous hollow tube shape, **offering great thermal insulation**. Eco-friendly brands use it as an alternative padding to down and synthetic fibers, referring to it as 'plant-down'. The fiber is naturally hypoallergenic, anti-microbial, and dust miteresistant. **The kapok fiber naturally repels moisture, giving it great drying times** and making it unsuitable for mold, mildew, and bacteria to thrive in.

COOLING – ABSORPTION – NATURAL THERMALREGULATION / COOLING



#### NATURAL THERMALREGULATION / COOLING WITH PLANT FIBERS\*

## LINEN/FLAX

The main benefit of wearing linen is the coolness it provides during hot weather. It has excellent heat conductivity properties, as linen quickly allows heat to escape. It is claimed that the heat conductivity of linen (which similar to hemp) is 5 times higher than wool and 18 times higher than silk. Alongside its cooling qualities, linen has excellent hygroscopic properties and can absorb up to 20% of its weight and yet still remain dry. Linen is renowned for its durability, being twice as durable as cotton. With its resistance to fungi and bacteria, it is naturally anti-odor and it is anti-allergenic.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



### NATURAL THERMALREGULATION / COOLING WITH PLANT FIBERS\*

#### **HEMP**

Hemp is thermo-conductive and therefore feels very cool on the skin. It is a very light and strong natural fiber at the same time; it is resistant to degradation from sun and salt water and can protect the user from UV radiation. As a partially hydrophobic fiber, it naturally repels water.

COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING



### NATURAL THERMALREGULATION / COOLING WITH ECOLOGICAL MAN-MADE FIBERS\*

## LYOCELL / TENCELTM / TENCELTM REFIBRATM

Lyocell is very soft, breathable, light and comfortable and therefore excellent for sensitive skin. It is easy to wear, because it has a high moisture absorbency, drying times and breathability compared to cotton. Its elasticity and strength make it perfect for the use in sportswear. Lyocell by Lenzing − TENCEL™ is made of sustainable sourced quick growing eucalyptus trees and their REFIBRA Technology − TENCEL™ Refibra − includes the recycling of pre-consumer cotton waste in the production process (cutting waste from garment making).

#### COOLING - ABSORPTION - NATURAL THERMALREGULATION / COOLING





## **LENZING AG**GRANADA – G.VALLONE TEXTILES

Woven Shirts 115 g/sm 100% TENCEL™ Modal

TENCEL™ Modal fibers are extracted from naturally grown beech wood by an environmentally responsible integrated pulpto-fiber process, which is self-sufficient in energy and recovers co-products from component parts of the wood. This flexible fiber is renowned for its exceptional softness.

https://www.performancedays.com/product-detail/26840.html



# **LENZING AG**BARY – G.VALLONE TEXTILES

Woven Shirts 130 g/sm 56% Linen, 44% TENCEL™ Modal

TENCEL™ Modal fibers are extracted from naturally grown beech wood by an environmentally responsible integrated pulpto-fiber process, which is self-sufficient in energy and recovers co-products from component parts of the wood. This flexible fiber is renowned for its exceptional softness.

https://www.performancedays.com/product-detail/26843.html



## PONTETORTO 2333

French Terry Sweater 280 g/sm 6% Elastan/Spandex, 94% TENCEL™ Lyocell

This fabric is a typical French Terry with loops on one side and soft piles of yarn on the other. This knit results in a soft, plush texture. French Terry is mid-weight—lighter than coldweather sweatpants but heavier than a typical tee. The use of Lyocell yarn and elastane, makes this fabric cozy, moisture-wicking, absorbent, and keeps you cool.

https://www.performancedays.com/product-detail/24902.html



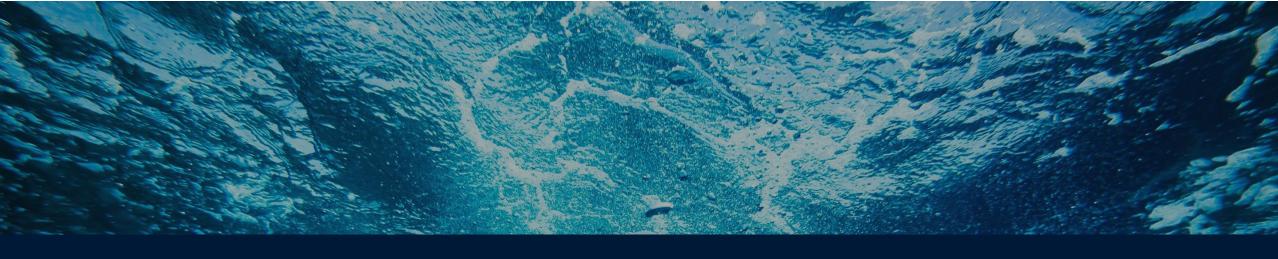
# **SUEDWOLLE GROUP**BIGROCK BETASPUN RWS NM 60/1

Baselayer 150 g/sm 13% recycl. Polyamide, 87% Wool Virgin

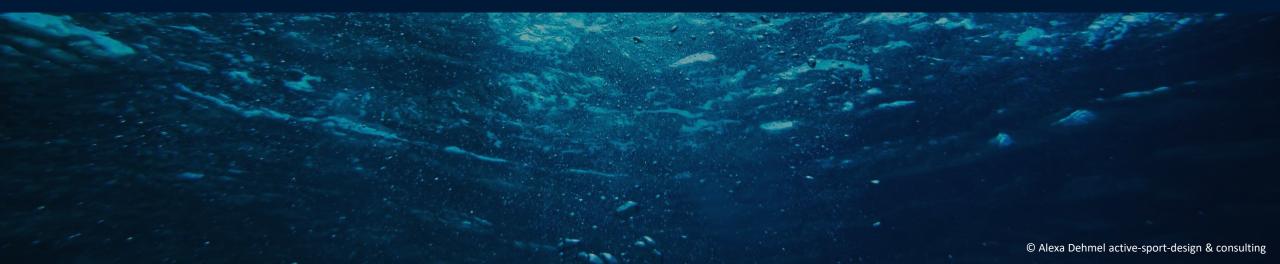
Introducing a special spinning technology we twist a recycled polyamide filament around a RWS certified Merino yarn. This way, fabrics with immense durability, abrasion resistance, light weight and significantly less pilling can be produced – all with using the natural component wool in combination with recycled nylon.

https://www.performancedays.com/product-detail/22296.html





# **ORGANIC- & MINERAL BASED INGREDIENTS**



BY PERFORMANCE DAYS & FUNCTIONAL FABRIC FAIR

COOLING - ORGANIC- & MINERAL BASED INGREDIENTS

## NATURAL THERMALREGULATION / COOLING WITH ORGANIC- & MINERAL BASED INGREDIENTS

**GRAPHITE** features unique properties such as thermal conductivity, which means, <u>Graphite has a low coefficient of thermal expansion</u> and an exceptional thermal resistance.

**GRAPHENE** has good thermal conductivity. Graphene fabric will transfer the body temperature from the higher part to the lower part, so the body temperature could be even and constant. <u>Graphene has both cooling and thermal property</u>.

**JADE** has very low thermal conductivity, meaning it absorbs heat very slowly and would take a long time to warm up even in hot conditions. Therefore, <u>fabrics featuring jade can remain cool</u>, relative to your body, for an extended period of time.

#### "THERMALREGULATION WITH FOCUS ON COOLING"

#### COOLING - ORGANIC- & MINERAL BASED INGREDIENTS











#### brrr<sup>o</sup> K0178

Baselayer 200 g/sm 68% Merino Wool, 32% brrr° Nylon

All brrr° yarns and fabrics have our Triple Chill Effect. This technology includes our natural cooling minerals, active wicking, and rapid drying to keep you cool and comfortable. All of our fabrics are tested and PROVEN TO KEEP YOU COOLER.

https://www.performancedays.com/product-detail/21994.html

# **brrrº** K0034-1R

Shirt Fabric 126 g/sm 9% Elastan/Spandex, 50% Polyamide, 41% brrr° recycled Nylon

Recycled brrr° Nylon All brrr° yarns and fabrics have our Triple Chill Effect. This technology includes our natural cooling minerals, active wicking, and rapid drying to keep you cool and comfortable. All of our fabrics are tested and PROVEN TO KEEP YOU COOLER.

\_

brrr° K0121R

Interlock Shirt Fabric 150 g/sm 100% brrr° recycled Polyester

All brrr° yarns and fabrics have our Triple Chill Effect. This technology includes our natural cooling minerals, active wicking, and rapid drying to keep you cool and comfortable. All of our fabrics are tested and PROVEN TO KEEP YOU COOLER.

https://www.performancedays.com/product-detail/22772.html

# LENZING AG TC16122 - TEXTILE TECH

Lifestyle 180 g/sm 6% LYCRA®, 61% MODAL, 33% SPUN Polyester(Cool Jade)

Cooling jersey wicking finish, uv protection

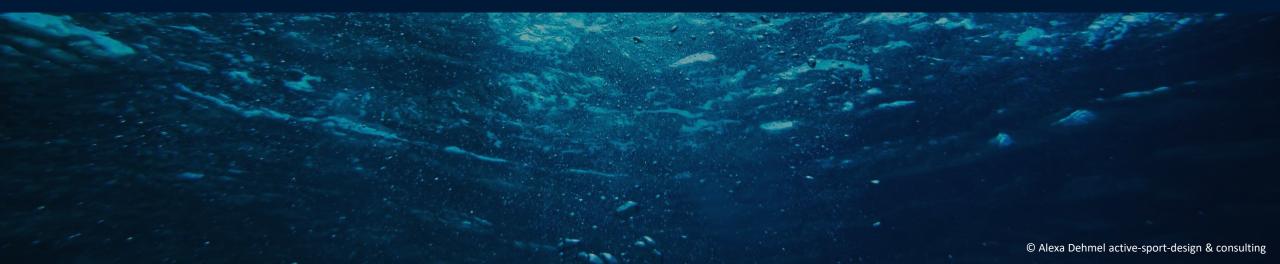
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# WHAT IS THE BEST WAY TO KEEP THE BODY COOL?



TOPIC

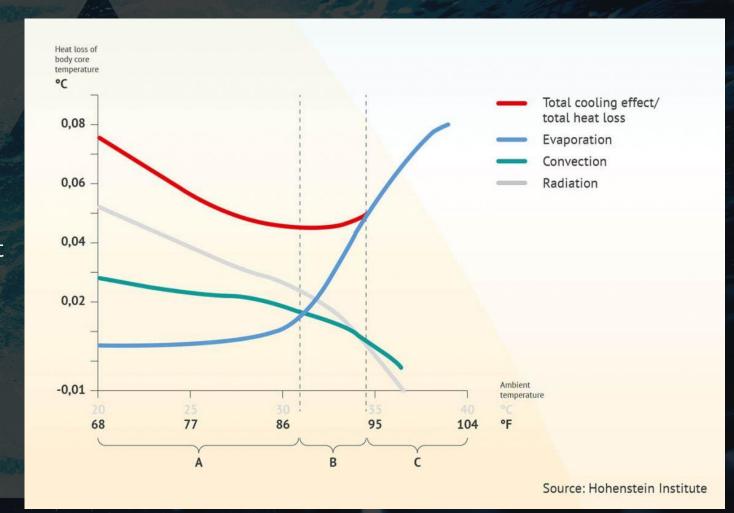


# WHAT IS THE BEST WAY TO KEEP THE BODY COOL?\*

### A

For ambient temperatures of ca. 20 °C / 68 °F – 31°C/87,7 °F, radiation is the strongest cooling factor.

Ensure the use of fabrics that reflect visible light (MIR, not UV light) and do not heat up.



TOPIC

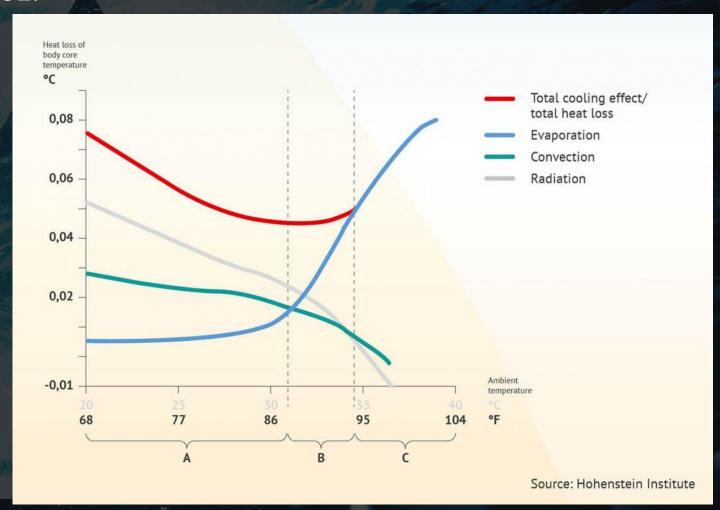


## WHAT IS THE BEST WAY TO KEEP THE BODY COOL?\*

B

For ambient temperatures of ca. 31 °C / 87,8 °F – 35°C/ 95 °F, a combination of radiation, convection, and evaporation produces the greatest cooling effect.

- Ensure the use of fabrics that reflect visible light (MIR, not UV light) and do not heat up.
- Sweat in the form of water vapor passes through the textile thanks to ventilation slots and mesh.
- Rapid and wide distribution of sweat close to the skin surface creates more area for evaporation.



TOPIC

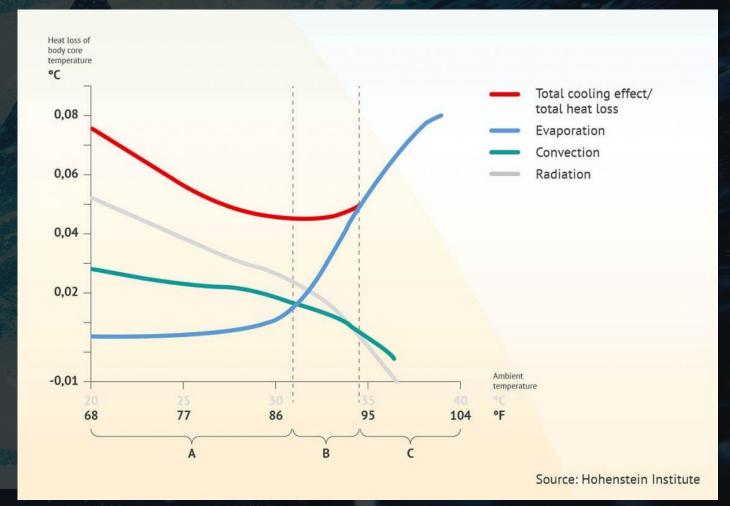


# WHAT IS THE BEST WAY TO KEEP THE BODY COOL?\*

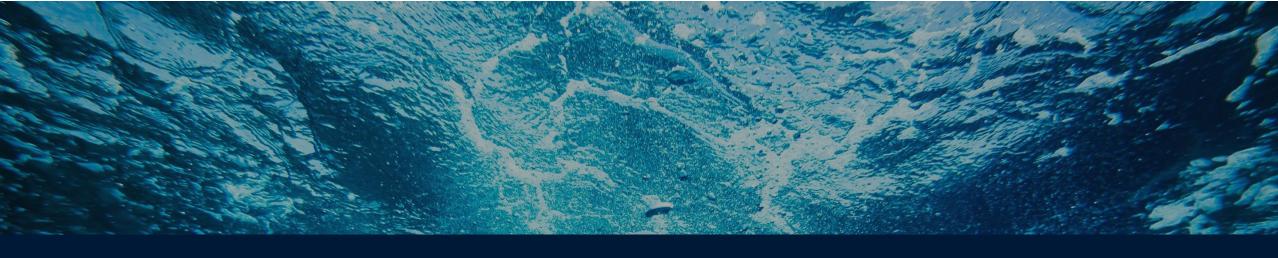
C

Above an ambient temperature of 35°C/95°F, evaporation is really the only relevant factor.

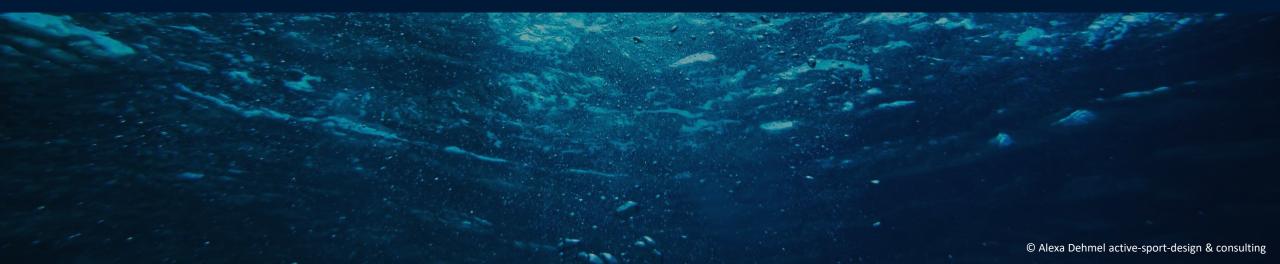
Rapid and wide distribution of sweat close to the skin surface creates more area for evaporation. The cooling effect of max. 0.08°C heat loss refers to the core body temperature – not the skin surface temperature!







# **GLOBAL COOLING FABRICS MARKET**



### "THERMALREGULATION WITH FOCUS ON COOLING"

TOPIC – GLOBAL COOLING FABRICS MARKET



## **GLOBAL COOLING FABRICS MARKET TO REACH USD 2.6 BILLION BY 2025\***

The global cooling fabrics market size in 2020 is estimated to be USD 2.0 billion and projected to reach USD 2.6 billion by 2025, at a CAGR of 6.0% from 2020 to 2025. The key factor driving the growth of the cooling fabrics market is due to the increasing demand for sports apparel, lifestyle, protective wearing, and other applications. Increasing research and development for cooling fabrics is the main factor anticipated to drive the cooling fabrics market.

TOPIC – GLOBAL COOLING FABRICS MARKET



## **INCREASING DEMAND FOR SPORTSWEAR AND PROTECTIVE WEAR\***

The use of cooling fabrics in sportswear applications is growing due to heat, moisture, and perspiration resistance, lightweight, smart, and easy to carry wearables, which help in regulating the body temperatures of wearers with respect to external temperatures. Sportspersons prefer using outfits made using cooling fabrics to remain dry while they are on the sports field. This makes wearers comfortable and thus helps performance in sports events. Cooling fabrics are also used to manufacture protective wear. Protective fabrics are exposed to hostile and adverse environments, including high temperatures. People working in such conditions experience a gradual increase in body temperatures. Cooling fabrics create a cooler microclimate to remove heat between the user and the environment. Hence, the increasing demand for cooling fabrics in sportswear and protective clothing is expected to drive the market.

TOPIC - GLOBAL COOLING FABRICS MARKET



# BASED ON TYPE, THE SYNTHETIC SEGMENT IS PROJECTED TO LEAD THE COOLING FABRICS MARKET BY 2025\*

Synthetics are expected to account for the largest share of the cooling fabrics market in 2020. Synthetic cooling fabrics are made from synthetic fibers as raw materials, including nylon, polyester, and spandex. Synthetic fabrics are most suitable for outdoor sports activities that regulate the temperature of the wearer through superior evaporative characteristics. Other than cooling, this type has excellent strength, high elasticity, and smooth texture, due to which the demand for synthetic cooling fabrics is expected to grow during the forecast period.

### "THERMALREGULATION WITH FOCUS ON COOLING"

TOPIC – GLOBAL COOLING FABRICS MARKET



# BY TEXTILE TYPE, THE KNITTED SEGMENT IS PROJECTED TO LEAD THE COOLING FABRICS MARKET BY 2025\*

Based on textile type, knitted cooling fabrics are expected to account for the largest share of the cooling fabrics market in 2020. Knitted textiles have a high degree of elasticity due to the looseness of the fabric yarn when compared to woven fabrics. The knitted fabrics are more comfortable to the wearer due to its properties, such as better breathability and the ability to fit the shape of the body in the best possible way. Due to this, knitted fabrics are used for manufacturing sports apparel, which triggers the demand for knitted cooling fabrics during the forecast period.

TOPIC – GLOBAL COOLING FABRICS MARKET



# BY APPLICATION, THE SPORTS APPAREL APPLICATION SEGMENT ACCOUNTS FOR THE LARGEST SHARE OF THE COOLING FABRICS MARKET\*

The sports apparel application segment is estimated to account for the largest share of the cooling fabrics market in 2020. Cooling fabrics play an essential role in manufacturing sports apparel, which helps the wearer provide a cooling effect while performing sports activities. The cooling fabrics absorb the heat in the form of sweat from the human body and give a cooling effect to the person wearing it. These cooling fabrics also increase the breathability to let the heat escape and give the wearer a comfortable feel without hampering their performance.



## Closure:

I hope I could give you some useful information and inspiration for the journey of your company.

That's all the time we have for today.

Thank you very much for attending today's webinar:

## "THERMALREGULATION WITH FOCUS ON COOLING"

You should receive the recording of the webinar later on and if I did not get a chance to answer your questions, please don't hesitate to contact me via email at <a href="mailto:alexa.dehmel@active-sports-design.com">alexa.dehmel@active-sports-design.com</a> or at <a href="mailto:www.active-sports-design.com">www.active-sports-design.com</a>.

If you wish to order some of the shown fabrics today, you can enter the article number in search and directly order the swatch at <a href="https://www.performancedays.com/marketplace.html">https://www.performancedays.com/marketplace.html</a> or klick on the link below the fabric, after registering for free.

Thanks again and I look forward to connecting with you all again, very soon!