Hydrophilising Agents to Impart Comfort Properties to Synthetic Fabrics

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Introduction

FITNESS IS the buzzword of modern-day youth. They are always looking for the hottest trends in clothes and accessories, which provide aesthetic appeal and, at the same time, the required comfort properties.

Synthetic textiles have innumerable advantages, including cost, durability and flexibility, but they suffer in comparison with cellulosic material on hydrophilicity.

Polyester and polyamide fabrics have limitations on sweat absorption and evaporation. Hence, there is a need to develop hydrophilising agents for synthetic textiles, to provide comfort properties.

Figure 1 shows the energy balance of the body when exposed to the environment. It produces a lot of heat during a workout and this could cause the core temperature to rise above 37°C, but the body tries to regulate the temperature via perspiration and evaporative cooling. Clothing can act as an unwanted buffer in the moisture-transfer or moisture-management process.

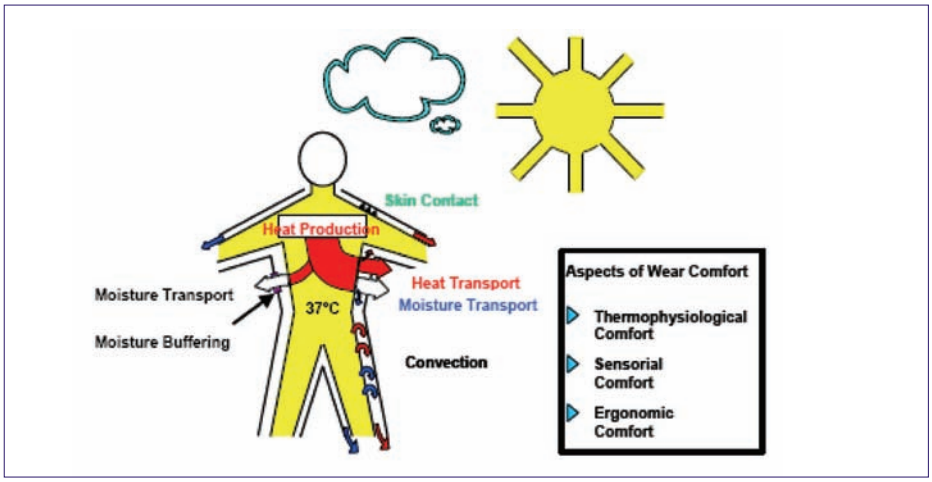

Figure 1: Energy Balance of the Human Body

Moisture Management

The term 'moisture management' always refers to the transport of moisture vapours and liquid away from the body (Figure 2). Today, this is just one aspect of the concept of 'wearer comfort', as the feel of the fabric against skin may include various descriptors, such as clammy, prickly, stiff or dry, etc.

In the case of cotton, the hydrophilicity of the fibre itself wicks away the moisture, which passes through the openings in the fibres or yarns, where distinctly accelerated evaporation takes place, resulting in comfort for the wearer.

On the other hand, clothing made up of synthetics such polyester or polyamide, etc, is unable to wick away the moisture/perspiration due to their inherent hydrophobic nature, so the fabric tends to stick to the skin. This impairs the comfort, which is a function of a fit garment. To maximise comfort and to feel cool in synthetic garments, the fabric must allow liquid to wick on to the surface, spread away and evaporate quickly.

Here, the wicking simply means the

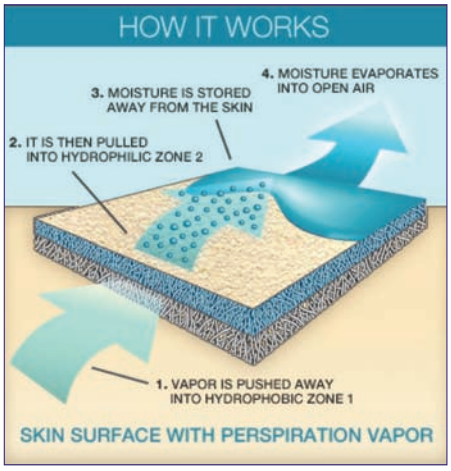

Figure 2: Mechanism of wicking away perspiration from skin

capillary movement of moisture within the fabric structure and moisture management is nothing but the controlled movement of water vapour and liquid water (perspiration) from the surface of the skin to the atmosphere, through the fabric.

Wicking rate is measured by a 'strip' test, in which a fabric strip is suspended vertically, with its lower end immersed in a reservoir of water containing red dye. The elapsed time for water to reach a certain height is recorded. The data measured by this method is reproducible.

Hydrophilising properties are, in addition, measured by a 'drop test', and the diameter of the drop and time is measured as a function of spreading. In this method, water droplet is placed on the fabric and the time taken for the droplet to wick into the fabric and disappear is measured.

As moisture-management properties are an important value-added element of clothing fabrics, it is necessary to impart the hydrophilicity to synthetics such as polyamide and polyester. Based on the need and demand of the consumer, Sarex has developed

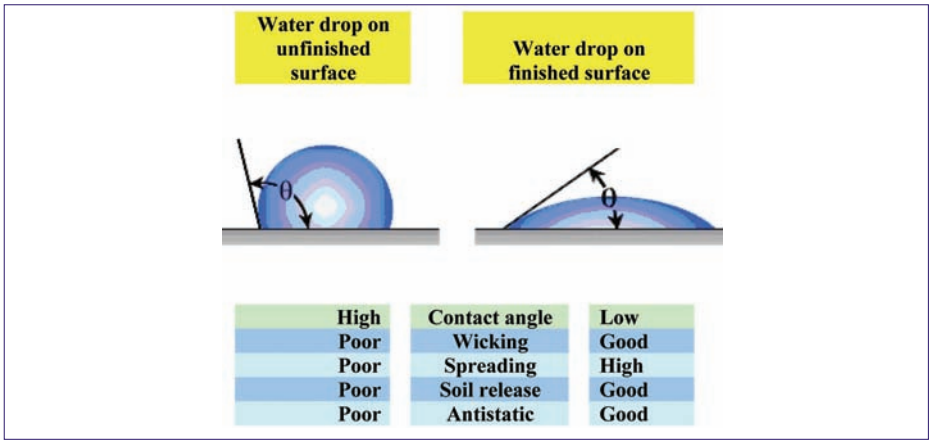

Figure 3. Typical water drop formation on unfinished and finished surfaces

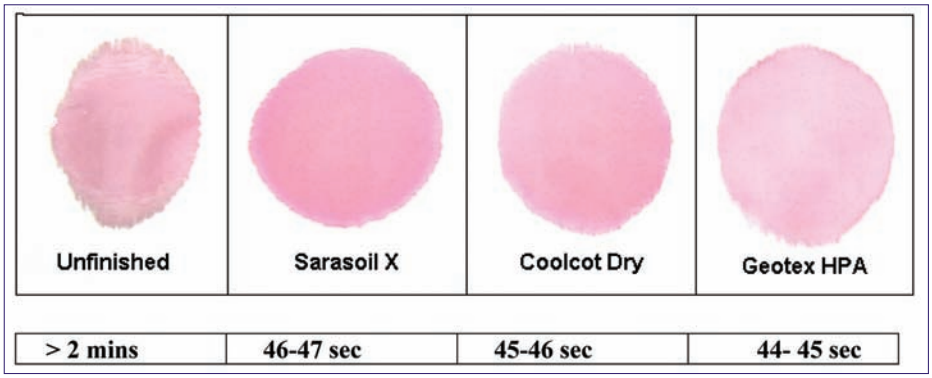

Figure 4: Absorbency and spreading effect of Sarasoil X, Coolcot Dry and Geotex HPA on polyeste

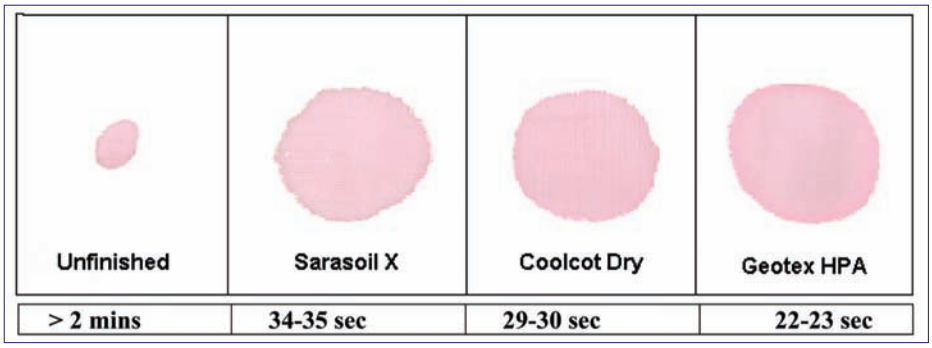

Figure 5: Absorbency and spreading effect of Sarasoil X, Coolcot Dry and Geotex HPA on polyamide

Table 1: Absorbency and spreading of drops of finished polyester fabric

Finishing agents	Absorbency, sec	Spreading of Drop, (0.1ml dye solution)		
		Time, sec	Vertical, (warp) cm	Horizontal, (weft) cm
Unfinished	52	>2min	8	6.3
20g/l Sarasoil X	11-12	46-47	8.0	7.6
20g/lCoolcot Dry	10-11	45-46	8.0	7.3
20g/l Geotex HPA	7-8	44-45	8.8	7.7

Table 2: Absorbency and spreading of drops of finished Polyamide fabric

Finishing agents	Absorbency, sec	Spreading of Drop, (0.1ml dye solution)		
		Time, sec	Vertical, (warp) cm	Horizontal, (weft) cm
Unfinished	>2min	>2min	1	1
20g/l Sarasoil X	13-14	34-35	4.5	4.5
20g/l Coolcot Dry	17-18	29-30	4.3	4.2
20g/l Geotex HPA	8-9	22-23	4.7	4.5

hydrophilising agents such as Sarasoil-X, Coolcot Dry and Geotex-HPA for polyester and polyamide. Some of these finishing agents not only impart hydrophilicity but also improve the soil-release and antistatic properties.

Moisture Management Finish from Sarex

Finishing with Sarasoil-X, Coolcot Dry and Geotex-HPA on polyamide and polyester fabric can be carried out by conventional methods and it does not require any new machines or special modifications.

Finishing with above products was carried out on polyamide and polyester fabric. Products were applied in concentrations of 20–30g/l by padding at 65 to 70% expression and dried at 150°-180°C for 1-2 min.

Complete wicking of moisture, combined with an accelerated spreading rate, was observed by rapid wicking and spreading of liquid, which would definitely impart wearing comfort to the synthetic apparels.

The results of absorbency and spreading of drops on finished polyamide and polyester fabrics are given in Tables 1 and 2 and Figures 3 and 4. From the results it is clear that Sarasoil X and Coolcot Dry show better hydrophilicity and spreading of drops in a shorter time on finisher polyester fabric than on unfinished fabric. Addition this, Sarasoil X shows better antisoiling properties and hence can be used for polyester and its blends. Even fatty and oily soiling can easily be washed out.

Geotex HPA also can be used for polyester, polyamide and their blends, as it shows better spreading of the drop vertically and horizontally on finished fabric than unfinished fabric.

Thus, this finishes provides textiles with even more advantages through this rapid wicking and spreading. This largely prevents the development of an unpleasant body odour.

Conclusion

Finishing with Sarasoil X, Coolcot Dry and Geotex HPA imparts a quality whereby moisture is quickly transported from the fabric and is allowed to evaporate, thereby giving a cooling effect and comfort to the wearer. In addition, fabric finished with above products showed improved antisoil and antistatic properties. These finishes are durable to repeated home laundering conditions.

Thus, fabric finished with Sarasoil X, Coolcot Dry and Geotex HPA make synthetic textiles universally applicable, especially in sportswear, underwear, uniforms and workwear, as well as in medical and technical textiles. ID