

Don't Fret while Sweating: Moisture Management Finish

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Abstract

TODAY'S MARKET IS consumer-driven, and the consumer today has become more and more serious about what they want, and what they want to buy. Looking beyond the physical appearance and feel of the fabric, today's end user is demanding of various functionalities in a garment or a textile material. As a result, clothing manufacturers are also focusing their attention in imparting performance and functional finishes to the fabric, which meet the requirement of the customer. These finishes help in enhancing the experience of the wearer. One such finish is moisture management finish, which helps in maintaining the body temperature under diverse environmental conditions. This property of the fabric is very important to determine the comfort level for the wearer, especially in the case of sportswear and active outdoor wear. In this paper, various speciality chemicals, developed by Sarex, were applied on 100% polyester fabric and polyamide, which are used in sportswear, and their moisture management properties were tested using AATCC 195:2012 and have been reported.

1. Introduction

In recent years there has been considerable research and development in moisture management fabrics, which perform in such a way that the body perspiration is transported away from the skin to the outer surface of fabric, where it can evaporate quickly in order to accomplish the comfort of the consumer. Moisture management can be defined as the controlled movement of water vapour and liquid water (perspiration) from the surface of the skin to the atmosphere, through the fabric, as seen in Figure 1.

The main aim of moisture management fabric is to make the skin feel dry and fresh. In order to achieve this, humidity should be evaporated and transferred to the atmosphere as soon as possible. The transportation of humidity to the surface of the fabric is done by a capillary force known as wicking. Wetting, wicking, and moisture vapour transmission properties are the critical aspects for evaluating the comfort performance of textiles.

The human body releases around 60ml of water vapour each hour at ambient conditions, even when it is at rest. When we do some activity like walking, or play any sports, the body warms up and sweats more, which is more or less absorbed by the textile material. This humidity needs to be transferred to the surface of the fabric for evaporation and thus to produce a cooling effect. Therefore, to make a wearer feel comfortable, not only should the fabric evaporate the perspiration from the skin surface to the fabric surface, but the moisture should also get evaporated. Moisture adds weight to the garment and makes the skin cold. It can also cause irritation and skin diseases. Hence, it is very essential to have a moisture management fabric, so as to make the wearer feel comfortable.

Most garments are made of polyester, polyamide, cotton or their blends. Polyester is one of the most extensively consumed of all fibres (about 70%), and when one perspires, this fibre tends to keep the perspiration trapped

against the body, due to the hydrophobic nature of polyester. On the contrary, cotton fibre, being hydrophilic, is able to absorb high levels of moisture, but the transport property between inner and outer surfaces of fabrics made of cotton fibres is very poor; this makes cotton unsuitable for use against the skin during energetic activity.

For sportsmen and women to concentrate fully on their sporting activities and to get the best results out of them, it is essential that their clothing is comfortable to wear. Feeling nice and dry and comfortable in every situation is the best way of giving their individual performance an extra boost.

The following are some of the application areas where, moisture management finishes are essential:



Sleeping bags



Active wear

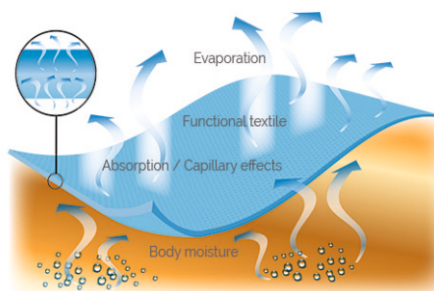


Figure1: Moisture management mechanism



Performance wear



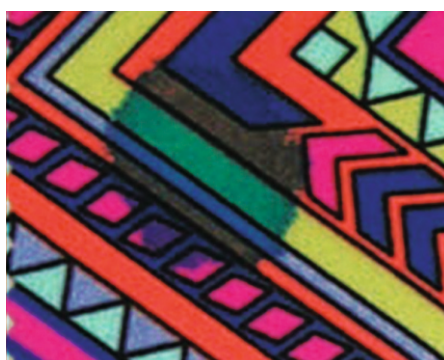
Protective clothing

Understanding the requirements of end users, Sarex has developed various moisture-management finishes, which can be applied on various substrates to satisfy customers' needs. The following are some of those finishes:

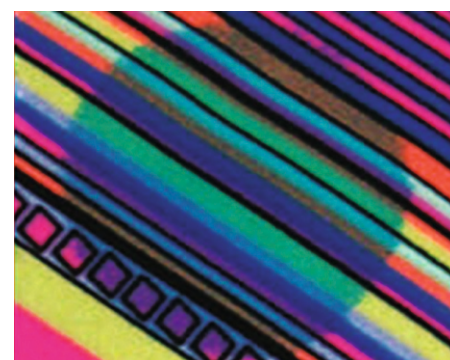
- Moisture-Guard is a concentrated organo modified hydrophilic finishing agent for cellulosic and synthetic fibres and their blends. It imparts rapid moisture absorption, evaporation and improved wicking thereby producing a cooling effect to wearer.
- Estofeel (Conc) is a specially developed hydrophilic finishing agent for polyester, polyamide and other synthetic fibres. It improves the wicking property of fibres.

2. Moisture Management Testing

The finished fabrics were evaluated for wicking height, absorbency and moisture management properties as per AATCC 195:2012. The



Untreated fabric



Treated fabric

Figure 2: Drop Test on untreated and treated fabrics

Moisture Management Tester is the only instrument in the market that can precisely measure the liquid management properties and performance of fabrics, ensuring the comfort and protection that consumers demand. To measure the dynamic liquid transport properties, a sample is placed horizontally in the instrument between the upper and lower sensors. These sensors are made of concentric rings of pins. A solution, representing perspiration, is dropped on the centre of the upper facing (skin side) of the test sample. As the solution moves through and across the sample, the changes in the electrical resistance are measured.

A two-minute test gives a comprehensive profile of a fabric's performance, producing the

following data:

- Overall Moisture Management Capacity
- Accumulative One-Way Transport Capacity
- Wetting Time for top and bottom surfaces
- Absorption Rate for top and bottom surfaces
- Max Wetted Radius for top and bottom surfaces
- Spreading Speed top and bottom surfaces

3. Results & Discussion

Fabrics of 100% polyester and polyamide were treated with Moisture-Guard and Estofeel (Conc) and their moisture management testing was carried out at the Wool Research Association (WRA), a Centre

Parameters		Unfinished	8gpl Estofeel Conc (10%)	5gpl Moisture-Guard
Wetting time top	Avg (Sec)	11.98	3.90	2.96
	Grade	3	4	5
Wetting time Bottom	Avg (Sec)	6.12	4.77	1.22
	Grade	3	4	5
Absorption rate top	Avg (%/Sec)	19.45	32.01	58.25
	Grade	2	2	4
Absorption rate bottom	Avg (%/Sec)	34.75	23.63	27.51
	Grade	3	2	2
Max. wetted radius top	Avg (mm)	11.67	20.00	23.33
	Grade	2	4	5
Max. wetted radius bottom	Avg (mm)	8.33	23.33	23.33
	Grade	2	5	5
Spreading Speed top	Avg (mm/Sec)	1.40	2.82	4.23
	Grade	1	3	5
Spreading speed bottom	Avg (mm/Sec)	7.02	3.36	15.01
	Grade	3	4	5
Accumulative one way transport index	Avg (%)	638.96	400.32	326.62
	Grade	5	5	4
OMMC	Avg	0.69	0.70	0.72
	Grade	4	4	4
Statements		This is water penetration fabric	This is moisture management fabric	This is moisture management fabric

Table 4. Moisture management test results on 100% polyester fabric

of Excellence (CoE) for Sportech. Tables 1 and 2 show the absorbency and wicking height of treated and untreated fabrics. It is evident from the results in Tables 1 and 2 that treated fabrics showed higher absorbency and higher wicking height compared to untreated fabric. Figure 1 shows the drop test results on treated and untreated fabrics of polyester and polyamide fabrics. This is because of the hydrophilicity which is imparted to 100% polyester and polyamide fabric, which enhances the absorbency and wicking height and allows the water to transport.

From Table 4 it is seen that the fabrics treated with Estofeel (Conc) and Moisture-Guard showed moisture management properties. From Table 4 it is seen that the wetting time for top and bottom surface reduces drastically after treatment with Moisture-Guard and Estofeel (Conc), and also that the radius of water spreading and speed with which water spreads on the top and bottom of the surface increases after treatment as compared to untreated fabric. The overall moisture management capacity rating of all the treated fabrics is 4 but the rating of radius of top and bottom wetting of untreated fabric is less than 3; ie. it is a water penetration fabric. A fabric having a higher one way transport index but lower spreading area is termed as

Fabric	Wetting Time (Sec)	Wicking Height (Cm) After 30min	
		Warp	Weft
Untreated Polyester	11.98	9.6	8.4
5gpl Moisture-Guard	2.96	13.7	12
8gpl Estofeel Conc (10%)	3.9	12.7	12.4

Table 1. Absorbency and wicking height of 100% Polyester fabric

Fabric	Wetting Time (Sec)	Wicking Height (Cm) After 30min	
		Warp	Weft
Untreated Polyamide	10	7.9	5.6
5gpl Moisture-Guard	2	15	15
8gpl Estofeel Conc (10%)	2-3	15	15

Table 2. Absorbency and wicking height of 100% Polyamide fabric

water penetration fabric. For effective moisture management, the fabric should be able to transport liquid in multiple directions, and therefore the spreading area should be higher. This property also helps the fabric achieve quick evaporation and quick drying.

4. Conclusion

For comfort properties of textiles with varying end use applications, in the normal textile sector, technical textiles and other fields, moisture management plays a key role.

Because of proper moisture management, textiles can be tailor-made for their specific end use. Apparel manufacturers are shifting their attention to the high-performance end uses of the Moisture Management Fabrics. As manufacturers of sports and active outdoor wear strive to improve the functionality of their collections, the future will see further developments in the field of moisture management fabrics. We at Sarex Chemicals can be a specific solution provider to its customers to meet their requirements.