

# Moisture management finish of polyamide fiber fabrics for athleisure



Naresh M. Saraf, Sanket P. Valia  
Sarex Chemicals, Mumbai/India

Polyamide (PA) fiber, and blends with it, are broadly used in athleisure, stockings, inner wear and sportswear. PA, having numerous advantages, has the drawback of generating static charges due to its less hydrophilic nature. This leads to fabric clinging to the wearer. Also, the sweat generated during activity will not be transported out, making it uncomfortable to the wearer. For this reason, there has been great demand for the hydrophilic finishing technology that could be applied to PA fiber by exhaust or dipping method. In this study, hydrophilic polyester (PET) resin, was applied on PA knitted fabric by dipping method. The treated fabric was tested for water absorption, wicking and moisture management property. Fabrics treated with Estofeel (Conc), a moisture absorber by Sarex Chemicals, showed higher absorbency, wicking and better moisture management property as compared to unfinished fabrics. These treated fabrics can thus have a great application in sportswear, athleisure wear and provide better comfort to the wearer.

Moisture management is the most vital property of any fabric meant for apparel, which decides the comfort level of that fabric. Humans sweat during different kinds of activities, and it is the ability of the fabric to transport the water away from the body to the surface of the fabric that makes the wearer feels comfortable. Today's market is a consumer driven market, and the consumer has become more and more thoughtful regarding what they want, and what they want to buy. Today, the end users look beyond the aesthetic property of the fabric and gives importance to technical properties as well.

Wicking behavior and drying rate are critical aspects for the performance of fabrics and have a practical significance in clothing comfort. For comfort, the rate of evaporation should be as close to the wicking rate as possible. Liquid transfer mechanisms include water diffusion and capillary wicking, which are determined mainly by effective capillary pore distribution, pathways and surface characteristics, whereas the drying rate of a material is related to the macromolecular structure of the fiber, surface finish on fabrics and the amount of water absorbed. In its unfinished state, PA fiber is hydrophobic and has a much lower water absorption capacity than cotton fiber, but its wicking rate, although slow compared with some other synthetic fibers, is faster than that of cotton. When PA is intended to make contact with the skin in a garment, it is usually

chemically treated by hydrophilic polymer to improve its wicking ability.

Hydrophilic finishing agents for PA fabrics are surfactants which are cationic, anionic and nonionic. Among them, cationic surfactants have the best hydrophilic effect, and polymeric nonionic surfactants have the most antistatic durability. One such product which is commercially available in the market was chosen for this study.

## Experimental

### MATERIALS

In this study, PA knitted activewear fabric was used. The fabric used was scoured, bleached and ready for finishing. The fabric selected is popularly used in sportswear, activewear and comfort wear either alone or in blend. These fabrics were purchased from Piyush Syndicate, Mumbai/India.

### Methods

### FINISHING TREATMENT

The fabric selected was ready for finishing, but in order to remove the dust particles and other impurities present on them, they were given a normal washing treatment with 0.5 g/l Celldet-R (Sarex Chemicals) a detergent in a washing machine and dried.

This fabric was then treated with 8 g/l of 10% Estofeel (Conc) a hydrophilic polyester resin from Sarex Chemicals. Following recipe and application conditions were maintained:

- Dosage: 8 g/l of (10%) Estofeel (Conc)
- Pick-up: 65%
- Bath pH: 5.5
- Drying: 120°C for 2 minutes.
- Curing: 170°C, for 1 minute (PA), 160°C, for 1 minute (PA)

**WASH DURABILITY**

Treated fabrics were tested for durability for 15 cycles as per the standard AATCC 135 method.

## Chemical characterization

**WATER ABSORBENCY TEST**

In order to measure the ability of the fabric to absorb water by spreading action, fabric sample size 10 x 10 cm<sup>2</sup> was taken. A drop of water was allowed to fall on the flat fabric surface. The height of water drop is controlled by a syringe, which contains 1 ml of water. Water absorbency is determined by time taken to absorb 1 ml of water.

**WICKING BEHAVIOR**

Wicking of fabrics was measured in accordance with AATCC 197 (2018) E, initially and after 3 washes, in this method the bottom of the specimen comes into contact with water. Then, the wicking distance by specified time intervals was recorded. The higher the wicking distance at the same interval, the better the fabric is in wicking.

**MOISTURE MANAGEMENT TESTING AATCC 195 (2017) E2**

The knit fabric (untreated and treated) samples were tested on SDL Atlas moisture management tester (MMT) according to AATCC test method (2017) E2 at Wool Research Association, Mumbai. The accumulative one-way transport index and the overall moisture management capacity (OMMC) were measured by using the moisture management tester MMT provide an understanding about the liquid transmission property of fabrics. Results and discussion

A 100% PA fabric was treated with hydrophilic polyester resin and their wicking and moisture management testing were carried out at Wool Research Association (WRA) Centre of Excellence of Sportech. Table 1 shows the absorbency and wicking height of treated and untreated fabrics. It is evident from the results that treated fabrics show higher absorbency and higher wicking height compared to untreated fabric. This behavior can also be

↓ **TABLE 1**  
**Absorbency and wicking height of 100% PA fabric**

Fabric	Wetting time [s]	Wicking height after 30min [cm]	
		Warp	Weft
Untreated PA	10	7.9	5.6
Treated PA10	2-3	15	15

explained by absorption and wicking phenomena. PA fibers are less hydrophilic, but they have very good liquid transport property as they have less affinity towards water molecule and thus impart very good capillary action. Therefore, when these fibers are treated with hydrophilic resin they will develop good affinity with water molecules and thus absorb water quickly. Due to the fibers' inherent property of liquid transport it will increase the wicking height as well.

From Table 2 it is seen that the fabrics treated with hydrophilic polyester resin shows moisture management property and washed fabric shows quick wick and quick drying property, these results and statements are given by the MMT Tester by SDL Atlas from Wool Research Association. It is seen that the wetting time for top surface reduces drastically, absorption rate increases after treatment, the radius of water spreading and speed with which water spreads on the top and bottom of the surface increases

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↓ **TABLE 2**  
**Moisture management test results on 100% PA fabric**

Parameters		Unfinished	8gpl Estofeel conc (10%)	8gpl Estofeel conc (10%) after 15 HL
Wetting time top	Avg [s]	120	23.54	6.53
	Grade	1	2	3
Wetting time bottom	Avg [s]	6.23	8.14	6.53
	Grade	3	3	3
Absorption rate top	Avg [%/s]	0	20.74	50.40
	Grade	1	2	4
Absorption rate bottom	Avg [%/s]	83.74	78.95	81.88
	Grade	4	4	4
Max. wetted radius top	Avg [mm]	0	21	21
	Grade	1	4	4
Max. wetted radius bottom	Avg [mm]	5	21	23
	Grade	1	4	5
Spreading speed top	Avg [mm/s]	0	0.96	3.01
	Grade	1	1	4
Spreading speed bottom	Avg [mm/s]	0.79	1.11	3.03
	Grade	1	2	4
Accumulative one-way transport index	Avg [%]	1078.3	549.31	46.08
	Grade	5	5	1
OMMC	Avg	0.70	0.68	0.47
	Grade	3	4	3
Statements		Water penetration fabric	Moisture management fabric	Fast absorbing and quick drying fabric

MANAGEMENT

## Matthias Holzammer

**Matthias Holzammer** is handing over the operational management of **Autoneum Management AG** Winterthur /Switzerland, as of March 27, 2023. As new **CEO** the Board of Directors has appointed **Eelco Spoelder**, who has over 25 years of experience in the automotive supply industry.

Spoelder has held global leadership positions in the automotive supply industry at Faurecia SA, Nanterre/France, and previously Continental AG, Hanover/Germany, where he ensured operational competence and strategic continuity even in a challenging market environment. He has experience in operations, manufacturing, purchasing, customer satisfaction, quality and IT. He is also familiar with technology trends in the automotive industry.

Holzammer is leaving Autoneum at his own request. Until June 30, 2023, he will serve as Senior Advisor to the Chairman of the Board of Directors and the new CEO.

MANAGEMENT

## Ib Jensen

Effective March 1, 2023, **Ib Jensen** will take over from **Jan Secher** as **Chief Executive Officer (CEO)** of **Perstorp Group** Malmö/Sweden, a leading specialty chemicals company and since 2022 part of Petronas Chemicals Group Berhad (PCG), Kuala Lumpur/Malaysia.

Jensen is a senior industry executive with a long career as Chief Financial Officer (CFO) and extensive experience from M&A and integration of acquired companies, a skill that will be required in the next phase for Perstorp. Jensen has been CFO of Perstorp for the past year. Previous experience includes CFO and executive roles within Finance and IT at companies such as Arxada, Lonza, Syngenta, Danisco and Lego.

After more than 9 successful years as the CEO, Secher has decided to step down. This decision was made prior to the acquisition by PCG, allowing for a full search process to be conducted for his replacement.

Secher remains in the CEO role until March 1, 2023, and will thereafter serve as an advisor to the new CEO and the Chairman, focusing on strategy and transferring external relationships. Monica Jönsson, currently deputy CFO, will then take on the role as CFO.

after treatment as compared to untreated fabric. The overall moisture management capacity rating the treated fabric is 4 while that of washed fabric is 3. The difference between the unfinished and the finished and washed fabric is that, in unfinished fabric the water is absorbed unidirectional which can be seen by the rating given in accumulative one way transport index, while in the case of treated fabric it is multidirectional i.e. water drop spreads and absorbs faster leading to an increase in surface area and thus to quick drying.

## Conclusion

For comfort properties of textiles with varying end-use applications, in the conventional textile sector, technical textiles and other fields, moisture management plays a key role. Based on moisture management, textiles can be made tailor made for its specific end use. Apparel manufacturers are shifting their attention to the high-performance end-use 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 and such finishes will help in improving the performance of the fabric and the individual.

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## TEXTILE TECHNOLOGY

Innovations in materials, technologies and chemistry are booming, and with them the corresponding start-ups. The need to become sustainable is also driving the industry into partly uncharted territory.

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