Sarex

Vol. 10, Issue 40, Oct 2017

Saraquest

Exclusive Insight

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Chemistry Behind Good Feelings

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Estofeel (Conc) - Moisture Management Finish

In recent years, there have been considerable research and developments in moisture management fabrics 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 accomplishing the consumer satisfaction of comfort. Moisture management can be defined as the controlled movement of water vapor and liquid water (perspiration) from the surface of the skin to the atmosphere through the fabric as seen in Fig.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 vapor transmission properties are the critical aspects for evaluating the comfort performance of textiles.

The human body releases around 60ml of water vapor 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 producing 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.

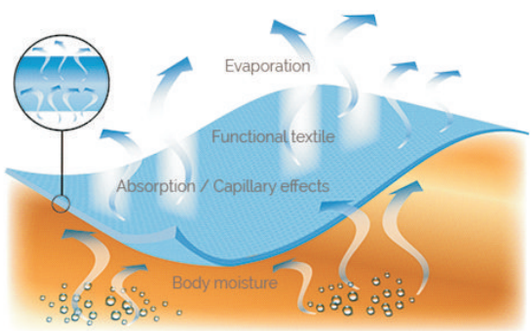


Figure.1 Moisture management mechanism

Most of the garments are made of polyester, polyamide, cotton or their blends. Polyester fibre is one of the extensively consumed of all fibres (about 70%), and when one perspires, the 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 the 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 activity and to get the best result 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.

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

Performance Wear

Active wear

Sleeping bags

Protective clothing

Key Features:

- Excellent antistatic property
- Makes the fabric hydrophilic
- It is durable
- It is compatible with dyeing recipe in exhaust process

Solution from Sarex:

Understanding the requirement of the end users, ***Sarex*** *has developed various moisture management finishes which can be applied on various substrates to satisfy the customers need. Following are some of the moisture management finishing chemicals which are developed by Sarex-*

Estofeel (Conc) *is specially developed hydrophilic finishing agent for polyester, polyamide and cotton fibres. It improves wicking property of fibres.*

Moisture management testing:

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

Results & Discussion:

A 100% polyester, polyamide and cotton fabrics were treated with Estofeel (Conc) (Sarex products) and their moisture management testing was carried out at Wool Research Association (WRA) COE of Sportech. It is evident from the results from Table 1, 2 and 3 that treated fabrics showed higher absorbency and higher wicking height compared to untreated fabric. From the results it is seen that the fabrics treated with Estofeel (Conc) showed moisture management property. It is seen that the wetting time for top and bottom surface reduces drastically after treatment with Estofeel (Conc) also 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 fabric having higher one way transport index but lower spreading area are termed as water penetration fabric. While in moisture management, the fabric should be able to transport liquid in multiple direction, therefore spreading area should be higher. This property also helps the fabric for quick evaporation and quick drying.

Table 1: Moisture management test results on 100% polyester fabric

Parameters		Unfinished	8gpl Estofeel Conc (10%)	8gpl Estofeel Conc (10%) after 20HL
Wetting time top	Avg (mm/Sec)	11.98	3.90	2.71
	Grade	3	4	5
Wetting time Bottom	Avg (mm/Sec)	6.12	4.77	3.61
	Grade	3	4	4
Absorption rate top	Avg (%/Sec)	19.45	32.01	13.98
	Grade	2	2	2
Absorption rate bottom	Avg (%/Sec)	34.75	23.63	30.60
	Grade	3	2	3
Max. wetted radius top	Avg (mm)	11.67	20.00	21
	Grade	2	4	4
Max. wetted radius bottom	Avg (mm)	8.33	23.33	16
	Grade	2	5	3
Spreading speed top	Avg (mm/Sec)	1.40	2.82	3.77
	Grade	1	3	4
Spreading speed bottom	Avg (mm/Sec)	7.02	3.36	2.71
	Grade	3	4	3
Accumulative one way transport index	Avg (%)	638.96	400.32	359.82
	Grade	5	5	4
OMMC	Avg	0.69	0.70	0.64
	Grade	4	4	4
Statements		This is water penetration fabric	This is moisture management fabric	This is moisture management fabric

Table 2: Moisture management test results on 100% polyamide fabric

Parameters		Unfinished	8gpl Estofeel Conc (10%)	8gpl Estofeel Conc (10%) after 20HL
Wetting time top	Avg (Sec)	120	13.54	6.53
	Grade	1	2	3
Wetting time Bottom	Avg (Sec)	6.23	8.14	6.53
	Grade	3	4	3
Absorption rate top	Avg (%/Sec)	0	20.74	50.40
	Grade	1	2	4
Absorption rate bottom	Avg (%/Sec)	12.16	78.92	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	4
Spreading speed top	Avg (mm/Sec)	0	0.96	3.01
	Grade	1	1	4
Spreading speed bottom	Avg (mm/Sec)	0.79	1.11	3.03
	Grade	1	2	4
Accumulative one way transport index	Avg (%)	1078	549.31	46.08
	Grade	5	5	2
OMMC	Avg	0.7	0.68	0.47
	Grade	4	4	3
Statements		This is water penetration fabric	This is moisture management fabric	This is moisture management fabric

Table 3: Moisture management test results on 100% cotton fabric

Parameters		Unfinished	8gpl Estofeel Conc (10%)	8gpl Estofeel Conc (10%) after 20HL
Wetting time top	Avg (Sec)	13.47	11.75	3.08
	Grade	3	3	4
Wetting time Bottom	Avg (mm/Sec)	10.53	6.60	3.08
	Grade	3	3	4
Absorption rate top	Avg (%/Sec)	87.73	18.09	38.76
	Grade	4	2	3
Absorption rate bottom	Avg (%/Sec)	87.97	37.64	43.19
	Grade	4	3	3
Max. wetted radius top	Avg (mm)	17	22	21.67
	Grade	3	4	4
Max. wetted radius bottom	Avg (mm)	17	21	23.33
	Grade	3	4	5
Spreading speed top	Avg (mm/Sec)	1.12	1.62	4.23
	Grade	2	2	5
Spreading speed bottom	Avg (mm/Sec)	1.13	1.68	4.24
	Grade	2	2	5
Accumulative one way transport index	Avg (%)	267.60	347.23	-2.43
	Grade	4	4	2
OMMC	Avg	0.49	0.54	0.39
	Grade	3	3	2
Statements		This is moisture management fabric	This is moisture management fabric	This is fast absorbing and quick drying fabric

Wetfin-NS - Silicone free hydrophilic agents

Man made fibres like polyester, nylon, polypropylene etc are the most widely used polymers in the textile industry. These fibres exceed the production of natural fibres with a market share of 54.4%. The advantages of these fibres are their high modulus, strength, stiffness, abrasion resistances and relatively low cost. The downside to synthetic fibres use are reduced wearing comfort, build-up of electrostatic charge, the tendency to pill, difficulties in finishing, poor soil release properties and low dyeability. These disadvantages are largely associated with their hydrophobic nature. To render their surfaces hydrophilic, various physical, chemical and bulk modification methods are employed to imitate the advantage of natural fibres.

Fibres including cotton, viscose, polyester, polypropylene, etc, are extensively used in manufacturing of nonwovens by needle punch technique, hydro entanglement, thermal bonding, chemical bonding, etc. Nonwovens used for technical textiles are primarily made from synthetic polymers, as strength and flexibility are of major importance.

Nonwovens are defined as distinctive, high-tech, engineered fabrics made from fibres, and are used for manufacturing of various products for numerous applications. The term 'nonwoven' is coined for fabrics that are neither knitted nor woven. They are materials having similar properties to woven and knitted fabrics but in this case the fabric is manufactured by bonding of fibres with each other chemically, mechanically or through heat or solvent treatment.

These fabrics are mostly porous sheets, directly made from fibres in a process that does not require the fibres to be transformed into yarn. Nonwovens offer a number of advantages over woven fabrics, one of the most important being that they are very economical, as their manufacture involves direct conversion of fibre to fabric, which leads to cost savings, less production time and the possibility of large volume production. Nonwoven fabrics made of synthetic fibres and/or natural fibres are commonly used in absorbent articles, for example, as top sheet material or as a core wrap to enclose the storage layer of the absorbent core. Such nonwoven fabrics are often hydrophobic. However, for many applications in hygiene products it may be preferable to have hydrophilic nonwovens. Therefore, the nonwoven fabric may be treated to increase its hydrophilicity. For example, a core wrap may be a nonwoven material which has been rendered hydrophilic and designed to contain the storage layer and provide structural integrity when the storage layer is wet or dry.

Accordingly, there is a need for a hydrophilic coating for a nonwoven which is durable during storage, including storage at elevated temperatures; does not migrate or transfer easily when dry; is not easily washed off when wetted or when fluid passes through or is in contact with the nonwoven; achieves a fast liquid strike-through time, both initially and following multiple exposures to aqueous fluids or liquids; does not significantly lower the surface tension of the fluid to be absorbed; and is not easily abraded or rubbed off the surface.

Understanding the requirement of the end users, ***Sarex*** *has developed a hydrophilic agent* ***Wetfin-NS*** *which is a silicone free hydrophilic agent and can be applied on various substrates to enhance the absorbency of the product:*

Wetfin-NS is a silicone free finish for imparting hydrophilicity on textile fabrics. It is suitable for natural and synthetic fibres. Wetfin-NS can be specifically used for increasing the hydrophilicity of polyolefin fabrics used in incontinence products. Wetfin-NS can be applied by padding.

Unique features:

- Silicone free
- Does not lade to skin irritation
- Suitable for hygiene products
- Excellent wetting
- Can be applied by Kiss roll technique

Application Condition:

- Wetfin-NS can be applied by padding or kiss coating technique.

Results and discussion:

From Table 1 it can be seen that after treatment with Wetfin-NS the hydrophilicity of the fabric improves drastically, this is because Wetfin-NS modifies the surface of the fibre and makes it hydrophilic permanently.

Table 1: Absorbency of various nonwoven fabrics

Fabric quality	Unfinished	10g/l Wetfin-NS
Needle punch 100% polyester nonwoven fabric	>2 min	1-2 sec
100 GSM polyester nonwoven fabric	>2 min	1-2 sec
100% polyester spun bonded	>2 min	1-2 sec
100% polyester spunlace yellow colour nonwoven	>2 min	<1 sec
18 GSM 100% polypropylene nonwoven	>2 min	1-2 sec
200 GSM polypropylene white colour nonwoven fabric	>2 min	1-2 sec
100% polypropylene melt blown nonwoven	>2 min	5-6 sec

Fabstrip-NS - Strip Easily

Textile dyeing industry often faces problems of uneven or faulty dyeing and formation of color patches on the fabric which leads to rejection. Correction of such fabrics is carried out by means of stripping. Stripping is defined as any operation aimed at removing or destroying some or all of dye from the dyed textile yarn or fabric. Stripping of dyed fabric is also carried out to utilize already dyed material.

Reactive dyes form covalent bond with the cotton fabric. This characteristics of reactive dye leads to the high resistance to color stripping. Once reactive dyes have been applied, and the unfixed hydrolyzed dye has been removed, the possibility of levelling or stripping by simple physical means almost becomes nil. For fabric dyed with heavy shades of reactive dye, a reduction of about 20-40% in depth of shade can sometimes be achieved by hydrolysis of the dye-fibre bond with alkali in presence of salt at 95°C.

Thus use of chemical stripping is common practice in order to reproduce or repair faulty dyeings or printings. chemical stripping process is either termed as 'back stripping' or 'destructive stripping'. In back stripping only the depth of shade is changed; such that required shade is obtained and the fabric can be redyed with desired shade. While in destructive stripping, the dyes are chemically altered.

Depending on the individual dyes, complete chemical stripping may be carried out in one of the four ways:

1) reduction only
2) reduction followed by oxidation
3) oxidation only and
4) oxidation followed by reduction.

Chemicals such as sodium chlorite or peroxide solutions are generally used in stripping by oxidation process, which lead to decrease in strength of textile material. Therefore stripping using alkali is preferred method by industries. However, alkaline reductive stripping using Caustic soda and Hydrose also affects the quality of fabric and leads to high BOD and COD which adversely affect environment.

Hence there is need for ecofriendly stripping process, which will offer solution without damaging the fabric.

Keeping in mind industries demand, Sarex has developed efficient stripping agent termed as FABSTRIP-NS. Fabstrip-NS strips various classes of reactive as well as disperse dyestuffs from the dyed fabric.

Unique features:

- Strips reactive and disperse dyes and hence fabric can be re-dyed
- Complies Oekotex-100 hence eco-friendly

Recommended dosage:

Fabstrip-NS	: 3-5%
Temperature	: 95-98°C
Time	: 30 mins
pH	: 4 - 4.5

Note: If fabric is dyefixed, treatment with 1% Saragen-SO is recommended.

Substrate: 100% Cotton fabric, 100% Polyester fabric.

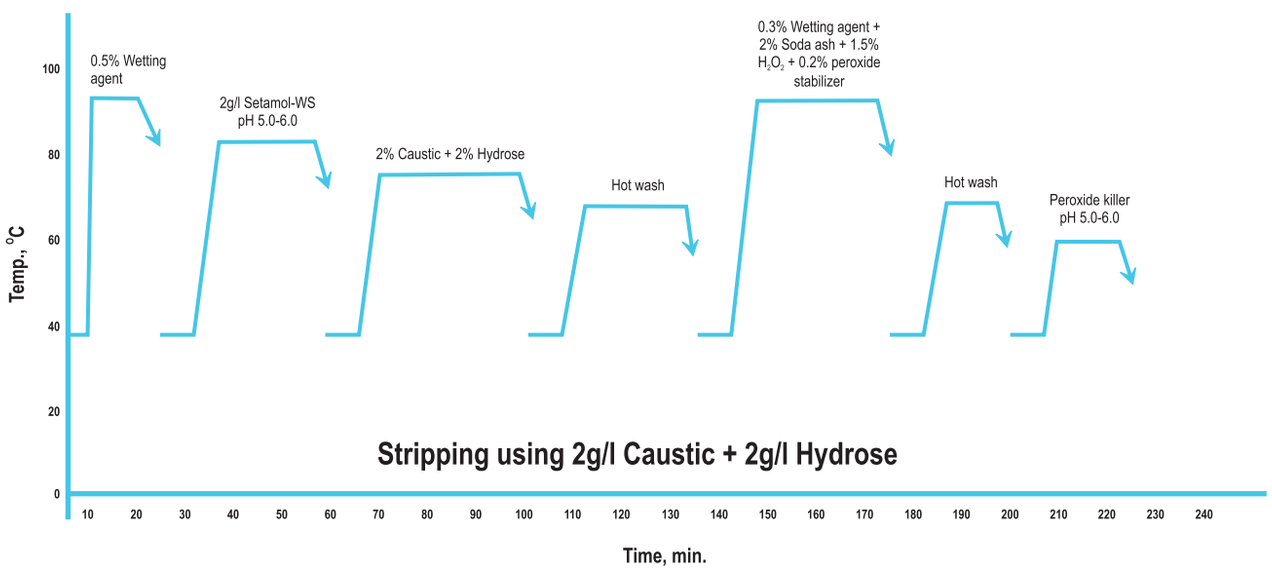
Following are the procedures carried out for stripping. Refer fig 1 for process flow:

Stripping with Caustic and Hydrose:

- Treat dyed fabric with 0.5% wetting agent.
- Treat with 2g/L Setamol-WS, pH 5.0-6.0 for 20mins.
- Treat wih 2% Caustic and 2% Hydrose at 75-80°C for 30 mins. followed by hot wash.
- Treat with 0.3% Wetting agent + 2% Soda ash + 1.5% H_2O_2 + 0.2% peroxide stabilizer at 95°C for 20 mins. followed by hot wash.
- Peroxide killer treatment at pH 5.0-6.0, 65°C for 10 mins.

Stripping with Fabstrip-NS:

- Treat dyed fabric with 0.5% wetting agent (Celldet-R).
- For dye fixed fabric treat with 1% Saragen-SO, pH 4.5-5.5 at 85°C for 20 mins., followed by cold wash.
- Strip using 3-5% FabstripNS, pH 4.0-4.5 at 95°C for 30 mins.-- Hot wash-- Cold wash.



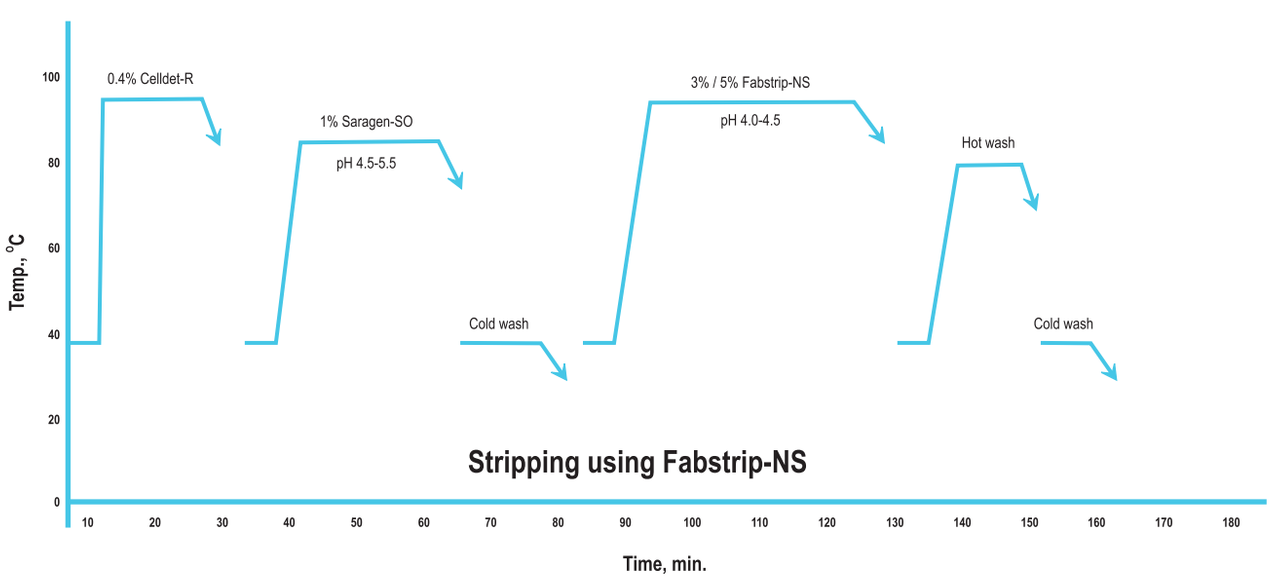
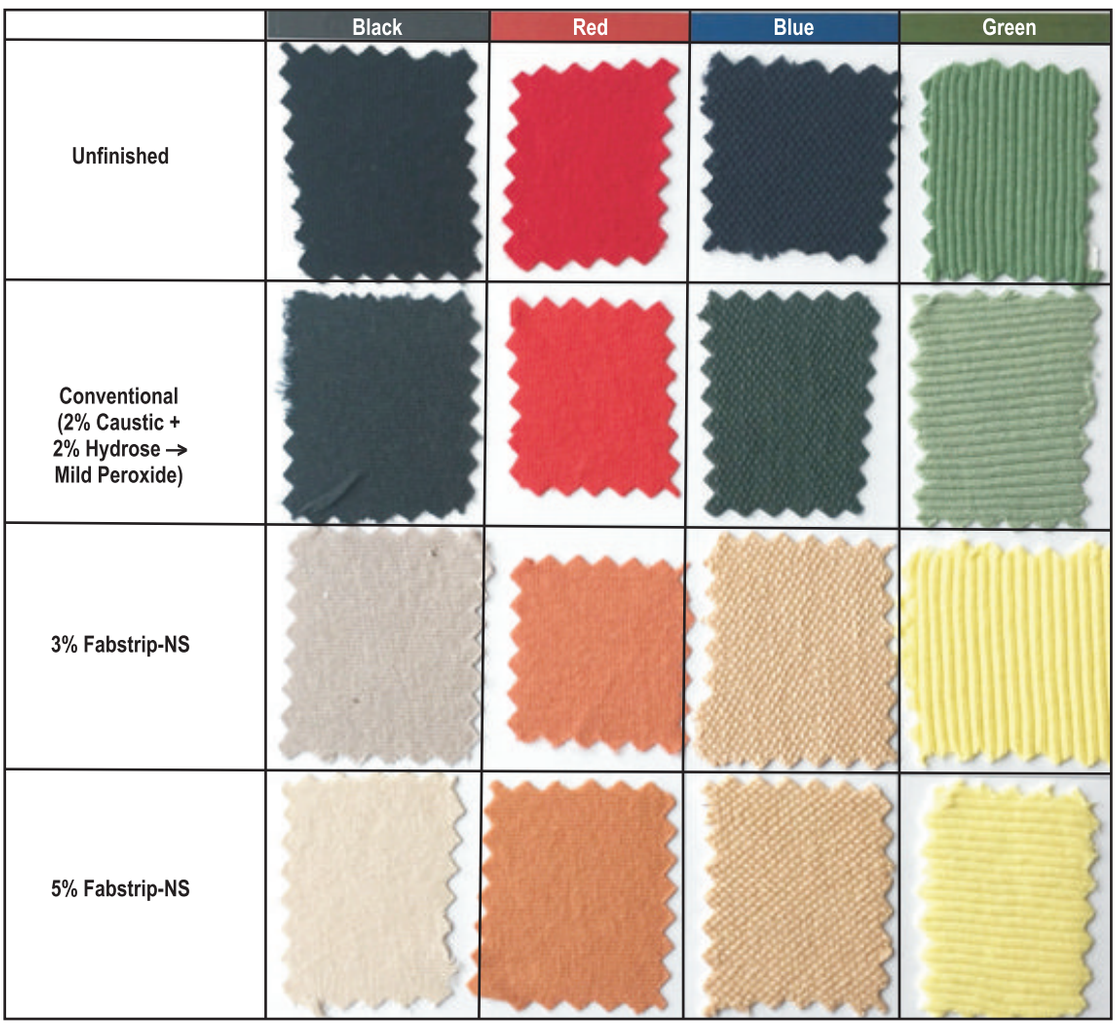
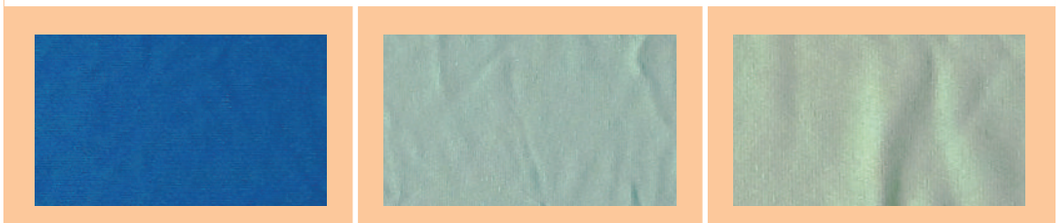


Fig 1: Process flow diagram of stripping



Stripping of reactive dyed fabric

Fig.2: Stripping of reactive dye



Royal blue dyed Polyester

Fig 3: Stripping of disperse dye

It can be observed from process flow that, Fabstrip-NS saves time, energy and hence overall process cost as compared to stripping of dyes by conventional process using caustic and hydrose. Further in case of stripping using Fabstrip-NS, tone of the fabric is changed while tone of the fabric remains unaltered in case of conventional stripping. Thus Fabstrip-NS is ecofriendly and economical solution developed for stripping of reactive and disperse dyes.

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