

Processing Cotton Knits in India

Dr Naresh M. Saraf and Deepak Alat, of Sarex Overseas, describe some of the company’s latest developments

The Indian textile industry is not only one of the oldest industries in the country but also one of the major industries providing employment and earning foreign exchange for the country. Among the processed material, cotton knits is emerging as an upcoming product category. Due to the export-encouraging policies of the Indian Government, as well as continuous efforts of various professional bodies, the processors of cotton knits are preparing themselves to compete globally. Thanks to the machinery, dyestuff and chemical suppliers, the industry has changed from a cottage industry, using winch dyeing, to modern dyehouses using latest

equipments and best available dyes and chemicals. Alas, in spite of modernisation and access to the latest dyes and chemicals, the industry has been unable to tackle the problem of water scarcity in harsh summers. Non-availability of good-quality water for processing has dampened the spirit of many dyehouses situated in South India, which are catering to overseas buyers. We at Sarex decided to tackle this problem. Since water is a natural resource, it cannot be created but can be conserved. Thus, Conservation of water in processing was taken as the goal. A survey of customers’ current processes was carried out to find out the

possibilities of combining or shortening them. We noted that many customers carry out only alkaline scouring for dark shades, which are dyed either with high-exhaust or bi-functional dyes, and navies and blacks being dyed with vinyl-sulphone-based dyes. Efforts were made earlier to utilise grey dyeing of sulphur black, using a suitable wetting agent, but this process could not give consistent results. Also, fastness properties were far from satisfactory. Therefore, rather than grey dyeing, we tried an approach of combined scouring and dyeing. Our team noted following requirements: **The recipe should**

- contain solvent-free and non-hazardous chemicals.
- be capable of scouring at near neutral pH and below 95.
- give uniform and good absorbency
- not interfere in dyeing, i.e. Should not affect rate of dyeing, yield or Brilliance
- be washed-off easily in the normal soaping operation at the end of dyeing.
- not compromise on required fastness properties.

After screening the available products, we identified following three products from Bayer AG, our principals.

Diadavin EWN 200%

- A solvent free non-ionic scouring agent and stain remover

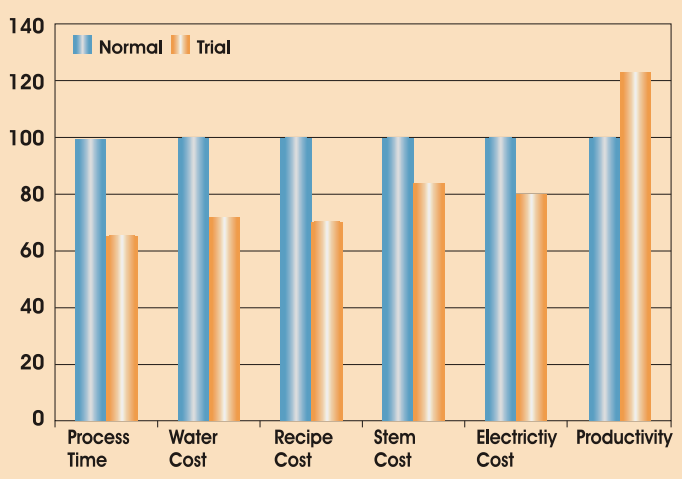
Table 1: Single bath scouring and dyeing

Machine	Soft Flow	Material 100%	Cotton Hosiery
Shade	0.Green		
Batch Size	350 kgs	Liquor: 2800 Ltrs	MLR : 1:8
Recipe	Persofalt LUSX		1.5 g/l
	Diadavin EWN 200%		1.0 g/l
	Baysorex AE		0.5 g/l
	Levegal RL		1.0 g/l
	Respumit NF		0.1 g/l
Dyestuff	Yellow HE4R		0.827 %
	Red HE3B		0.248 %
	Green HE4BD		3.13 %
Process Sequence:			
Fill water ➡ Add Respumit NF & Persofalt LUSX ➡ Load the material, Add Diadavin EWN 200% & Baysorex AE ➡ Circulate for 5 mins ➡ Raise temp to 85°C Hold for 10 mins ➡ Cool at 60°C ➡ Add Levegal RL ➡ run for 10 mins ➡ Add dyestuff & start dyeing.			

Table 2

Comparison of Trial Results Normal		Trial
Process Time	10 Hrs. 30 Min.	7 Hrs.
No. Of Bath	11	8
Recipe Cost	5.92 / Kg	4.15 / Kg
Cost of Water	Rs. 290/- per batch	Rs. 211/- per batch
Cost of Steam	100%	85%
Cost of Electricity	100%	80%
Productivity	-	+25%
Lab Results		
Wet Rub Fastness	3	3
Dry Rub Fastness	4	4
Wash fastness (ISO 3)	4 - 5	4 - 5

Figure 1: Comparison of Normal Process & Combined Scouring & Dyeing Process of Cotton Knits



Baysorex AE

- A good demineralising agent

Levegal RL

- A good dyebath conditioner enhancing solubility of reactive dyes and having good levelling action.
- Initial experiments in lab were carried out to standardise the recipe and process. Once it was standardised, we dyed critical shades in the lab, like olive and brown, to check the effect on dyeing rate and yield. Once it was confirmed that the recipe and process does not interfere in dyeing or fastness properties, we conducted a bulk trial with a willing customer.

Table 1 gives the actual conditions of one of the representative bulk trials, whereas Table 2 & Fig. 1 give comparison of costs, energy and water consumption, and fastness properties of the bulk trials.

Subsequent bulk trials with various shades and various dye classes gave consistent results. Many of our

customer have adopted this process to reduce water consumption.

Apart from reduction in cost and optimisation of process, our team also worked on value enhancement. As the casual look has grown in popularity among young and middle-aged consumers, demand for cotton T-shirts has also gone up in the domestic market. Apart from soft, pleasing handle, customers are demanding comfort properties, i.e. Moisture management.

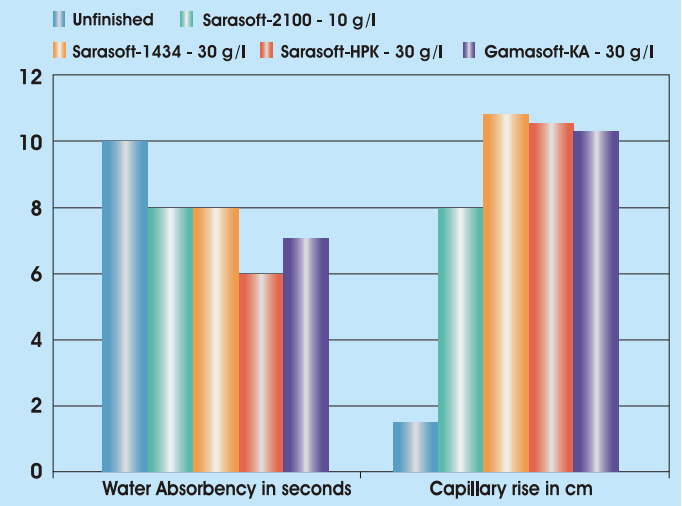
Traditionally, cationic softeners or conventional silicone softeners are used in India., by exhaust as well as pad application. Unfortunately, both these class of softeners increased hydrophobicity of the treated material. Another problem with cationic softener was poor washfastness to strong anionic soaps, used for home laundering.

To overcome these problems, we worked on a special category of

Table 3

	Absorbency by drop test	Absorbency by capillary rise
Unfinished	10 sec.	1.7 cm
Sarasoft-2100 - 10 g/l	8 sec.	8 cm
Sarasoft-1434 - 30 g/l	8 sec.	10.9 cm
Sarasoft-HPK - 30 g/l	6 sec.	10.8 cm
Gamasoft-KA - 30 g/l	7sec.	10.6 cm
Recipe x g/l Softener 1 g/l Acetic Acid 2 g/l Sarapol-MN pH 5.5, 60% pick-up, dry at 120°C		

Figure 2: Hydrophilic finish on cotton knits



silicone-based softeners, which could impart hydrophilic finish. Based on the chemistry and formulation of our products, we shortlisted a few softeners from our range, applied them on cotton hosiery and studied effect on the handle as well as hydrophilicity. Hydrophilicity was tested by measuring absorbency by drop test as well as capillary rise.

Table 3 & Fig. 2 give absorbency and capillary rise of finished cotton knits, finished with optimum concentration of each softener.

In all cases, the handle or feel of treated material was found to be soft and pleasing, compared to conventional softeners, as measured by five independent evaluators by hand feel. Thus, we could offer our customers soft finish with comfort properties. Various combinations of these softeners were tried on both mercerised as well as unmercerised cotton knits and we were able to obtain the desired