DEEPER BLACKS WITH LESS DYE

Dr. Naresh M. Saraf and Deepak V. Alat, of Sarex Overseas, India, explore the application of Sarabloom 683, a blooming agent

Colour is a most important factor for the consumer, since it is the shade of the fabric that creates the first impression in the mind of an observer, before the texture or finish of the fabric.

Any colour that creates a pleasing sensation in the mind of an observer, or looks appealing or satisfactory to the eye, is preferred by the customer. Thus, colour is a vital factor in the commercial success of a textile.

In the solid dyeing of dark shades on polyester and its blends, many attempts have been made to obtain the deepest possible black shade, which will stand out among the other shades. Such attempts for polyester component dyeing include:

- Increasing the quantity of dyes in the recipe
- Using a diffusion accelerator/ carrier to promote further exhaustion of the dyestuff
- Use of fibres with easy dyeability and higher dyeability values
- Use of dope-dyed fibre

1. Increasing quantity of dyes in the recipe

Depending upon the substrate, dyeing conditions and individual dyes used in the recipe, a depth beyond the saturation limit of dyes, on a given substrate under normal dyeing conditions, cannot be achieved. By using more components of different chemical composition, a higher build-up can be obtaind than the normal recipe, but here again the wet-fastness properties and sublimation-fastness properties obtained are far from acceptable norms.

2. Using a diffusion accelerator/ carrier to promote exhaustion of the dyestuff

Here, limitations are similar to those discussed above and in addition, there could be a negative effect on light fastness, an increase in pollutant load and an adverse effect on the handle of the material.

3. Use of fibres with easy dyeability

Here again wet fastness properties are low at a higher depth.

4. Use of dope-dyed fibre

Though the depth is better than that obtained by normal disperse dyeing, the exact tone desired by the end user may not be possible.

The problem is more severe when fabrics made from microfilament polyester yarns are to be dyed. In this case, in order to obtain similar visual depth, comparatively higher concentrations of dye have to be used compared with normal polyester and this results in comparatively low wet fastness and sublimation fastness.

We have attempted to tackle this problem by working on a finishing formulation which, apart from giving soft feel to the treated fabric, improves the depth as perceived visually, and also using a colour computer. The product used for study is Sarabloom 683, from Sarex Overseas, India – known as a blooming agent.

We attempted to evaluate the effect on all hues in the shade range, ie. from yellow to black.

DYES:

Sarasperse Yellow F3GI	(C.I. Disperse Yellow 54)
Sarasperse Orange ERL 200%	(C.I. Disperse Orange 25)
Sarasperse Scarlet RR	(C.I. Disperse Red 54)
Sarasperse Black BTU	
Sarasperse Navy Blue EXSF	
Sarasperse Black RDG2	

MATERIAL:

Scoured, heat-set, texturised-polyester filament-by-filament fabric made from normal polyester, and fabric made from micro-denier polyester-filament yarns.

EXPERIMENTS:

Dyeing was carried out in a laboratory HTHP beaker dyeing machine at MLR 1:20 and pH was adjusted to 4.5-5.0 using ammonium sulphate and formic acid (both LR grade).

Dyeing was carried out at 130°C for 45 minutes. Dyeings were then reduction cleared, neutralised and air-dried.

EVALUATION:

Evaluation of shade was carried out using colour computer.

We also compared fastness properties of treated and untreated polyester fabrics, ie. both micro- and normal polyester fabrics. This was carried out to evaluate the effect of increased depth on fastness properties. Our findings were that both treated and untreated fabrics show comparable fastness to wash fastness (ISO3, 60°C), dry and wet rubbing fastness as well as fastness to sublimation (180°C), confirming there is no adverse effect of the treatment on any of the fastness ratings.

Reprinted from International Dyer June 2001

Sr. No.	Dyes % Shade	Conc. of **683**	MICRO PET ▲ E	MICRO PET % Shade	MICRO PET λ Max	MICRO PET K/S value	NORMAL PET ▲ E	NORMAL PET Shade	NORMAL PET λ Max	NORMAL PET K/S value
1.	Sarasperse Yellow F3GL 0.5%	CONTROL	–	100.00	440	5.776	–	100.00	440	10.029
		10 gpl	0.073	103.43	440	5.950	0.247	111.17	440	11.216
		20 gpl	1.294	109.06	440	6.260	1.148	116.62	440	11.856
		40 gpl	1.333	111.32	440	6.530	1.900	118.09	440	11.856
2.	Sarasperse Yellow F3GL 3.0%	CONTROL	–	100.00	440	22.763	–	100.00	440	20.846
		10 gpl	0.570	107.97	440	24.756	0.223	106.84	440	22.375
		20 gpl	0.863	111.84	440	25.535	0.543	113.20	440	23.763
		40 gpl	1.518	121.37	440	27.370	1.269	114.66	440	25.188
3.	Sarasperse Orange ERL 0.5%	CONTROL	–	100.00	480	6.165	–	100.00	480	7.816
		10 gpl	0.288	106.13	480	6.521	0.448	108.87	480	8.523
		20 gpl	0.502	108.95	480	6.689	1.045	109.12	480	8.532
		40 gpl	2.561	118.09	480	7.359	2.891	122.74	480	9.359
4.	Sarasperse Orange ERL 3.0%	CONTROL	–	100.00	480	22.074	–	100.00	480	22.651
		10 gpl	0.482	110.31	480	24.494	0.388	104.27	480	24.849
		20 gpl	0.130	112.59	480	24.717	0.632	113.70	480	26.036
		40 gpl	1.263	114.06	480	26.588	0.982	110.80	480	26.332
5.	Sarasperse Scarlet RR 0.5%	CONTROL	–	100.00	480	4.358	–	100.00	490	5.055
		10 gpl	0.191	110.67	480	4.877	0.300	106.05	490	5.361
		20 gpl	0.396	111.76	480	4.894	0.406	113.24	490	5.735
		40 gpl	2.411	114.94	480	5.135	2.540	117.79	490	6.227
6.	Sarasperse Scarlet RR 3.0%	CONTROL	–	100.00	480	20.425	–	100.00	480	19.174
		10 gpl	0.196	106.19	480	22.159	0.160	110.45	480	20.846
		20 gpl	0.367	108.02	480	22.534	0.270	111.73	480	21.184
		40 gpl	1.637	115.79	480	22.991	0.515	114.69	480	21.947
7.	Sarasperse Navy Blue EXSF300% - 0.5%	CONTROL	–	100.00	600	4.421	–	100.00	600	5.503
		10 gpl	0.086	104.10	600	4.601	0.297	104.00	600	5.639
		20 gpl	0.062	108.19	600	4.726	0.539	105.19	600	5.731
		40 gpl	2.396	117.78	600	5.613	1.650	111.72	600	6.083
8.	Sarasperse Navy Blue EXSF 300% - 3.0%	CONTROL	–	100.00	600	22.430	–	100.00	580	20.470
		10 gpl	0.080	102.01	600	22.991	0.159	108.13	580	22.321
		20 gpl	0.120	102.95	600	23.165	0.515	112.04	580	22.760
		40 gpl	1.830	112.92	600	24.849	1.356	110.08	580	23.677
9.	Sarasperse Black RDG2 0.5%	CONTROL	–	100.00	440 580	2.268 3.365	–	100.00	440 580	2.112 2.865
		10 gpl	0.342	103.47	440 580	2.381 3.435	0.294	110.24	440 580	2.340 3.156
		20 gpl	0.423	110.36	440 580	2.513 3.694	0.474	111.27	440 580	2.369 3.186
		40 gpl	1.668	111.53	440 580	2.538 3.733	1.710	111.70	440 580	2.399 3.222
10.	Sarasperse Black RDG2 3.0%	CONTROL	–	100.00	440 620	12.229 16.745	–	100.00	440 580	10.663 15.544
		10 gpl	0.202	104.41	440 620	12.868 17.285	0.071	107.76	440 580	11.551 16.651
		20 gpl	0.432	104.40	440 620	12.984 17.163	0.119	110.18	440 580	11.791 17.300
		40 gpl	2.022	118.91	440 620	14.401 21.534	1.925	117.20	440 580	12.229 17.315
11.	Sarasperse Black BTU 0.5%	CONTROL	–	100.00	620	3.370	–	100.00	480 620	2.0577 2.884
		10 gpl	0.185	104.57	620	3.493	0.888	101.03	480 620	2.078 2.852
		20 gpl	0.245	104.83	620	3.495	2.303	108.13	480 620	2.201 2.997
		40 gpl	2.012	113.94	620	3.510	2.744	119.79	480 620	2.390 3.337
12.	Sarasperse Black BTU 3.0%	CONTROL	–	100.00	620	18.061	–	100.00	480 620	8.9854 12.117
		10 gpl	0.348	103.72	620	18.506	0.166	106.84	480 620	9.707 12.888
		20 gpl	0.358	104.94	620	18.775	0.370	108.43	480 620	9.707 13.162
		40 gpl	2.274	119.84	620	20.082	1.891	116.36	480 620	10.443 14.237

CONCLUSION:

1. All the dyes under study, whether low-energy, medium-energy or high-energy showed increase in depth with increase in concentration of the blooming agent.
2. Irrespective of hue, there is a clear trend of increase in depth with increase in concentration of the blooming agent.
3. For the same dyestuff, at lower depth, at highest concentration of blooming agent, at 40 g/l, normal polyester shows more increase in depth; whereas at higher depth of the same dyestuff, at highest concentration of blooming agent, at 40 g/l, micropolyester shows higher increase in depth than normal polyester.
4. The above observation can also be confirmed from k/s vs concentration graphs, indicating that at high concentration of blooming agent, at 40 g/l, micropolyester shows higher increase in depth than normal polyester at dark shades, whereas in case of light shade it is normal polyester that shows higher increase in depth than micropolyester.
5. In case of Sarasperse Navy Blue EXSF, Sarasperse Black RDG2 and Sarasperse Black BTU, for dark shades there is significant increase in depth in case of micropolyester when concentration of the blooming agent is increased from 20 g/l to 40 g/l. This indicates that for micropolyester, where dyestuff requirement is higher to obtain the same optical depth, a treatment with 40 g/l blooming agent can be used to enhance the depth without affecting fastness properties.