PROJECT SINGLE JERSEY 86

The operations of winch dyeing and winch bleaching

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Author: R.D. Leah

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APPENDICES

1. INTRODUCTION

Research record number 209 describes the knitting of a range of 18 and 28 gauge single jersey fabrics which were knitted to supplement the fabrics which were originally contract knitted by IIC for NTI. These were not used for the proposed project and subsequently became the property of IIC. In total 99 pieces of fabric were knitted, consisting of three pieces each of 33 different qualities.

The overall finishing plan for all these fabrics is as yet undecided. A decision was, however, made that one complete set (33 qualities) should be processed by two winch processing routes in order to enlarge the data base. The aim of this was to make the equations used in the STARFISH model more secure for these particular routes.

Rather than a single winch processing route it was envisaged that two routes could be investigated using one set of fabrics by careful make-up of the processing lots. In the event, a winch bleach route and a winch dye route were investigated. This report is a record of the operations involved in this investigation which were carried out at Martins (Leicester) Dyers and Finishers Ltd during 1st-2nd September, 1986.

2. FABRICS

For the original NTI contract a total of 60 pieces were knitted. These were all knitted on a 24 gauge machine and consisted of:

3 yarn counts x 5 stitch lengths using combed yarns = 15 qualities x 3 pieces
Total 45 pieces

1 yarn count x 5 stitch lengths using carded yarns = 5 qualities x 3 pieces
Total 15 pieces

The knitting details for these fabrics are given in Research Record No. 165.

To supplement these a further 39 fabrics (13 qualities) were knitted on 18 and 28 gauge machines (see Research Record No. 209.

In total, three identical processing sets were available, each set weighing approximately 550 kg and consisting of 33 rolls (minimum length 75 metres).

3. FABRIC PREPARATION

A typical winch processing batch consists of 200-300 kg of fabric with individual fabric rope lengths of 75-100 metres (all ropes must be within ±5% of each other).

From one of the three available lots it was possible to make up two winch processing batches. To achieve this, it was necessary to remove approximately 2 x 37 metres from each of the 33 qualities and to then sew two qualities together to give two new pieces of approximate length 75 metres. The qualities being joined had to have almost identical finishing widths and in order to make up the dye

batches, finishing targets had firstly to be obtained using STARFISH. Predicted width targets were obtained for all the qualities using shrinkage targets of 8% x 8%.

Since an odd number of qualities were being processed it was necessary to use up a quantity of scrap material to make up the required length of the final ropes. In total, two complete dye lots were assembled, each consisting of 17 pieces of approximate individual lengths of 75 metres and weighing around 210 kg per lot.

To make the subsequent processing easier it was desirable to load and unload the winches in a particular width order. To achieve this, each piece was given a number in respect of its order in the processintg sequence i.e. piece 1 was the narrowest and piece 17 the widest.

4. WINCH BLEACH ROUTE

The fabrics destined for winch bleaching were designated Set 1. These were processed in a Leemetal shallow draught winch using Martin's standard procedure. Particular care was taken to ensure that the fabrics were loaded into the winch in the precise numerical order.

PROCEDURE

Set bath to 40°C using a liquor ratio of 18 to 1. Add (in order):

Stabilizer NFS (Sandoz)
Hydrogen Peroxide
Caustic soda
Fluorescent brightener

Raise temperature to 95°C over 40 minutes.

Run for 40 minutes
Drop liquor
Cold rinse - 5 minutes
Drop liquor
Refill - add sodium bisulphite
Rinse to 50°C
Run - 10 minutes
Drop liquor
Refill

Soften with

Ceranine HCL	(Sandoz)
Alcolube PKL	(Allied Colloids)
Eulysin S*	(BASF)

*Acid to exhaust cationic softeners

Total processing time in winch, 3½ hours.

The fabric was unloaded from the winch in piece order 17 - 1.

5. WINCH DYE ROUTE

The fabrics destined for winch dyeing were designated Set 1A.

The dyeing was carried out in a Leemetal shallow draught winch, a different machine but identical in all respects to the machine used for the winch bleach route. Once again care was taken to ensure that the fabric ropes were loaded in numerical sequence.

PROCEDURE

Prescour
Set bath to 40°C using a liquor ratio of 18 to 1.
Add soda ash and non-ionic detergent

Raise to boil and hold at boil for 25 minutes.

Drop liquor
Two hot rinses

Dyeing
Set dye bath to 40°C, add salt.
Add predissolved dyestuffs
(Remazol Black B, Levafix Red E5BNS)

Depth of shade - approximately 4% owf

Run for 25 minutes
Add half of required amount of soda ash
Run 25 minutes
Add remainder of soda ash
Run 60 minutes
Drop liquor
Two cold rinses
Five minute boil
Drop
Soap off at boil - 10 minutes
Hot and cold rinses

Soften Ceranine HCL
Alcolube PKL
Eulysin S

Total time in winch 8 hours

The fabric was unloaded from the winch in piece order 17 to 1.

6. FINISHING PROCESS

Following winch processing it is Martins usual practice to de-water and de-twist the fabric in a single operation using either a Calator "Airtex" machine or a Pegg-Whiteley "Express" unit. Both machines have basically the same elements and a very similar fabric path run.

On the day of processing, whites were being processed on the Airtex and dark colours on the Express unit. With single jersey fabrics it is the usual procedure at Martins to wet stretch the fabrics so that the width immediately from the machine is 10% over target finished width. To obtain this it is a rule of thumb to increase this width by 10 cms in deciding upon the stretcher frame width. By our description of wet stretching, the stretcher was therefore set to 22-25% over the target finished width.

The 33 qualities had previously been grouped, in order to reduce the number of width changes necessary during wet stretching. In all, five width groups were necessary, ranging from 68 cms to 84 cms (finished). A further addition of softener (Alcolube PKL) was made on the wet-stretch machine. Fabric widths were measured immediately following wet-stretching and the course density was also measured on several qualities. These measurements are recorded in Tables 1 and 2.

Following the wet-stretching operation the piles of plaited fabric were covered to prevent drying out since the drying operation could not be commenced until the following morning.

Drying was carried out on the Kiefer "Rotoswing" under autocontrol. In this mode the machine speed is controlled by a moisture sensor which is normally set to 6% residual moisture. The fabric was overfed onto the conveyer by 40% and two fabric strands were dried simultaneously. Fabric leaves the Rotoswing in a rather untidy manner and for this reason it was not possible to measure fabric width with sufficient accuracy for it to be meaningful. However, it was possible to measure course density on the majority of qualities and these are recorded in Tables 1 and 2. It is usual to let the dried fabric stand overnight to cool prior to calendering. This is to eliminate static problems but in this case time did not allow this and the fabrics were calendered immediately following drying.

A Weiss calender fitted with a precision plaiter was used and an attempt was made to bring the fabrics off the calender 1½-2cms over the final target width. Calendered widths were measured for each quality and these are recorded in Tables 1 and 2.

7. OBSERVATIONS

The processing of these two winch lots proceeded without problems largely due to the extensive preparatory work carried out in Manchester in organising fabrics in width sequence.

STARFISH was used to give finishing targets for all the qualities in terms of width and course density. In nearly all cases these targets were achieved with

relatively little difficulty. Where targets were not achieved, this was probably due to lack of fine tuning and targets would probably have been achieved if longer lengths of fabric had been available.

This exercise enabled us to demonstrate that given the correct equipment, there is no reason why present day performance standards should not be readily achievable.

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SET 1 WINCH BLEACH

TABLE 1

LAB REF NO	FABRIC REF. NO	ROPE NO.	FINISHED TARGETS WIDTH	FINISHED TARGETS C/3	WET-STRETCH TARGET WIDTH	AFTER WET-STRETCH WIDTH	AFTER WET-STRETCH C/3	AFTER KIEFER C/3	AFTER CALENDER WIDTH	AFTER CALENDER C/3
6	18/18/327	1	68	50	75	77		53	70	49/5
21	24/32/276			56		75				
31	28/50/230	2	68	67	75	74		69	69½	
7	18/18/344			47		77				
22	24/32/291	3	68	53	75	73		64	69½	
32	28/50/243			63						
8	18/18/362	4	72	44/45	79	78½		55	73½	
16	24/28/291			54		78½				
1	28/38/246	5	72	63/64	79	79		65	73½	
23	24/32/306			49/50		80				
9	18/18/380	6	72	42	79	79½				
17	24/28/306			50		80½		51½	74	
26	24/28Ø/306	7	72	50	79	80½	48/49	49		49½
33	28/50/264			57		79½			74	
24	24/32/321	8	76	47	84	85				
2	28/38/259			60		83			77	
11	24/28/306	9	76	51	84	85				
10	18/18/399			40		84		40	77½	
18	24/28/321	10	76	47/48	84	85				
27	24/28Ø/321			47/48		85		47½	78	
25	24/32/337	11	76	44	84	84½				
3	28/38/273			56		85		56½	78	
12	24/24/321	12	80	49	88	89				
19	24/28/337			45		88½			82	
28	24/28Ø/337	13	80	45	88	89				
4	28/38/287			52/53		90			83	
13	24/24/337	14	80	46	88	90				
20	24/28/354			42		90	39	43	82	
29	24/28Ø/354	15	84	42	92	92				
5	28/38/301			49		91		50	84	
14	24/24/354	16	84	43	92	92				
30	24/28Ø/372			39		93½		38½		
15	24/24/372	17	84	40/41	92	92½	37	39	86	39

JET 1H WINCH DYE — 1 HOLE Q.

AB REF NO.	FABRIC REF. NO.	ROPE NO.	FINISHED TARGETS WIDTH	FINISHED TARGETS C/3	WET-STRETCH TARGET WIDTH	AFTER WET-STRETCH WIDTH	AFTER WET-STRETCH C/3	AFTER KIEFER C/3	AFTER CALENDER WIDTH	AFTER CALENDER C/3
6	18/18/327	1	68	50	75	75		50		49
21	24/32/276			56		75			69½	
31	28/50/230	2	68	67	75	73			69½	
7	18/18/344			47		74		46		
22	24/32/291	3	68	53	75	73		53		
32	28/50/243			63		75			69½	
8	18/18/362	4	72	44/45	79	79				
16	24/28/291			54		80		56	74	
1	28/38/246	5	72	63/64	79	79		65		
23	24/32/306			49/50		79			74	
9	18/18/380	6	72	42	79	81		41½		
17	24/28/306			50		80½			73½	
26	24/28Ø/306	7	72	50	79	82		51		
33	28/50/264			57		79			74	
24	24/32/321	8	76	47	84	83		46		
2	28/38/259			60		84			77½	
11	24/28/306	9	76	51	84	84		53½		
10	18/18/399			40		84			77½	
18	24/28/321	10	76	47/48	84	84				
27	24/28Ø/321			47/48		85	46		77½	
25	24/32/337	11	76	44	84	84				
3	28/38/273			56		84		55	77½	
12	24/24/321	12	80	49	88	89		51½		
19	24/28/337			45		89			81½	51
28	24/28Ø/337	13	80	45	88	90				
4	28/38/287			52/53		89		52	82	
13	24/24/337	14	80	46	88	90½	44	47		
20	24/28/354			42		89			82	
29	24/28Ø/354	15	84	42	92	92				
5	28/38/301			49		92			85	
14	24/24/354	16	84	43	92	93		44½		
30	24/28Ø/372			39		92			85½	
15	24/24/372	17	84	40/41	93	93	36	41	85	40