THE PROCESSING OF SINGLE JERSEY FABRICS ON A DORNIER MERCERISING MACHINE - STAGE 2.

Trials carried out at Empresa Textil de Barcelos Sarl (TEBE) 12th - 16th March 1984

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1. INTRODUCTION

Empresa Textil de Barcelos (TEBE) of Barcelos Portugal are a knitting, dyeing/finishing, and garment manufacturing company which is French owned. A large percentage of their production is 100% cotton and they possess a Dornier tubular mercerising range in their dyehouse.

The background to the work described in this report is given in Research Record No. 173, but briefly the co-operation with TEBE can be broken down into two distinct stages which consists of:-

Stage 1 - is an evaluation of the Dornier mercerising machine itself and the effect of making alterations to machine settings on the reference state of two fabric qualities, namely 1 x 1 rib and single jersey.

Stage 2 - is the processing of a range of single jersey fabrics through the TEBE plant both with and without mercerising with the aim of producing a unique set of equations applicable to the TEBE plant for predicting a number of fabric properties. These sets consist of three gauges of knitting machine, singles and two-fold yarns and a range of five stitch lengths.

Research Record No. 173 describes the practical processing aspects of Stage 1 and its supplementary report analyses the results and draws certain conclusions.

The observations and conclusions are obviously pertinent to the work described in this report and are therefore appended to this report.

This report describes the Stage 2 processing of 60 pieces of single jersey fabric which was carried out during March 1984.

2. FABRICS

The knitting of the fabrics is described in Research Records 114 and 177 but for clarity the fabrics consisted of two identical sets comprised of:-

18G Single Jersey - 1500 needles

Yarns: 1/20's Ne, 2/40's Ne
Nominal stitch lengths (cms): 0.327, 0.344, 0.362, 0.380, 0.399

24G Single Jersey - 1920 needles

Yarns: 1/28's Ne, 2/56's Ne
Nominal stitch lengths (cms): 0.291, 0.306, 0.321, 0.337, 0.354

28G Single Jersey - 2112 needles

Yarns: 1/36's Ne, 2/72's Ne
Nominal stitch lengths (cms): 0.259, 0.273, 0.287, 0.301, 0.316

The grey test results of these fabrics are given in Table 1.

3. TARGETS

Preliminary examination of TEBE fabrics and also of IIC fabrics processed through TEBE's plant have established that the R-Jet 95 route in the STARFISH predictive model gives a reasonably accurate guide to what targets can be used for fabrics being processed on the Barriquand "Gyrostock" dyeing machine at TEBE.

Target courses/3cm and width were therefore predicted for the thirty unmercerised control fabrics using STARFISH, on the assumption that a 10% length and 10% width shrinkage to the tumble tests was a realistic target. These targets are given in Table 2. As far as the thirty mercerised fabrics were concerned, preliminary examination of TEBE's production of single jersey established that a permanent change in the reference wales and therefore width, of 13% could be expected following mercerisation. This was also confirmed in the analysis of the Stage 1 fabrics.

For the mercerising stage it is also necessary to relate the sizes of the cigars in the stabilising section of the machine to the finished width of the fabric.

The factor of 1.87 (see Appendix) was adopted as a general rule but it would have been impractical to change cigar sizes for each fabric variant and therefore some grouping was necessary. In establishing the processing groups an attempt was made to ensure that the factor was kept within the range 1.76 to 1.97 and therefore in an area where it has been established that there is no noticeable variation in the reference state.

The factor relates the circumference of the first cigar to the target finished width. The circumference of the second cigar is normally set 10% smaller than the first cigar. The third cigar is normally run at its minimum size which is at a circumference of 128cms.

The merceriser cigar sizes and the target finished courses/3cm and width for the mercerised fabrics are given in Table 3.

4. FABRIC ASSEMBLY

To facilitate easier processing the fabrics were allocated a running number which indicated the position in the sequence narrowest to widest. The control fabric set was therefore coded from 1 to 30 and the mercerised set was coded 31 to 60.

The quantity of fabric in each set was of the order of 400Kg thus necessitating two dyeing operations. Since the control set was to be loaded directly into the dyeing machine as the first step, the fabric rolls were first plaited off so that both ends could be suitably marked, and the pieces sewn together. Two ropes are normally run together in the Gyrostock and therefore to ensure continuity of the processing sequence, these two ropes were organised at the plaiting off stage.

With the fabric set destined for mercerising, rather more preparation was required. Since it is easier to process in the order wide to narrow on the merceriser, it was necessary to assemble the fabric in reverse order, viz 60 to 31. When calculating the targets it became apparent that it would be necessary to change the cigar size on three occasions during the mercerising run. At the position in the sequence where a cigar size change was necessary, a length of end cloth was sewn into the run of sufficient length to cover cigars 1 and 2.

5. THE MERCERISING STAGE

Since the first visit to TEBE in July 1983 some additional engineering work has been carried out on the Dornier merceriser, i.e.

- the rubber wash tanks have been replaced by stainless steel tanks,
- the second cigar has been repaired and reconditioned.

The only other major difference is that it has been established as common practice to run with the mangle nip in the saturator in a raised position. This is done to eliminate the risk of edge creasing but it does mean that considerably higher quantities of lye have to be washed out of the fabric in the stabilising sections.

The conditions on the merceriser were:-

lye concentration	28° Bé
lye temperature	5-9°C
wetting agent	Akramerce GA (Hoechst)
speed	8.5 metres/minute

Timings

saturator entry	0 secs
exit impregnation/delay	2 mins 30 secs
exit 2nd wash tower	3 mins 30 secs
exit 3rd wash tower	4 mins 30 secs

The fabrics were run in the order widest to narrowest since it is easier to reduce rather than increase the cigar size when fabric is in the tower. All three cigars were utilised and the sizes are given in Table 3.

When a size change was necessary, the end cloth which had previously been sewn into the sequence was stopped on cigars 1 and 2, small holes were inserted and the adjustments made to the cigar sizes. The total stoppage time to adjust the two cigars was only of the order of two minutes.

On several occasions during the mercerising run, 50cm marks were placed on the greige cloth prior to mercerising and these were remeasured at the end of the merceriser to determine the overall change in fabric length. These are also recorded in Table 3.

Since the minimum size of cigar 3 is 128cms circumference, it became apparent part way through the run that it would be necessary to eliminate cigar 3 for the narrower fabrics. The break was made between pieces 47 and 48.

Samples of fabric were removed at the end of the merceriser to determine the residual lye concentration in the fabric. This was done with three cigars in operation and also with only two cigars in operation. These samples were transported back to Manchester in sealed polythene bags and tested on return. The testing revealed the following:-

3 cigar operation

concentration of NaOH based on fabric weight - 0.07%
concentration of NaOH in fabric liquor - 0.2°tw

2 cigar operation

concentration of NaOH based on fabric weight - 0.67%
concentration of NaOH on fabric liquor - 1.4°tw

To mercerise the thirty pieces of fabric took almost four hours but no problems were encountered and the calculated cigar sizes appeared to be realistic.

6. THE DYEING STAGE

The fabrics were dyed in the TEBE dyehouse, using Barriquand "Gyrostock" machines, model GK01. A diagram of this machine is shown in Figure 1. The GK01 has a recommended fabric capacity of 200 kg. It consists of a single horizontal annular compartment and a small circular driven wheel operating at about 300 metres per minute. Fabric leaving the reel is impregnated with dye liquor in an overflow compartment and then deposited into a circular rotating perforated cage. The rotation of the cage returns the fabric to the reel.

The normal practice at TEBE for this fabric weight is to divide the load into two equal ropes, which are run in parallel, and this was done in this case. The control fabric was therefore divided into two loads of approximately equal weight. The first comprised pieces 1-14, and was run as two seven-piece ropes; the second comprised pieces 15-30, and was run as two eight-piece ropes. Both dyelots were processed in machine No. 5.

The mercerised fabrics were divided in a similar fashion, and both dyelots were processed in machine No. 6.

Details of the preparation, dyeing and after-treatments carried out in the Gyrostock machines are given in Table 4. Identical recipes and procedures were used for both control and mercerised fabrics, with the single exception of the initial dyeing temperature, prior to fixation. This, as can be seen by reference to Figure 2, was 60°C in the case of the unmercerised controls and 80°C for the mercerised fabric.

7. FINISHING OPERATIONS

The finishing sequence at TEBE consists of wet-stretching on a Tubetex Tri-Pad, drying on a Tubetex Super Relax dryer and calendering.

For single jersey constructions wet stretch levels of 25-30% would seem to be the optimum. The stretching frame on the Tri-Pad is adjusted by inserting spacer bars which increase in size by increments of 1 inch.

There is a turntable in front of the Tri-Pad which is controlled by means of a foot switch by the Tri-Pad operative and therefore fabrics are detwisted and wet stretched and finally expressed in a continuous operation.

A small amount of softener/lubricant is added on the Tri-Pad to supplement that which is added in the dyeing vessel.

The Tri-Pad stretcher frame dimensions and the degree of stretch over target finished width are given for the control and mercerised fabrics in Tables 2 and 3 respectively.

Courses per 3cm and width were obtained for all the fabric variants after wet stretching, prior to drying. The conditions of the Tubetex dryer were adjusted to give maximum relaxation.This entailed using higher levels of overfeed than was normal practice and also the removal of a counterbalance weight on the compensator between the dryer exit and the plaiter.

Although the fabric had a tendancy to come off the dryer in a more untidy fashion this was not detrimental and more length relaxation was possible.

Fabric width and courses/3cm were obtained after the dryer for all the variants and these are recorded in Tables 2 and 3. The calender at TEBE is a Tubetex Duplex Convertor Finisher which is not the ideal machine for this type of exercise, for a number of reasons:

- the stretcher frame width is altered by inserting spacer bars which increase in size in $\frac{1}{2}$ inch increments,
- the overfeeding system is not ideal,
- there is no plaiting facility

Since the previous visit to TEBE in July 1983 it has become common practice to run the calender with the nip rollers apart to prevent creasing problems.

In the case of the control fabrics, the width was adjusted so that it was 2cm over target finished width on the calender roll. This was to allow for creep back during subsequent transportation. In the case of the mercerised fabrics this was increased to 3cm.

Following calendering, the rolls were placed on a nearby table and samples were removed for TEBE and the fabric width and courses/3cm were again measured. These are recorded in Tables 2 and 3.

8. OBSERVATIONS

8.1. Mercerising

The mercerising stage was carried out without any undue difficulties. This was due in the main to the previous visit which enabled realistic cigar sizes to be calculated for the various fabrics and to ensure that fabrics were assembled for processing in a systematic order.

8.2. Dyeing

Dyeing of the control fabrics was carried out, as far as could be seen, without problems. However, frequent entanglements hindered the processing of the mercerised fabric, and resulted in the formation of a considerable number of "rub-marks". This seems likely to have been due to the practice, already described, of running two ropes over the single winch. In normal production

when a dyelot consists of a single quality and piece lengths are similar, this might be expected to give no problems; but we were running thirty different qualities and although the grey piece lengths were similar, mercerisation had stretched them to varying degrees depending on structure. The two ropes were therefore different lengths, and this seemed to be the cause of the difficulty.

The Gyrostock machine is designed to cope with entanglements by temporarily reversing the reel, but this mechanism did not seem to be very successful in this case.

8.3. Finishing

Once again, the work which was carried out in Manchester prior to the visit in calculating targets and wet stretching conditions paid dividends.

In the case of the control fabrics, the alterations made to the Tube-Tex dryer enabled the majority of fabrics to be finished at or very close to target dimensions. With the mercerised fabrics however, this was not the case, and even with maximum relaxation on the dryer, most fabrics ended up with fewer courses/3cm than was required to hit target.

This will probably be shown in higher length shrinkage figures when the fabrics are eventually tested.

9. CONCLUSIONS

The processing of the 30 pieces of control fabric and 30 pieces of mercerised fabric was carried out successfully with no untoward problems.

This was due in the main to a number of factors:-

- the excellent co-operation extended to the IIC staff by the management and operatives at TEBE,
- the fact that very little production was being carried out meant that machine availability was not a problem and continuity of production was not disrupted,
- the preliminary work carried out in Manchester in calculating machine settings and finishing targets.

The Dornier merceriser has shown itself to be a good commercial machine, capable of processing tubular fabrics without sign of edge creasing or differential wale spacing.

The finishing of mercerised fabric is an area which needs further investigation. It has been shown that there are large differences in fabric shrinkage when tested by methods based on line and tumble drying.

It would also appear to be the case that unless the processing sequence includes a drying treatment which also confers mechanical agitation to the fabric, then targets which have been established based on a tumble drying relaxation procedure will not be easily attained.

TENE TRIAL - GREY TEST RESULTS

SAMPLE	StL.BW G	StL.AW G	NeBW G	NeAW G	Spr.BW G	Spr.AW G	ThknsB G	ThknsA G
18/1-20A327/	3.290	3.230	20.2	20.4	3.2	9.5	732	973
18/1-20A344/	3.450	3.380	20.4	20.4	4.1	11.8	707	994
18/1-20A362/	3.620	3.550	20.0	20.5	4.7	13.3	695	988
18/1-20A380/	3.800	3.740	20.0	20.4	5.3	14.9	712	1000
18/1-20A399/	3.990	3.930	20.2	20.5	6.1	18.0	690	1038
18/2-40A327/	3.280	3.240	21.0	20.9	-0.3	-1.1	683	885
18/2-40A344/	3.430	3.380	20.7	20.8	-0.1	-0.5	651	909
18/2-40A362/	3.620	3.560	20.6	20.6	-0.5	-0.9	655	916
18/2-40A380/	3.800	3.750	20.9	21.0	-0.7	0.2	635	918
18/2-40A399/	4.000	3.930	20.9	20.7	1.1	-0.1	621	909
24/1-28/291/	2.936	2.890	n.a.	29.6	13.1	17.0	618	867
24/1-28/306/	3.071	3.015	n.a.	29.2	7.7	18.9	593	952
24/1-28/321/	3.216	3.196	n.a.	28.9	17.5	20.1	668	965
24/1-28/337/	3.397	3.350	n.a.	29.1	15.3	21.8	650	957
24/1-28/354/	3.573	3.496	n.a.	28.9	11.5	25.3	628	849
24/2-56/291/	2.910	2.906	n.a.	27.5	2.3	-0.6	621	789
24/2-56/306/	3.105	3.038	n.a.	28.0	2.6	-2.1	585	774
24/2-56/321/	3.225	3.150	n.a.	27.9	2.7	-2.3	574	882
24/2-56/337/	3.373	3.322	n.a.	25.1	-0.4	-3.5	587	888
24/2-56/354/	3.538	3.512	n.a.	27.0	-1.4	-4.2	604	836
28/1-36/259/	2.610	2.614	n.a.	37.6	12.7	20.1	537	787
28/1-36/273/	2.770	2.742	n.a.	37.2	11.9	21.3	517	796
28/1-36/287/	2.871	2.809	n.a.	37.9	18.0	24.5	571	876
28/1-36/301/	3.046	2.976	n.a.	38.0	20.0	26.6	528	869
28/1-36/316/	3.188	3.153	n.a.	38.4	15.4	26.5	578	860
28/2-72/259/	2.550	2.563	n.a.	36.2	2.8	0.6	559	719
28/2-72/273/	2.734	2.727	n.a.	37.2	3.6	-1.3	521	662
28/2-72/287/	2.844	2.833	n.a.	36.2	2.8	-2.4	520	812
28/2-72/301/	3.020	2.964	n.a.	36.5	1.4	-2.9	498	809
28/2-72/316/	3.192	3.114	n.a.	37.4	-1.3	-3.2	521	757

TABLE 1.

TEBE TRIAL -- GREY TEST RESULTS

SAMPLE	C/3cmB G	C/3cmA G	W/3cmB G	W/3cmA G	WtC&WB G	WtC&WA G	Wid.BW G
18/1-20A327/	54.6	54.9	27.4	38.1	156.2	211.6	82.5
18/1-20A344/	49.3	51.9	26.9	36.6	149.6	202.2	82.6
18/1-20A362/	44.7	47.9	27.3	35.9	142.6	194.1	83.7
18/1-20A380/	41.4	46.4	27.5	34.3	138.7	185.2	80.7
18/1-20A399/	37.1	43.9	27.1	33.1	131.8	176.9	83.8
18/2-40A327/	53.4	52.5	27.5	38.8	152.6	202.0	82.2
18/2-40A344/	48.1	49.8	27.0	36.5	141.0	192.6	81.8
18/2-40A362/	43.1	47.1	27.1	35.8	134.0	182.1	82.8
18/2-40A380/	38.6	44.7	26.6	33.5	122.8	170.1	83.4
18/2-40A399/	35.5	42.9	27.2	32.6	115.8	163.0	84.0
24/1-28/291/	61.2	61.4	33.2	43.8	135.1	169.8	89.4
24/1-28/306/	49.2	56.9	32.3	42.1	120.1	159.3	87.8
24/1-28/321/	47.1	54.1	33.1	40.7	133.9	158.4	88.4
24/1-28/337/	42.9	50.8	33.2	39.9	116.4	148.1	89.9
24/1-28/354/	37.6	48.6	32.0	39.0	121.0	145.7	89.5
24/2-56/291/	56.8	58.9	32.4	42.8	133.3	168.7	87.2
24/2-56/306/	49.9	56.3	31.6	41.3	125.0	157.7	88.3
24/2-56/321/	45.5	53.0	31.4	40.4	112.6	157.0	90.3
24/2-56/337/	41.1	49.3	32.2	38.6	111.2	150.3	88.5
24/2-56/354/	38.8	46.9	31.5	36.3	105.3	132.5	91.7
28/1-36/259/	56.4	66.2	38.1	50.2	105.3	147.4	82.0
28/1-36/273/	51.6	63.6	37.8	48.4	100.9	137.0	n.a.
28/1-36/287/	48.5	59.1	37.3	46.9	101.1	131.9	84.7
28/1-36/301/	44.8	56.6	38.4	46.0	108.8	133.7	86.2
28/1-36/316/	42.8	53.8	37.9	44.4	98.4	123.2	87.0
28/2-72/259/	59.1	64.4	37.4	49.0	108.7	145.5	83.6
28/2-72/273/	53.4	61.8	37.7	47.3	107.3	137.3	82.8
28/2-72/287/	44.6	58.1	38.2	45.2	94.0	127.7	82.1
28/2-72/301/	43.6	55.5	36.7	42.4	94.3	123.7	84.5
28/2-72/316/	41.0	51.3	37.0	41.4	90.1	114.6	86.0

TABLE 1. (CONTINUATION)

TEBE TRIAL - GREY TEST RESULTS

SAMPLE	Bst.BW G	Bst.AW G	DistBW G	DistAW G	Y.StrB G	Y.StrA G	%extBW G	%extAW G
18/1-20A327/	726.2	710.2	19.6	22.2	370.1	355.3	7.0	7.9
18/1-20A344/	666.7	681.0	20.8	22.2	370.6	354.6	7.3	7.8
18/1-20A362/	635.7	668.8	21.0	22.6	372.1	336.5	7.0	7.6
18/1-20A380/	619.5	618.3	21.7	22.9	364.0	345.5	7.2	8.1
18/1-20A399/	591.8	574.5	20.1	22.5	346.4	341.2	7.0	8.0
18/2-40A327/	953.4	896.6	21.2	21.5	651.2	652.6	7.6	8.1
18/2-40A344/	909.2	855.7	20.1	22.5	655.8	649.7	7.7	8.1
18/2-40A362/	820.9	821.6	20.1	22.5	648.4	632.6	7.6	8.1
18/2-40A380/	814.5	791.4	22.2	22.2	647.3	646.6	7.5	8.2
18/2-40A399/	815.1	746.7	20.2	22.1	661.3	633.3	7.8	7.8
24/1-28/291/	n.a.	607.6	n.a.	15.8	270.5	276.0	9.1	9.5
24/1-28/306/	n.a.	575.8	n.a.	18.5	266.2	256.9	7.6	8.9
24/1-28/321/	n.a.	534.8	n.a.	18.8	271.8	236.3	8.1	7.1
24/1-28/337/	n.a.	494.0	n.a.	19.3	265.8	252.1	7.8	10.0
24/1-28/354/	n.a.	471.1	n.a.	19.5	252.6	249.2	6.7	7.8
24/2-56/291/	n.a.	761.7	n.a.	15.1	466.0	453.0	7.2	8.9
24/2-56/306/	n.a.	712.2	n.a.	14.8	488.2	469.3	7.4	7.8
24/2-56/321/	n.a.	702.9	n.a.	18.8	496.5	440.9	6.9	9.6
24/2-56/337/	n.a.	685.1	n.a.	19.0	516.1	446.9	6.9	9.5
24/2-56/354/	n.a.	653.4	n.a.	18.2	473.2	470.2	6.7	9.4
28/1-36/259/	n.a.	483.8	n.a.	15.0	191.3	182.6	7.8	9.4
28/1-36/273/	n.a.	483.5	n.a.	18.6	204.7	197.6	8.1	9.4
28/1-36/287/	n.a.	456.1	n.a.	18.0	190.7	188.4	7.1	9.3
28/1-36/301/	n.a.	412.0	n.a.	18.9	198.3	184.2	8.3	9.7
28/1-36/316/	n.a.	390.6	n.a.	18.8	208.7	189.9	9.3	11.1
28/2-72/259/	n.a.	641.6	n.a.	14.9	376.3	325.6	9.0	9.4
28/2-72/273/	n.a.	624.6	n.a.	14.4	355.4	349.7	7.4	7.3
28/2-72/287/	n.a.	620.5	n.a.	19.2	363.6	334.9	8.7	9.5
28/2-72/301/	n.a.	560.1	n.a.	18.7	352.8	338.8	6.3	10.0
28/2-72/316/	n.a.	544.0	n.a.	17.6	364.6	354.2	6.7	9.1

TABLE 1. (CONTINUATION)

CONTROL FABRICS

	FABRIC VARIANT	FINISHING TARGETS		TRI-PAD SETTINGS		AFTER TRI-PAD		AFTER TUBETEX DRYER		WIDTH ON CALENDER CM.	AFTER CALENDER ON TABLE	
		C/3	WIDTH CM.	SPACER BAR INCHES	FRAME WIDTH CM.	C/3	WIDTH CM	C/3	WIDTH CM.		C/3	WIDTH CM.
1	18/2-40/327	46	66	27	86 30%	48	72	50.5 50	64 64	68	49 49	69
2	18/1-20/327	48	66	27	86 30%	52	71	52 51.5	65 65	68	49.5 50.5	69
3	18/1-20/344	45	68	27	86 26%	44	72	45.5 46	66.5 66	70	44 44.5	69.5
4	18/2-40/344	44	69	28	89 29%	44	73	45 44	64 65	71	45 45	68.5
5	18/1-20/362	43	70	29	91 30%	40	77	42 42.5	67 67	72	43 42	69
6	18/2-40/362	41	72	29	91 26%	39	76	42 42	66 66	74	43.5 42.5	73.5
7	28/2-72/259	57	72	29	91 26%	60	75	59 58	67 67	74	59 60	73
8	28/1-36/259	58	72	29	91 26%	60	76	57.5 58	69 69	74	59 59	74
9	18/1-20/380	40	73	29	91 25%	39	78	38.5 40	69 69	75	40 40	74.5
10	28/1-36/273	54	74	30	94 27%	53	78	54.5 54	71 71	76	54 54	77
11	24/1-28/291	52	74	30	94 27%	51	77	55 54	68 69	76	54 55	74.5
12	18/1-20/399	38	75	31	97 29%	35	82	36 36.5	71 71	77	37 37	77
13	24/1-28/306	49	75	31	97 29%	50	79	50 50	71 72	77	49.5 50	77
14	24/2-56/291	50	75	31	97 29%	52	80	53 54	68 68	77	52 54	76.5
15	28/2-72/273	53	76	31	97 28%	55	80	54 54.5	71 71	78	54 55	77

TABLE 2

CONTROL FABRICS

	FABRIC VARIANT	FINISHING TARGETS		TRI-PAD SETTINGS			AFTER TRI-PAD		AFTER TUBETEX DRYER		WIDTH ON CALENDER CM.	AFTER CALENDER ON TABLE	
		C/3	WIDTH CM.	SPACER BAR INCHES	FRAME WIDTH CM.		C/3	WIDTH CM	C/3	WIDTH CM.		C/3	WIDTH CM.
16	18/2-40/380	39	76	31	97	28%	40	81	38 38	72 71	78	38 38	77
17	28/1-36/287	51	77	32	99	29%	50	85	51 52	71 74	79	48 49	78
18	24/1-28/321	46	78	32	99	27%	47	83	44.5 46	76 76	80	45 46	80
19	24/2-56/306	47	78	32	99	27%	49	82	49 49	72 74	80	51 51	80
20	18/2-40/399	36	79	32	99	25%	34	85	36 36	75 75	81	36 35.5	80
21	28/2-72/287	50	79	33	102	29%	52	83	51 -	75 -	81	49.5 50	81
22	28/1-36/301	48	79	33	102	29%	44	84	48 47	75 76	81	46 46	80
23	24/1-28 337	43	80	33	102	28%	43	85	44 42	76 75	82	43 42	81
24	24/2-56/321	45	81	33	102	26%	47	84	45.5 46	76 76	83	45 45	81
25	28/1-36/316	45	82	35	107	30%	43	90	43.5 44	75 75	84	43 44	83
26	24/1-28/354	41	83	35	107	29%	39	92	40 41	77 79	85	40 39	84
27	28/2-72/301	46	83	35	107	29%	47	89	48 49	76 76	86	47 47.5	84.5
28	24/2-56/337	42	84	35	107	27%	43	90	42 44	80 80	86	42.5 42.5	85
29	28/2-72/316	43	87	36	109	25%	44	93	42 43	79 81	89	41 42	87
30	24/2-56/354	39	88	37	112	27%	41	94	38 39	81 81	90	38 38	88.5

TABLE 2 (CONTINUED)

TABLE 3.

MERCERISED FABRICS

	FABRIC VARIANT	FINISHING TARGETS C/3	FINISHING TARGETS WIDTH CM.	MERCERISER CIGAR SIZES 1	2	3	TRI-PAD SETTINGS SPACER BAR INCHES	TRI-PAD SETTINGS FRAME WIDTH CM.		AFTER TRI-PAD C/3	AFTER TRI-PAD WIDTH CM.	AFTER TUBETEX DRYER C/3	AFTER TUBETEX DRYER WIDTH CM.	WIDTH ON CALENDER	AFTER CALENDER ON TABLE C/3	AFTER CALENDER ON TABLE WIDTH CM.
31	18/2-40/327	44	57	116	114	—	22	74	30%	43	55	40 40	50 50	60	41 41.5	59
32	18/1-20/327	46	57	48% LENGTH EXTENSION 116	114	—	22	74	30%	42	56.5	42 42	52 53	60	41 42	59.5
33	18/1-20/344	43	59	116	114	—	22	74	25%	38	56	39.5 39.5	54 53	62	41 41	60
34	18/2-40/344	42	60	116	114	—	23	76	27%	38	55.5	39.5 39	53 53	63	41 41	62
35	18/1-20/362	41	61	116	114	—	23	76	25%	37	57.5	36 37	54 55	64	36 37	63.5
36	18/2-40/362	39	63	116	114	—	25	81	29%	38	57.5	38 38	53 53	66	38 38	65
37	28/2-72/259	55	63	116	114	—	25	81	29%	51	58	49 49	53 53	66	52 53	65
38	28/1-36/259	55	63	116	114	—	25	81	29%	47	52	48 47.5	54 54	66	49 49.5	65
39	18/1-20/380	38	64	34% LENGTH EXTENSION 116	114	—	25	81	27%	34	59	34 34	56 56	67	36 37	66.5
40	28/1-36/273	51	64	116	114	—	25	81	27%	44	56	44 44	54 54	67	46.5 46.5	66
41	24/1-28/291	49	64	116	114	—	25	81	27%	45	57	44 44	56 56	67	48 48.5	66.5
42	18/1-20/399	36	65	124	114	—	26	84	29%	31	60	32 31	56 56	68	32 32	66
43	24/1-28/306	47	65	124	114	—	26	84	29%	41	60	39.5 40	56 57	68	42 43	67.5
44	24/2-56/291	48	65	124	114	—	26	84	29%	49	60	45 45	55 55	68	48 49	67
45	28/2-72/273	50	66	124	114	—	26	84	27%	47	58	47 47	55 55	69	48 49	69

TABLE 3 (CONT.)

MERCERISED FABRICS

	FABRIC VARIANT	FINISHING TARGETS		MERCERISER CIGAR SIZES			TRI-PAD SETTINGS			AFTER	TRI-PAD	AFTER TUBETEX DRYER		WIDTH ON CALENDER	AFTER CALENDER ON TABLE	
		C/3	WIDTH CM.	1	2	3	SPACER BAR INCHES	FRAME WIDTH CM.		C/3	WIDTH CM.	C/3	WIDTH CM.		C/3	WIDTH CM.
46	18/2-40/380	37	66	124	114	—	26	84	27%	34	56	33 33.5	52 53	69	34 34	68
47	28/1-36/287	48	67	124	114	—	27	86	28%	40	57	38 40	54 56	70	39.5 40	68
48	24/1-28/321	44	68	124	114	128	27	86	26%	38	58	36 36	56 56	71	39 40	71
49	24/2-50/306	45	68	32% LENGTH EXT^N 124	114	128	27	86	26%	43	58	44 42	55 53	71	42 42	71
50	18/2-40/399	34	69	124	114	128	28	89	29%	30	57	29 29	50 51	72	31 31	70
51	28/2-72/287	48	69	124	114	128	28	89	29%	41	56	41 40	53 52	72	42.5 43	70
52	28/1-36/301	46	69	124	114	128	28	89	29%	35	55	34 36	53 54	72	37 37	70
53	24/1-28/337	41	70	133	120	128	28	89	27%	32	60	34 33	57 56	73	36 36	72.5
54	24/2-56/321	43	70	133	120	128	28	89	27%	39	60	39 37	55 54	73	40 40	72.5
55	28/1-36/316	43	71	133	120	128	28	89	25%	31	57	32 32	53 54	74	35 35	72
56	24/1-28/354	39	72	133	120	128	30	94	30%	30	56	31 30.5	58 57	75	32 32	75
57	28/2-72/301	44	72	133	120	128	30	94	30%	39	59	38.5 38	55 54	75	41 41	75
58	24/2-56/337	40	73	31% LENGTH EXT^N 133	120	128	30	94	29%	36	59	33 33	52 53	76	36.5 36.5	74.5
59	28/2-72/316	41	76	142	128	128	32	99	30%	35	62	35 36	56 57	79	37.5 37.5	76
60	24/2-56/354	37	77	142	128	128	32	99	29%	32	61	32 32	57 56	80	34 35	77

TABLE 4 DYEING RECIPES (LIQUOR RATIO 4.5:1)

Bleaching - 20 minutes at 98°C.

Hydrogen Peroxide	8% o.w.f.
Stabiliser T (Apoquimica)	1.0 g/l
Sodium carbonate	20% o.w.f
Toxal K	1.0 g/l

Neutralisation and washing-off

Acetic acid	0.5 g/l
Tetralix ALK (Stockhausen)	3.0 g/l

Dyeing

Remazol Brilliant Yellow 4GL (Hoechst)	0.16	~~1.6~~% o.w.f
Remazol Turquoise Blue G (Hoechst)	1.17	~~11.7~~% o.w.f
Calgon T (Hoechst)		1.0 g/l
Humectol C (Hoechst)		1.5 g/l
Common salt		60 g/l
Trisodium phosphate		10 g/l

After-treatments (1)

Acetic acid	0.5 g/l
Cotoblanc RS (CHT-Tübingen)	1.0 g/l

(2)

Lamephan KWA conc (Grünau)	15% o.w.f

BARRIQUAND

MACHINES TEXTILES POUR L'ENNOBLISSEMENT

V/RÉF. : N/RÉF. : ROANNE, LE

GYROSTOCK GK 01

GYROSTOCK GK 01 is a rope dyeing atmospheric machine that can operate up to 100°C at sea level and that has an average capacity of 200 Kg.

I - GYROSTOCK MAIN CHARACTERISTICS

1/ A liquor ratio below 1 : 2 on a wet fabric basis

This very low liquor ratio results from the concept of GYROSTOCK which is using bath exclusively for dyeing and not at all for moving the fabric, neither in the storing compartment nor in the dyeing system.

Indeed the fabric is stored within a revolving cylinder with a vertical axis. Within the dyeing systems the fabric is moved through a winch. Consequently GYROSTOCK allows very huge savings in water, energy, colors, chemicals, time and less pollution. The actual savings being obtained in dyehouse operation is approximately 500 000 FF per year for a 200 Kg capacity machine compared to an equivalent beck. (See detailed figures in green leaflet).

2/ A high versatility

GYROSTOCK high versatility results from the fact GYROSTOCK is equipped with the 3 presently known dyeing systems :

FIG. 1.

9 à 13, RUE SAINT-CLAUDE / 42300 ROANNE FRANCE / TÉLÉPHONE (77) 72 44 44 / TÉLEX BARICAN 330 449 F
C. C. P. LYON 608.43 / R. C. ROANNE B 405782590 / S. A. R. L. AU CAPITAL DE 1.000.000 FRANCS

- 1 Softjet
- 1 Overflow
- 1 Jet

The Softjet is on the way of the fabric up to the winch which makes counterflow circulation possible.

The overflow and the Jet are on the way of the fabric down back to the revolving cylinder.

The Softjet, the Overflow and the Jet are controlled totally independently only according to what is necessary for the quality of the fabric.

Indeed any combination of the 3 dyeing systems is possible. This offers considerable flexibility and versatility : a wide range of knitted and woven fabrics can be dyed.

The dyeing system is not used to transport the fabric around the machine. The fabric is transported in a cylinder which revolves slowly. As a result, the machine is ideal for dyeing delicate fabrics without any distortion, dyeing fabrics that cannot be dyed in a jet and dyeing fabrics simultaneous of different qualities and sizes in one rope. As an example, heavy terry fabric, light-weight fabric of different body sizes and colors can be dyed simultaneously in one rope.

In addition, ropes of different lengths can be dyed simultaneously and will pass through the dyeing system an equal number of times, thereby insuring even dyeing throughout.

II - GYROSTOCK GK 01 DESCRIPTION

++

GYROSTOCK GK 01 is made out of 4 main parts.

1/ The first part of GYROSTOCK is a fixed cylinder with a vertical axis that has a crown shape.

Within the centre of the crown are located the pump, the valves and the heat-exchanger.

BARRIQUAND

The lowest part of the fixed cylinder feeds the pump that makes bath circulate to the heat-exchanger and then to the 3 dyeing systems : Softjet, Overflow and Jet.

Within the fixed crown is located a revolving cylinder which is totally perforated.

This revolving cylinder is used for the storing of the fabric.

The speed of the revolving cylinder is controlled through a motor which makes possible one revolution in any time between 30 seconds to 5 minutes.

A pump (7.5 KW) is used for bath circulation.

Pneumatic valves control water inlet, emptying and continuous rinsing.

The heat-exchanger is a Platular heat-exchanger which has a small volume (favorable for the liquor ratio) and a high transfer coefficient. It allows to increase temperature at a maximum average rate of 8°C per minute.

The heat-exchanger is located within the filter, which also helps in minimizing the liquor ratio.

2/ The second part of the machine is the head above the revolving cylinder.

The head of GYROSTOCK includes :

- a winch
- the 3 dyeing systems : Softjet + Overflow + Jet.
- a J.Box for preparing the folding of fabric to the revolving cylinder.

Rate of flow within each of the 3 dyeing systems is controlled independently.

The softjet is on the way of the fabric up to the winch.

The overflow and the jet are located on the way of the fabric down back to the revolving cylinder.

A safety device located between the winch and the overflow would make automatically the winch stop, go reverse and then forward again if any loop was to go up.

This safety device makes it very improbable to have a tangle within the machine.

By the head of the machine is located the local control panel that clearly identifies all functions :

- circulation pump control
- winch control
- revolving cylinder control
- pneumatic valves control
- callings for addition
- unloading winch control

An other safety device controls the speed of the revolving cylinder.

3/ The third part of GYROSTOCK is an addition tank for colors and chemicals adding.

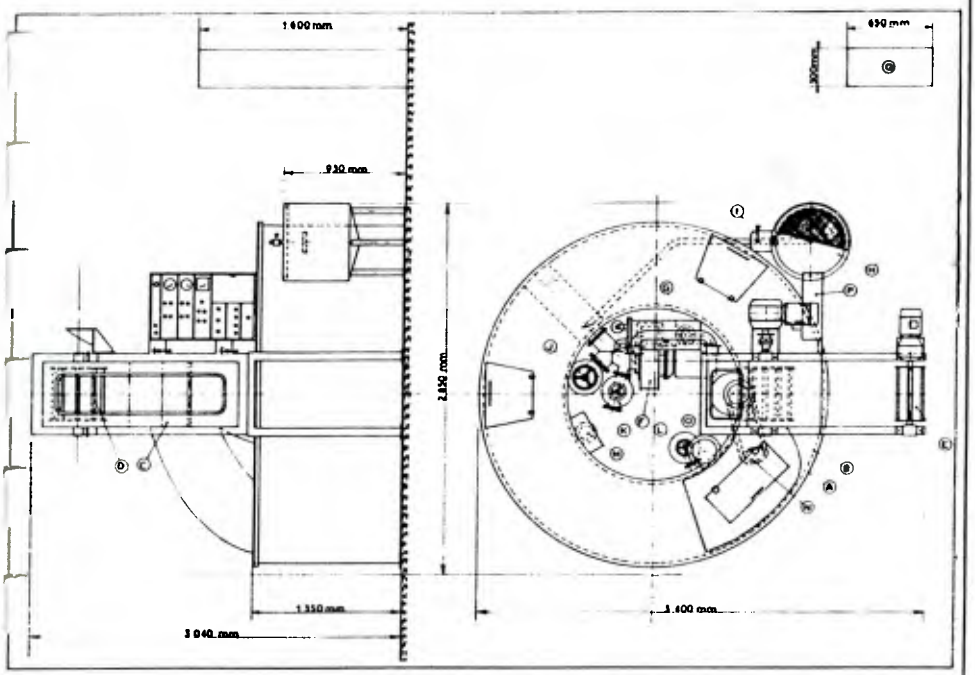
4/ The forth part is a control panel which includes a programmer for the full automatic control of the machine :

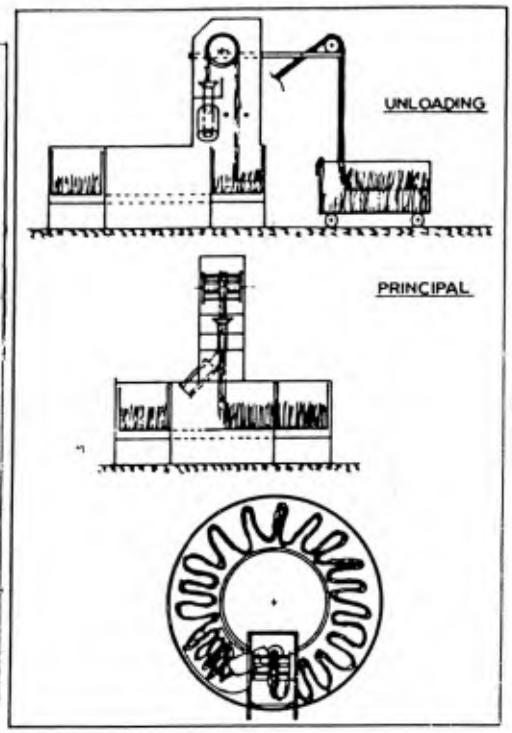
- automatic control of temperature according to time
- automatic control of all other valves and motors

This control panel includes a temperature recorder.

It also includes all electric and pneumatic parts necessary to make the machine operate.

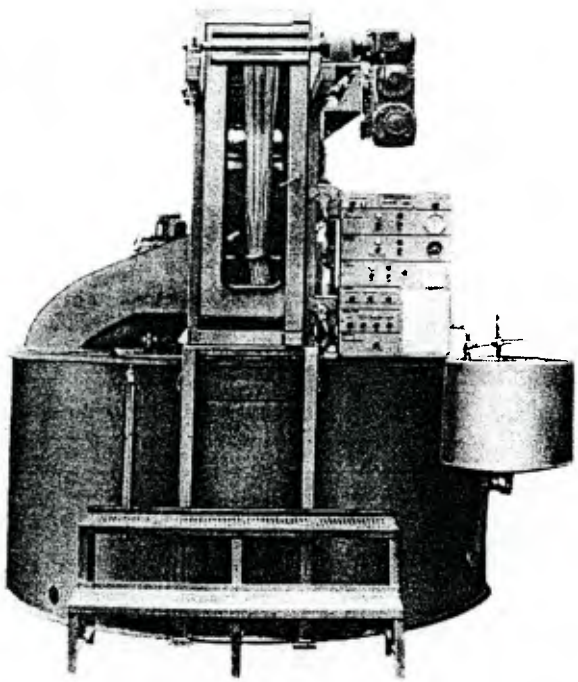
N.B. : GYROSTOCK GK 01 is delivered ready to be connected
==== with water, steam, electricity and pneumatic air.





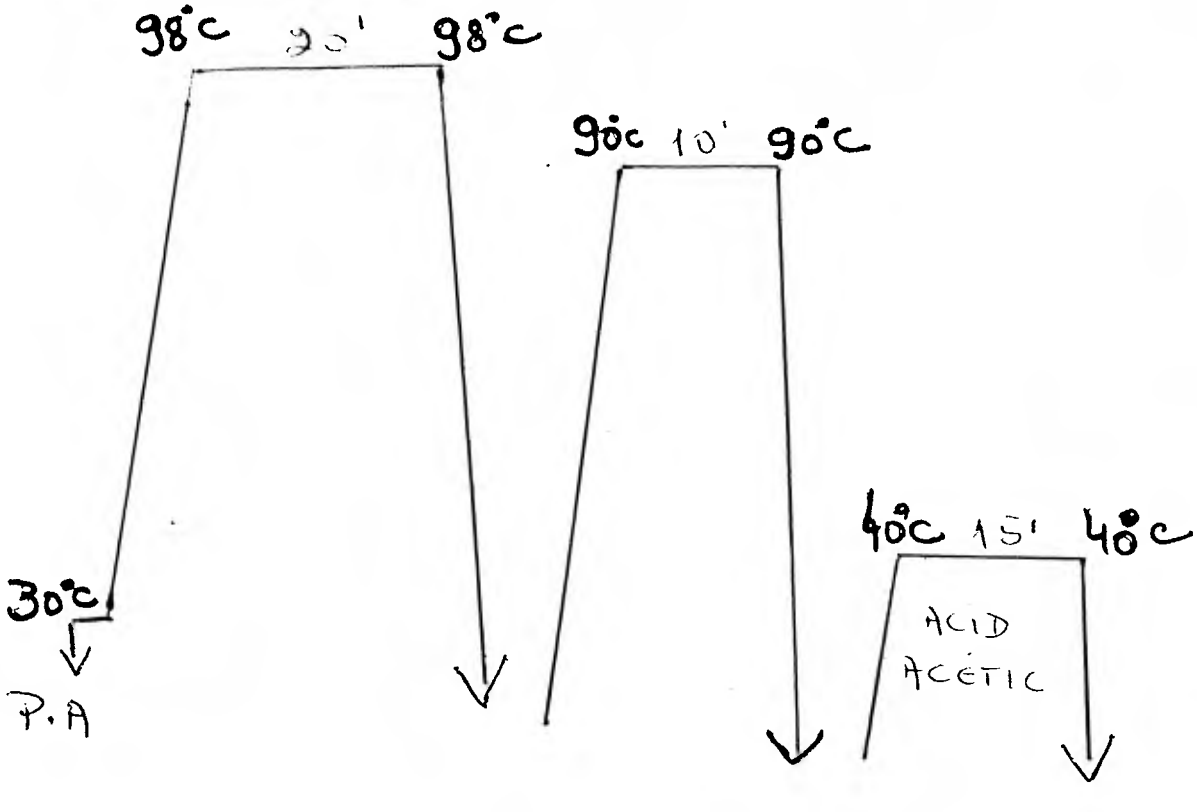
A- Fixed cylinder
B- Revolving cylinder
C- Head of machine (Dyeing head)
D- Winch
E- Unloading winch
F- Circulation pump
G- Head exchanger
H- Addition tank with filter
I- Inlet tap
J- Emptying valve
K- Water inlet valve
L- Continuous rinsing valve (Low level)
M- Overflow (Continuous rinsing-High level)
N- Impregnation area
O- Impregnation compartment
P- Centralized control panel
Q- Master and temperature control panel

– *Barriquand Girostock machine*

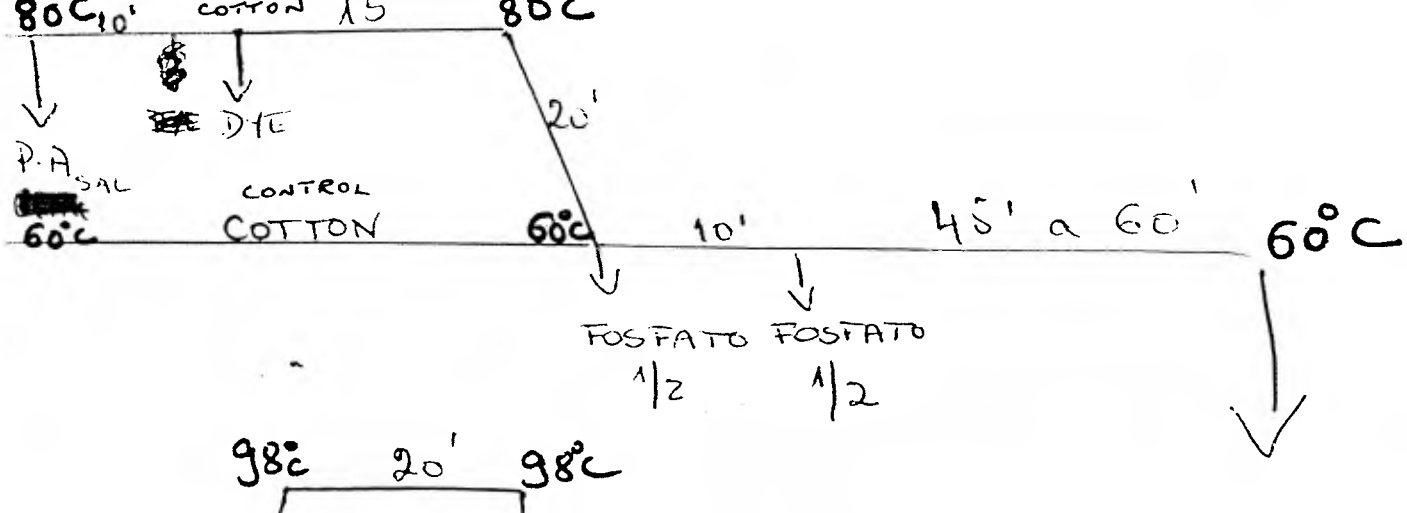


– *Barriquand Girostock*

PREPARATION



DYEING



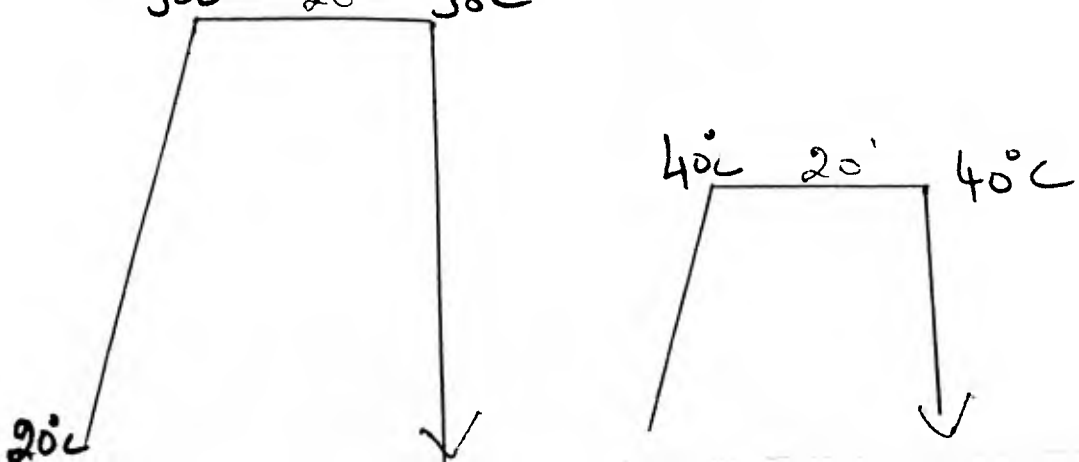


FIG. 2.

APPENDIX

CONCLUSIONS FROM THE STAGE 1 TRIALS AT TEBE

The main observation which has come from analysing the results of this preliminary trial is that altering the size of the cigar in the first wash tower seems to have virtually no effect on the reference wales and therefore width of the mercerised fabric. A width reduction of 12.5% in the case of 1 x 1 rib and 13.1% in the case of single jersey would appear to be typical of this merceriser when compared with unmercerised fabric. Altering cigar size within the range studied appears to give little or no control over this. Altering cigar size does however seem to have an effect on the reference course density particularly at lower cigar diameters.

In order to maintain consistency, it would therefore seem logical to ensure that a certain degree of width stretch is applied to ensure that the conditions will give a result which falls on the flat part of the curve which represents the reference course linear density.

The fabrics to be used in Stage 2 of this project have a range of target finished widths. Therefore it is necessary to have some factor which can be used to determine the optimum size of the cigar during the mercerising stage. In the case of the fabrics which were treated in this particular exercise, if it is assumed that the 140 cm cigar size is sufficiently far away from the danger area then the cigar size can be related to the target finished widths of these fabrics.

With the mercerised 1 x 1 rib construction a realistic target finished width to give approximately 8% width shrinkage can be shown to be around 65 cms.

The factor is therefore:

$$\frac{140}{65} = 2.15$$

With the mercerised single jersey fabric the target finished width to give a residual shrinkage of 10% is approximately 75 cms.

The factor is therefore:

$$\frac{140}{75} = 1.87$$

For stage 2 processing therefore, the target finished widths for the unmercerised control can be obtained using STARFISH, with a width shrinkage of 10% built-in. This can then be reduced by 13% to allow for mercerising and the suggested cigar size calculated by multiplying the target finished width by a factor of 1.87.

It will no doubt be necessary to group the fabrics into several width brackets for mercerising since the cigar size cannot be altered for each fabric variant.

The question arised as to whether end-cloths should be placed between the various groups to ensure that fabric is not stopped on the machine during changes to the cigar size. Provided that the fabrics are mercerised in the order of wide to narrow, the change of cigar size should be effected in a very short period of time (less than 1 minute). It is the authors view therefore that since the differences observed in the reference courses and wales of the single jersey fabric stopped on the machine were within one standard deviation of the average that it is not necessary to use end-cloths and this will greatly simplify the exercise.