



International Institute For Cotton
Technical Research Division
Manchester
Research Record No 139

Project K2
Piece Mercerisation Of Single Jersey On The
Omez "Merceland" Tubular Mercerising Machine
At Tintoria Giuseppe Tosi, Busto Arsizio, Italy

Peter F. Greenwood
May 1981

Classification: Fabrics/Knitted/Processing

Key Words: Tosi, Dyeing, Omez, Mercerising, Single Jersey.

Digital Version: February, 2012

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1 Introduction

As part of a continuing programme of study on the behaviour of knitted cotton fabrics in dyeing and finishing, a series of single jersey fabrics has been produced which are being subjected to a variety of dyeing and finishing treatments.

The production of these fabrics has been described in *Research Record No. 114*.

Although the full range of structures produced for this study contains 120 variants, these have not all been included in all of the finishing treatments which are being examined. The finishing programme for this full range consists of two variants: one in which the fabric is maintained in the tubular state throughout processing while, in the other, the fabric is slit into open width for final finishing. This part of the programme has been designated Project K1.

In addition, a limited range of twenty constructional variants has been selected for study in a much more extensive programme of dyeing and finishing, which has been designated Project K2. A major section of this latter project is devoted to a study of the behaviour of single jersey fabrics when subjected to the process known as piece mercerisation.

In recent years, machines for both tubular and open-width knitgoods mercerisation have been developed to full commercial operation. Both types of equipment have been included in the Project K2 programme, and this report describes the processing carried out, as part of Project K2, at the finishing works of Tintoria Giuseppe Tosi, Busto Arsizio, Italy, where an Omez "Mercelux" tubular knitgoods mercerising range has been in commercial use since 1976. Two previous trials have been carried out on this machine: in June 1977 and June 1978. Results of these trials were reported in *Research Records Nos. 86 and 128*.

2. Project K2. Fabric Constructions And Coding

The twenty single-jersey fabric constructions selected for study in Project K2 include both 24 and 28 gauge and both singles and two-fold yarns in each gauge. The range of 24 gauge fabrics was produced from Ne 28/1 and Ne 56/2 yarns, each in five stitch lengths, and the 28 gauge fabrics from Ne 36/1 and Ne 72/2 yarns, each again in five stitch lengths.

A fabric coding system was devised to describe the construction and finishing route for each variant. The coding consists of four sections; for example, *24/1-28/291/Brazz* refers to a 24 gauge fabric, knitted from singles 28's yarn to a stitch length of 2.91 mm, and processed by a finishing route designated by "Brazz". This coding system has been used to describe the fabrics in the tables of test results at the end of this report.

Two complete sets of fabrics, lots 7 and 8, were processed at the Tosi finishing works. Finishing route 7 included processing on the Omez mercerising range, followed by dyeing in a Brazzoli machine and tubular finishing. This route was designated "Omez". Lot 8 was dyed and finished in the same way, but was not mercerised; this route was designated "Brazz". A detailed description of the processing appears later in the report.

3. Processing Machinery At Tintoria Giuseppe Tosi

3.1. The Omez Mercerising Range

Since the last IIC trials took place in June 1978, two major modifications had been made to the machine. The mechanical stretcher frame in the wash tower, which applied width-way tension to the fabric during wash-off had been replaced by an air-jet unit.

This unit injects air into the fabric tube at the top of the wash tower, so that a balloon is formed to straighten the fabric and provide some tension. The air flow is controlled by a fabric sensor so that the ballooning effect is kept constant.

The second improvement has been the installation of a four-unit Omez UNO-3 continuous washing range in line with the merceriser.

Figure 1 shows a general view of the machine. Fabric entry is shown in *Figure 2*, and the impregnation unit and wash tower in *Figure 3*. *Figure 4* shows a close-up of the nip preceding the wash tower. *Figure 5* shows the washing range and *Figure 6* shows the fabric exit.

3.2. Dyeing Machinery

Of the machinery available for dyeing, the Tosi management recommended a Brazzoli overflow dyeing machine, ref. MBC/R2+2, for our fabrics. This was a four-tube machine with a capacity of 100 Kg per tube.

It was decided that this machine should be used, although it was rather large for our 250-260 Kg batches. The installation is shown in *Figure 7*.

3.3. Other Equipment

The other main equipment used in the trials included an Alea de-twister and hydro-extraction unit, Alea air-cushion driers and two Ferraro calenders, one with two steel bowls the other with two felt blankets against steel rollers.

The first calender was used to straighten the fabric, line up the cutting mark to the edge of the tube and to attain the approximate width, the second calender was then used for final finishing.

4. Operational Planning

As with previous runs in this series of knitgoods finishing trials, the behaviour of each construction during processing could not be accurately predicted.

Nevertheless, it was necessary to have some guidelines laid down for finishing these fabrics, and therefore targets were set, based on certain assumptions.

The first assumption was that, in the weft knitted structure, length and width dimensions are inter-dependent, and therefore that control of one will also give a good measure of control to the other. Based on this, it was decided that a target should be set for the finished width of each variant based on the behaviour of the corresponding grey fabric in the IIC knitgoods relaxation test.

Earlier studies on the behaviour of knitted fabric in dyeing and finishing had indicated that relaxed fabric width tends to increase slightly after jet dyeing (though not after winch dyeing) but is markedly reduced as a result of mercerisation. It was assumed that these fabrics would behave in a similar fashion. Further, and perhaps with less justification, it was also assumed that these effects would be constant across the range of fabrics in the study.

Targets for finished width were therefore calculated in the following manner.

- i. Wale spacings were measured on the grey fabrics after relaxation (*Table 8*)
- ii. Knowing the number of needles on the knitting machine, a figure for the width of each fabric, relaxed from the grey state, could be calculated (*Table 26*).

- iii. As width-way stretching helps to stabilise the fabric in the length direction, and as some residual width shrinkage is usually desirable, it was considered that the finished fabrics should ideally exhibit a residual width shrinkage of 10 - 12%.
- iv. Bearing in mind the assumed effects of processing, it was decided to set target widths for fabric finishing as follows.

dyed: 1.17 x calculated relaxed grey width
 mercerised and dyed: 0.88 x jet dyed target

These "target widths" are recorded in *Tables 26 and 27*.

5. Processing

Fabric processing at Tintoria Giuseppe Tosi took place during the week 20-24 October 1980. Members of the IIC Technical Research Division were present throughout to observe the operation.

5.1. Mercerisation

The fabrics for mercerisation were first arranged in increasing order of grey relaxed width, calculated as already described, and allocated a running number following the sequence M1 to M20, as shown in *Table 27*.

The following observations were made during processing.

caustic concentration	28 °Bé
caustic temperature	16 °C
wetting agent	Mercerol PL (Sandoz)
dwel time in saturator	21 seconds
swelling time (impregnation + delay)	57 seconds
dwel time in wash tower	6 seconds
time in washing range	48 seconds
fabric speed at saturator	36 m/min
fabric speed in wash range	40 m/min

Fabric width measurements were made at three points during the processing:

1. at the entry to the wash tower, just after the ring expanders;
2. at the entry to the washing range;
3. at the exit from the washing range.

These results are recorded in *Table 27*.

5.2. Dyeing

Dyeing was carried out in a Brazzoli overflow dyeing machine, type MBC/RL, at a liquor ratio of 10:1 for both the unmercerised and mercerised fabrics.

Prior to dyeing, the fabric was subjected to a two-stage bleaching treatment: hypochlorite followed by peroxide. The unmercerised fabric was dyed with 2% (on weight of fabric) Procion Blue H-EG, and the mercerised fabric with 1.5% (owf) of the same dye. Details of the bleaching and dyeing are given in *Table 28*.

5.3. Drying and Calendering

De-twisting and hydroextraction was carried out on an Alea compressed air machine. Courses and widths were measured at this stage, and are recorded in *Tables 26 & 27*.

Drying was carried out on Alea air-cushion dryers, and the fabric was then calendered twice; first on a Ferraro steel-to-steel calender to straighten the cloth and attain approximate target widths; secondly on a Ferraro double blanket-to-steel calender for final presentation.

Width measurements taken during calendering are also recorded in *Tables 26 and 27*.

6. Test Results

On return to Manchester, the fabrics were sampled for testing. The results of tests carried out on these fabrics, and on the equivalent grey fabrics, are given in *Tables 1 - 25*. A list of the tests carried out is to be found at the beginning of the tables.

Analysis of these results will take place over the next few months, together with data from the other finishing routes in Project K2, and therefore it is not considered appropriate to comment here, or to attempt to draw any conclusions. It should also be pointed out that these figures are at this stage to be regarded as preliminary, as re-testing and re-evaluation of the fabrics may be considered desirable once the data analysis has begun.

List Of Testing Carried Out For Project K2 samples

- 1 Length shrinkage, %
- 2 Width shrinkage, %
- 3 Fabric weight, BW (g/sm)
- 4 Fabric weight, AW (g/sm)
- 5 Courses per 3cm., BW
- 6 Courses per 3cm., AW
- 7 Wales per 3cm., BW
- 8 Wales per 3cm., AW
- 9 Stitch length, BW (mm.)
- 10 Stitch length, AW (mm.)
- 11 Burst strength, BW (kN/sm)
- 12 Burst strength, AW (kN/sm)
- 13 Distension at burst, BW %
- 14 Distension at burst, AW %
- 15 Angle of spirality, BW (deg)
- 16 Angle of spirality, AW (deg)
- 17 Width, BW (cm.)
- 18 Yarn strength, BW (g)
- 19 Yarn strength, AW (g)
- 20 Yarn extension at break, BW %
- 21 Yarn extension at break, AW %
- 22 Yarn count, BW (Ne, optional Tex)
- 23 Yarn count, AW (Ne, optional Tex)
- 24 Fabric thickness, BW (mm/1000)
- 25 Fabric thickness, AW (mm/1000)
- 26 Average Tex for this Yarn/Process AW

Notes for Digital Version:

Shrinkage is that measured after the 5-cycle Reference Relaxation Procedure

BW means as received (before wash)

AW means after the 5-cycle Reference Relaxation Procedure (after wash)

The units for Distension at Burst should probably be mm, not %

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.1 Length shrinkage, %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	2.7	12.9	14.3
24/1-28/306	15.0	13.4	15.7
24/1-28/321	13.9	15.8	19.3
24/1-28/337	18.2	16.1	20.4
24/1-28/354	23.1	19.7	21.7
24/2-56/291	6.8	9.6	6.0
24/2-56/306	11.2	11.3	5.6
24/2-56/321	14.1	14.5	7.2
24/2-56/337	17.1	14.7	7.8
24/2-56/354	20.9	16.4	8.6
28/1-36/259	15.8	13.9	13.3
28/1-36/273	19.7	14.7	17.6
28/1-36/287	20.0	16.8	18.3
28/1-36/301	19.5	17.3	22.3
28/1-36/316	22.0	18.8	21.2
28/2-72/259	11.4	11.3	5.1
28/2-72/273	14.4	11.6	6.2
28/2-72/287	23.0	13.5	7.9
28/2-72/301	21.7	14.7	6.0
28/2-72/316	21.5	15.5	7.1

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.2 Width shrinkage, %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	25.6	9.9	17.0
24/1-28/306	21.2	11.1	17.7
24/1-28/321	19.4	10.7	17.0
24/1-28/337	18.3	9.9	17.0
24/1-28/354	14.8	6.0	14.3
24/2-56/291	24.7	13.4	20.8
24/2-56/306	21.7	12.3	22.8
24/2-56/321	21.8	11.6	22.2
24/2-56/337	16.1	12.8	24.3
24/2-56/354	13.6	13.4	27.1
28/1-36/259	22.7	9.0	18.5
28/1-36/273	20.0	10.4	17.8
28/1-36/287	15.8	10.0	19.0
28/1-36/301	15.7	6.7	18.0
28/1-36/316	14.8	7.4	18.6
28/2-72/259	23.6	13.3	22.5
28/2-72/273	19.5	13.2	24.3
28/2-72/287	15.7	13.7	24.3
28/2-72/301	15.9	13.3	28.0
28/2-72/316	13.1	14.3	28.0

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.3 Fabric weight,BW (g/sm)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	116.2	114.2	118.8
24/1-28/306	105.3	111.4	110.8
24/1-28/321	99.0	99.4	107.6
24/1-28/337	94.6	93.4	94.8
24/1-28/354	100.0	91.0	95.6
24/2-56/291	115.3	111.8	123.0
24/2-56/306	102.2	104.0	118.8
24/2-56/321	92.2	95.4	105.4
24/2-56/337	92.2	87.8	100.0
24/2-56/354	90.0	83.4	88.0
28/1-36/259	91.3	92.8	100.0
28/1-36/273	88.5	93.6	96.4
28/1-36/287	85.5	85.6	94.2
28/1-36/301	78.4	82.2	88.6
28/1-36/316	81.0	70.4	81.0
28/2-72/259	95.8	94.0	120.6
28/2-72/273	95.0	90.8	97.6
28/2-72/287	84.8	84.8	94.0
28/2-72/301	79.2	80.6	99.0
28/2-72/316	82.0	71.0	87.8

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.4 Fabric weight,AH (g/sm)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	165.2	152.0	176.5
24/1-28/306	159.6	145.2	180.2
24/1-28/321	156.0	136.2	171.2
24/1-28/337	152.5	134.0	159.8
24/1-28/354	145.0	125.4	155.9
24/2-56/291	167.2	144.6	179.0
24/2-56/306	160.6	141.2	167.8
24/2-56/321	143.8	132.2	162.0
24/2-56/337	132.4	118.4	151.2
24/2-56/354	130.0	114.4	146.2
28/1-36/259	139.4	130.6	150.0
28/1-36/273	130.0	127.0	146.0
28/1-36/287	122.0	115.8	138.8
28/1-36/301	119.4	113.2	132.4
28/1-36/316	120.0	110.0	132.1
28/2-72/259	137.9	130.4	153.8
28/2-72/273	127.0	118.4	148.6
28/2-72/287	118.0	112.8	140.0
28/2-72/301	114.0	102.0	134.4
28/2-72/316	110.0	100.0	130.6

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.5 Courses per 3cm.,BW

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	61.2	50.9	46.3
24/1-28/306	49.2	47.6	43.2
24/1-28/321	47.1	43.9	39.0
24/1-28/337	42.9	41.0	36.9
24/1-28/354	37.6	37.1	33.8
24/2-56/291	56.8	51.9	47.0
24/2-56/306	49.9	47.5	44.7
24/2-56/321	45.5	43.5	40.3
24/2-56/337	41.1	40.3	38.1
24/2-56/354	38.8	37.6	35.6
28/1-36/259	56.4	55.2	50.3
28/1-36/273	51.6	51.1	45.3
28/1-36/287	48.5	47.9	42.9
28/1-36/301	44.8	43.6	39.0
28/1-36/316	42.8	41.7	36.8
28/2-72/259	59.1	56.0	53.8
28/2-72/273	53.4	52.6	50.2
28/2-72/287	44.6	48.2	44.5
28/2-72/301	43.6	44.6	42.7
28/2-72/316	41.0	42.1	39.9

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.6 Courses per 3cm.,AW

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	61.4	57.4	51.1
24/1-28/306	56.9	54.0	49.6
24/1-28/321	54.1	51.6	48.6
24/1-28/337	50.8	48.6	46.9
24/1-28/354	48.6	45.5	42.6
24/2-56/291	58.9	56.8	50.0
24/2-56/306	56.3	53.3	46.6
24/2-56/321	53.0	50.1	44.8
24/2-56/337	49.3	47.2	41.4
24/2-56/354	46.9	44.0	38.5
28/1-36/259	66.2	63.1	56.8
28/1-36/273	63.6	58.6	54.4
28/1-36/287	59.1	56.4	51.0
28/1-36/301	56.6	53.4	48.3
28/1-36/316	53.8	49.9	44.6
28/2-72/259	64.4	62.3	56.4
28/2-72/273	61.8	58.5	54.4
28/2-72/287	58.1	54.9	48.8
28/2-72/301	55.5	51.9	45.0
28/2-72/316	51.3	48.4	42.2

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.7 Wales per 3cm.,BH

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	33.2	38.8	42.9
24/1-28/306	32.3	36.7	41.3
24/1-28/321	33.1	35.1	40.0
24/1-28/337	33.2	34.4	39.4
24/1-28/354	32.0	33.7	39.1
24/2-56/291	32.4	36.7	42.9
24/2-56/306	31.6	35.5	41.3
24/2-56/321	31.4	35.1	41.3
24/2-56/337	32.2	33.5	39.0
24/2-56/354	31.5	31.7	36.7
28/1-36/259	38.1	42.9	49.3
28/1-36/273	37.8	42.1	47.6
28/1-36/287	37.3	40.0	46.0
28/1-36/301	38.4	39.8	45.9
28/1-36/316	37.9	38.0	43.9
28/2-72/259	37.4	42.8	48.1
28/2-72/273	37.7	40.0	46.2
28/2-72/287	38.2	38.8	46.6
28/2-72/301	36.7	37.5	42.4
28/2-72/316	37.0	35.7	42.1

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.8 Wales per 3cm.,AH

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	43.8	43.4	53.1
24/1-28/306	42.1	41.7	49.1
24/1-28/321	40.7	40.2	46.8
24/1-28/337	39.9	39.7	44.9
24/1-28/354	39.0	38.1	44.9
24/2-56/291	42.8	42.3	52.3
24/2-56/306	41.3	40.9	50.6
24/2-56/321	40.4	39.5	50.3
24/2-56/337	38.6	37.4	47.8
24/2-56/354	36.3	35.7	47.3
28/1-36/259	50.2	48.8	59.1
28/1-36/273	48.4	47.8	57.0
28/1-36/287	46.9	46.4	55.0
28/1-36/301	46.0	44.6	52.8
28/1-36/316	44.4	43.4	52.9
28/2-72/259	49.0	49.0	58.1
28/2-72/273	47.3	46.8	59.3
28/2-72/287	45.2	44.1	55.2
28/2-72/301	42.4	42.9	56.6
28/2-72/316	41.4	41.3	54.5

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.9 Stitch length,BW (mm.)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	2.936	2.769	2.743
24/1-28/306	3.071	2.882	2.886
24/1-28/321	3.216	3.125	3.035
24/1-28/337	3.397	3.269	3.181
24/1-28/354	3.573	3.412	3.345
24/2-56/291	2.910	2.820	2.686
24/2-56/306	3.105	3.063	2.818
24/2-56/321	3.225	3.127	2.951
24/2-56/337	3.373	3.256	3.136
24/2-56/354	3.538	3.385	3.276
28/1-36/259	2.610	2.548	2.454
28/1-36/273	2.770	2.715	2.603
28/1-36/287	2.871	2.794	2.733
28/1-36/301	3.046	3.042	2.879
28/1-36/316	3.188	3.099	3.018
28/2-72/259	2.550	2.475	2.393
28/2-72/273	2.734	2.559	2.493
28/2-72/287	2.844	2.762	2.649
28/2-72/301	3.020	2.924	2.764
28/2-72/316	3.192	3.076	2.925

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.10 Stitch length,AH (mm.)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	2.890	2.903	2.769
24/1-28/306	3.015	3.038	2.907
24/1-28/321	3.196	3.189	3.071
24/1-28/337	3.350	3.317	3.199
24/1-28/354	3.496	3.517	3.357
24/2-56/291	2.906	2.857	2.712
24/2-56/306	3.038	3.009	2.839
24/2-56/321	3.150	3.164	2.962
24/2-56/337	3.322	3.330	3.141
24/2-56/354	3.512	3.484	3.296
28/1-36/259	2.614	2.584	2.449
28/1-36/273	2.742	2.720	2.602
28/1-36/287	2.809	2.860	2.736
28/1-36/301	2.976	3.004	2.890
28/1-36/316	3.153	3.135	3.009
28/2-72/259	2.563	2.555	2.388
28/2-72/273	2.727	2.694	2.495
28/2-72/287	2.833	2.839	2.670
28/2-72/301	2.964	2.972	2.792
28/2-72/316	3.114	3.127	2.947

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.11 Burst strength, BW (kN/sm)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	n.a.	526.2	597.6
24/1-28/306	n.a.	485.2	593.4
24/1-28/321	n.a.	490.1	562.4
24/1-28/337	n.a.	453.6	538.6
24/1-28/354	n.a.	427.3	447.5
24/2-56/291	n.a.	705.4	791.0
24/2-56/306	n.a.	706.2	758.7
24/2-56/321	n.a.	671.8	736.4
24/2-56/337	n.a.	629.9	689.5
24/2-56/354	n.a.	621.6	677.5
28/1-36/259	n.a.	438.6	476.4
28/1-36/273	n.a.	426.0	462.1
28/1-36/287	n.a.	389.3	407.7
28/1-36/301	n.a.	357.0	394.9
28/1-36/316	n.a.	310.8	402.8
28/2-72/259	n.a.	615.6	676.5
28/2-72/273	n.a.	547.5	661.8
28/2-72/287	n.a.	570.4	646.6
28/2-72/301	n.a.	542.3	611.5
28/2-72/316	n.a.	496.8	563.4

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.12 Burst strength, AW (kN/sm)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	607.6	535.8	672.6
24/1-28/306	575.8	519.8	632.5
24/1-28/321	534.8	511.1	577.0
24/1-28/337	494.0	462.8	542.5
24/1-28/354	471.1	443.4	534.9
24/2-56/291	761.7	718.9	899.0
24/2-56/306	712.2	703.2	908.1
24/2-56/321	702.9	650.4	882.1
24/2-56/337	685.1	620.8	819.7
24/2-56/354	653.4	606.4	831.9
28/1-36/259	483.8	471.0	543.7
28/1-36/273	483.5	429.8	501.0
28/1-36/287	456.1	420.2	505.3
28/1-36/301	412.0	384.0	458.9
28/1-36/316	390.6	374.2	433.6
28/2-72/259	641.6	631.9	800.8
28/2-72/273	624.6	611.2	803.2
28/2-72/287	620.5	572.1	762.0
28/2-72/301	560.1	546.8	746.7
28/2-72/316	544.0	513.8	700.3

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.13 Distension at burst,BW %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	n.a.	15.5	12.7
24/1-28/306	n.a.	15.4	12.7
24/1-28/321	n.a.	15.2	12.6
24/1-28/337	n.a.	15.1	12.1
24/1-28/354	n.a.	14.8	11.1
24/2-56/291	n.a.	14.4	12.0
24/2-56/306	n.a.	14.9	12.1
24/2-56/321	n.a.	15.1	12.0
24/2-56/337	n.a.	14.5	11.8
24/2-56/354	n.a.	13.9	12.0
28/1-36/259	n.a.	15.1	11.3
28/1-36/273	n.a.	14.6	11.2
28/1-36/287	n.a.	15.0	10.6
28/1-36/301	n.a.	14.1	11.4
28/1-36/316	n.a.	13.5	11.4
28/2-72/259	n.a.	14.8	11.9
28/2-72/273	n.a.	14.4	12.3
28/2-72/287	n.a.	14.1	11.9
28/2-72/301	n.a.	14.5	12.2
28/2-72/316	n.a.	13.8	11.8

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.14 Distension at burst,AW %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	15.8	18.6	17.5
24/1-28/306	18.5	18.8	17.7
24/1-28/321	18.8	19.1	18.2
24/1-28/337	19.3	18.9	18.4
24/1-28/354	19.5	18.9	18.4
24/2-56/291	15.1	18.1	15.0
24/2-56/306	14.8	18.0	15.9
24/2-56/321	18.8	18.1	16.2
24/2-56/337	19.0	18.2	16.7
24/2-56/354	18.2	18.1	16.9
28/1-36/259	15.0	18.3	16.6
28/1-36/273	18.6	18.9	17.7
28/1-36/287	18.0	18.9	18.1
28/1-36/301	18.9	18.7	18.3
28/1-36/316	18.8	18.6	17.8
28/2-72/259	14.9	17.6	16.1
28/2-72/273	14.4	18.0	16.1
28/2-72/287	19.2	18.0	16.1
28/2-72/301	18.7	18.2	16.3
28/2-72/316	17.6	18.6	16.4

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.15 Angle of spirality, BW (deg)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	13.1	2.8	3.1
24/1-28/306	7.7	2.8	2.8
24/1-28/321	17.5	2.0	1.8
24/1-28/337	15.3	3.4	2.2
24/1-28/354	11.5	3.4	3.9
24/2-56/291	2.3	1.0	2.0
24/2-56/306	2.6	1.3	1.8
24/2-56/321	2.7	0.8	2.3
24/2-56/337	1.2	1.5	4.0
24/2-56/354	2.1	3.0	2.3
28/1-36/259	12.7	2.4	2.7
28/1-36/273	11.9	3.1	1.9
28/1-36/287	18.0	3.9	2.4
28/1-36/301	20.0	3.6	1.7
28/1-36/316	15.4	3.1	2.2
28/2-72/259	2.8	1.9	3.5
28/2-72/273	3.6	1.2	1.6
28/2-72/287	2.8	1.0	1.5
28/2-72/301	1.4	1.2	2.0
28/2-72/316	1.6	2.3	3.0

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.16 Angle of spirality, AW (deg)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	17.0	11.4	7.3
24/1-28/306	18.9	11.9	8.2
24/1-28/321	20.1	13.8	10.0
24/1-28/337	21.8	16.2	12.7
24/1-28/354	25.3	19.7	12.1
24/2-56/291	2.5	-2.1	-6.1
24/2-56/306	2.1	-2.8	-6.0
24/2-56/321	-2.3	-3.1	-6.3
24/2-56/337	-3.5	-3.5	-8.2
24/2-56/354	-4.2	-5.0	-9.4
28/1-36/259	20.1	11.0	7.2
28/1-36/273	21.3	13.1	8.6
28/1-36/287	24.5	15.9	10.6
28/1-36/301	26.6	18.2	10.9
28/1-36/316	26.5	21.3	12.2
28/2-72/259	1.2	-2.8	-7.2
28/2-72/273	1.3	-3.0	-5.8
28/2-72/287	-2.4	-3.4	-8.2
28/2-72/301	-2.9	-3.7	-7.6
28/2-72/316	3.3	-3.7	-7.3

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.17 Width,BW (cm.)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	89.4	77.4	69.2
24/1-28/306	87.8	79.4	71.3
24/1-28/321	88.4	82.3	73.3
24/1-28/337	89.9	85.7	74.4
24/1-28/354	89.5	87.7	75.6
24/2-56/291	87.2	79.3	68.3
24/2-56/306	88.3	81.1	71.4
24/2-56/321	90.3	84.3	72.7
24/2-56/337	88.5	86.1	77.1
24/2-56/354	91.7	92.8	82.0
28/1-36/259	82.0	74.1	65.7
28/1-36/273	n.a.	77.1	68.5
28/1-36/287	84.7	79.0	70.5
28/1-36/301	86.2	81.1	71.7
28/1-36/316	87.0	84.1	75.1
28/2-72/259	83.6	74.4	66.9
28/2-72/273	82.8	79.0	70.4
28/2-72/287	82.1	82.3	70.4
28/2-72/301	84.5	84.7	76.8
28/2-72/316	86.0	89.8	78.8

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.18 Yarn strength,BW (g)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	270.5	302.0	354.8
24/1-28/306	266.2	260.5	340.7
24/1-28/321	271.8	266.7	325.0
24/1-28/337	265.8	259.9	317.8
24/1-28/354	252.6	269.1	311.2
24/2-56/291	466.0	482.9	520.2
24/2-56/306	488.2	492.5	550.5
24/2-56/321	496.5	501.8	548.0
24/2-56/337	516.1	491.1	534.6
24/2-56/354	473.2	480.2	546.0
28/1-36/259	191.3	210.0	233.1
28/1-36/273	204.7	195.3	249.9
28/1-36/287	190.7	203.7	212.1
28/1-36/301	198.3	185.4	233.2
28/1-36/316	208.7	194.2	243.8
28/2-72/259	376.3	388.2	389.7
28/2-72/273	355.4	362.3	437.1
28/2-72/287	363.6	374.4	422.5
28/2-72/301	352.8	363.5	423.5
28/2-72/316	364.6	354.8	403.1

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.19 Yarn strength,AW (g)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	276.0	290.3	337.9
24/1-28/306	256.9	279.7	309.0
24/1-28/321	236.3	265.5	320.2
24/1-28/337	252.1	290.1	323.9
24/1-28/354	249.2	270.6	328.7
24/2-56/291	453.0	472.4	560.9
24/2-56/306	469.3	454.7	535.0
24/2-56/321	440.9	488.7	564.4
24/2-56/337	446.9	473.0	555.1
24/2-56/354	470.2	478.2	567.3
28/1-36/259	182.6	217.9	260.0
28/1-36/273	197.6	212.4	226.4
28/1-36/287	188.4	211.7	229.0
28/1-36/301	184.2	212.0	230.5
28/1-36/316	189.9	214.0	221.5
28/2-72/259	325.8	359.3	405.6
28/2-72/273	349.7	359.8	417.1
28/2-72/287	334.9	366.8	421.2
28/2-72/301	338.8	344.9	399.9
28/2-72/316	354.2	343.6	400.5

***** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE *****

Table No.20 Yarn extension at break,BW %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	9.1	8.9	11.3
24/1-28/306	7.6	10.5	10.4
24/1-28/321	8.1	9.4	9.5
24/1-28/337	7.8	8.8	10.0
24/1-28/354	6.7	10.2	6.7
24/2-56/291	7.2	9.4	8.2
24/2-56/306	7.4	9.3	11.9
24/2-56/321	6.9	10.2	11.4
24/2-56/337	6.9	9.5	10.9
24/2-56/354	6.7	9.8	10.2
28/1-36/259	7.8	9.4	7.2
28/1-36/273	8.1	8.2	8.2
28/1-36/287	7.1	9.6	6.1
28/1-36/301	8.3	7.9	8.1
28/1-36/316	9.3	8.5	8.8
28/2-72/259	9.0	9.7	7.7
28/2-72/273	7.4	9.4	12.3
28/2-72/287	8.7	8.1	10.1
28/2-72/301	6.3	8.8	11.2
28/2-72/316	6.7	8.7	11.1

***** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE *****

Table No.21 Yarn extension at break,AW %

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	9.5	8.0	11.4
24/1-28/306	8.9	8.4	10.2
24/1-28/321	7.1	8.0	10.7
24/1-28/337	10.0	8.8	10.5
24/1-28/354	7.8	8.6	11.1
24/2-56/291	8.9	8.2	12.8
24/2-56/306	7.8	8.0	12.4
24/2-56/321	9.8	8.1	12.4
24/2-56/337	9.5	7.9	12.6
24/2-56/354	9.4	8.3	11.6
28/1-36/259	9.4	7.0	9.1
28/1-36/273	9.4	8.2	9.3
28/1-36/287	9.3	7.8	9.1
28/1-36/301	9.7	8.0	8.5
28/1-36/316	11.1	8.5	9.0
28/2-72/259	9.4	8.1	11.5
28/2-72/273	7.3	8.0	12.1
28/2-72/287	9.5	7.5	11.5
28/2-72/301	10.0	7.6	11.3
28/2-72/316	9.1	7.4	10.7

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.22 Yarn count,BW (Ne,optional Tex)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	n.a.	28.8	27.8
24/1-28/306	n.a.	28.1	28.3
24/1-28/321	n.a.	28.0	27.9
24/1-28/337	n.a.	28.8	27.3
24/1-28/354	n.a.	28.2	27.3
24/2-56/291	n.a.	27.7	26.3
24/2-56/306	n.a.	29.7	26.8
24/2-56/321	n.a.	28.1	26.3
24/2-56/337	n.a.	28.4	27.0
24/2-56/354	n.a.	28.5	27.0
28/1-36/259	n.a.	38.6	36.8
28/1-36/273	n.a.	38.1	36.9
28/1-36/287	n.a.	38.5	36.6
28/1-36/301	n.a.	39.0	36.1
28/1-36/316	n.a.	38.4	37.3
28/2-72/259	n.a.	37.3	34.6
28/2-72/273	n.a.	37.6	34.6
28/2-72/287	n.a.	37.0	35.3
28/2-72/301	n.a.	37.5	34.6
28/2-72/316	n.a.	37.5	34.6

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.23 Yarn count,AW (Ne,optional Tex)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	29.6	29.5	27.8
24/1-28/306	29.2	29.2	28.2
24/1-28/321	28.9	29.5	27.8
24/1-28/337	29.1	30.4	27.5
24/1-28/354	28.9	29.6	27.4
24/2-56/291	27.6	28.6	26.4
24/2-56/306	28.0	28.8	26.8
24/2-56/321	27.9	28.7	26.7
24/2-56/337	28.1	28.6	27.0
24/2-56/354	27.0	28.7	27.1
28/1-36/259	37.6	38.4	36.3
28/1-36/273	37.2	38.2	36.4
28/1-36/287	37.9	39.1	36.5
28/1-36/301	38.0	38.4	37.1
28/1-36/316	38.4	38.4	36.4
28/2-72/259	36.2	37.5	34.8
28/2-72/273	37.2	37.8	34.6
28/2-72/287	36.2	37.9	34.6
28/2-72/301	36.5	37.9	34.6
28/2-72/316	37.4	37.5	35.1

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.24 Fabric thickness,BW (mm/1000)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	618	513	440
24/1-28/306	593	503	430
24/1-28/321	668	486	431
24/1-28/337	650	471	432
24/1-28/354	628	493	440
24/2-56/291	621	470	410
24/2-56/306	585	478	413
24/2-56/321	574	471	418
24/2-56/337	587	467	436
24/2-56/354	604	474	432
28/1-36/259	537	432	396
28/1-36/273	517	438	377
28/1-36/287	571	431	374
28/1-36/301	528	437	384
28/1-36/316	578	450	370
28/2-72/259	559	413	382
28/2-72/273	521	429	368
28/2-72/287	520	418	379
28/2-72/301	498	424	386
28/2-72/316	521	416	391

*** SINGLE JERSEY MERCERISING ON THE OMEZ MERCELUX MACHINE ***

Table No.25 Fabric thickness,AW (mm/1000)

SAMPLE	Grey	Dyed	Merc.&Dyed
24/1-28/291	867	715	715
24/1-28/306	952	732	714
24/1-28/321	965	751	740
24/1-28/337	957	740	758
24/1-28/354	849	740	737
24/2-56/291	789	658	621
24/2-56/306	774	664	632
24/2-56/321	882	674	644
24/2-56/337	888	662	667
24/2-56/354	836	666	690
28/1-36/259	787	652	649
28/1-36/273	796	664	679
28/1-36/287	876	666	661
28/1-36/301	869	677	675
28/1-36/316	860	703	708
28/2-72/259	719	605	585
28/2-72/273	682	593	606
28/2-72/287	812	608	608
28/2-72/301	809	656	610
28/2-72/316	757	615	614

TABLE 26

CONTROL FABRICS : CALCULATED RELAXED WIDTHS,
FINISHING TARGETS AND MEASUREMENTS

REF. NO.	FABRIC CODING	RELAXED GREY WIDTH (CALC.) CM.	RELAXED GREY WIDTH + 17% CM.	WIDTH AFTER CALENDERING CM.	WIDTH AT SAMPLING CM.
C1	28/1-36/259	63.1	74.2	75.5	74.1
C2	28/2-72/259	64.7	76.1	76.5	74.4
C3	28/1-36/273	65.5	77.1	78.5	77.1
C4	24/1-28/291	65.7	77.3	79.5	77.4
C5	28/2-72/273	67.0	78.8	81.5	79.0
C6	24/2-56/291	67.2	79.0	81.0	79.3
C7	28/1-36/287	67.6	79.5	82.0	79.0
C8	24/1-28/306	68.4	80.5	82.0	79.4
C9	28/1-36/301	68.9	81.8	83.5	81.1
C10	24/2-56/306	69.7	82.0	83.0	81.1
C11	28/2-72/287	70.1	82.5	83.5	82.3
C12	24/1-28/321	70.8	83.3	85.0	82.3
C13	24/2-56/321	71.3	83.9	85.0	84.3
C14	28/1-36/316	71.4	84.0	85.5	84.1
C15	24/1-28/337	72.2	84.9	86.5	85.7
C16	24/1-28/354	73.8	86.8	88.5	87.7
C17	28/2-72/301	74.7	87.9	88.5	84.7
C18	24/2-56/337	74.6	87.8	88.0	86.1
C19	28/2-72/316	76.5	90.0	91.5	89.8
C20	24/2-56/354	79.3	93.3	95.0	92.8

TABLE 27

MERCERISED FABRICS : CALCULATED RELAXED WIDTHS,
FINISHING TARGETS AND MEASUREMENTS

REF. NO.	FABRIC CODING	TARGET WIDTH CONTROL 12% CM.	WIDTH AT TOWER ENTRY CM.	WIDTH AT TOWER EXIT CM.	WIDTH AT WASHER EXIT CM.	WIDTH AFTER CALENDERING CM.	WIDTH AT SAMPLING CM.
M1	28/1-36/259	65.3	48.0	45.0	48.5	66.5	65.7
M2	28/2-72/259	67.0	47.0	44.0	49.5	69.0	66.9
M3	28/1-36/273	67.8	48.0	44.0	50.5	69.5	68.5
M4	24/1-28/291	68.0	50.0	47.0	52.0	70.0	69.2
M5	28/2-72/273	69.3	48.0	46.0	49.5	72.5	70.4
M6	24/2-56/291	69.5	48.0	46.0	52.0	72.0	68.3
M7	28/1-36/287	70.0	46.0	45.0	49.5	72.0	70.5
M8	24/1-28/306	70.8	47.0	46.5	52.5	73.0	71.3
M9	28/1-36/301	71.4	49.0	46.0	51.0	72.5	71.7
M10	24/2-56/306	72.2	49.5	46.0	52.0	74.0	71.4
M11	28/2-72/287	72.6	47.0	44.5	49.0	73.0	70.4
M12	24/1-28/321	73.3	50.0	46.0	52.5	75.0	73.3
M13	24/2-56/321	73.8	50.0	47.0	53.0	74.5	72.7
M14	28/1-36/316	74.0	49.0	45.0	53.0	75.0	75.1
M15	24/1-28/337	74.7	51.0	47.0	54.0	76.0	74.4
M16	24/1-28/354	76.2	52.5	47.0	55.0	79.0	75.6
M17	28/2-72/301	77.3	47.5	45.0	50.5	78.5	76.8
M18	24/2-56/337	77.3	49.0	47.0	53.0	80.0	77.1
M19	28/2-72/316	79.0	47.0	44.0	52.0	81.0	78.8
M20	24/2-56/354	82.1	49.5	47.0	54.0	84.5	82.0

TABLE 28

BLEACHING AND DYEING

	<u>Unmercerised</u>	<u>Mercedised</u>
Fabric Weight (Kg)	262	252
Liquor Volume (l)	2620	2520
Liquor Ratio	10:1	10:1

Bleaching

1. Sodium hypochlorite (cold, 30 mins, followed by two cold washes)	20%	20%
2. H ₂ O ₂ , 130 vol.	2.5%	2.5%
NaOH, 36° Bé	1%	1%
Humectol CX (Hoechst)	0.5%	0.5%
Diadavin EWN (Bayer)		0.5%
(96°C, 10 mins, followed by two cold washes)		

Dyeing (For processing details see Figure 8)

Ludigol (BASF)	0.5g/l	0.5g/l
Procion Blue H-EG (ICI)	2%	1.5%
NaCl	60g/l	60g/l
NaHCO ₃	5g/l	5g/l
Na ₂ CO ₃	15g/l	15g/l

"Soaping"

Tripolyphosphate	1%	1%
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Softening

Mykon 449 (RGL)	3%	3%
Avolan IW (Bayer)	0.4%	0.4%

Figure 1

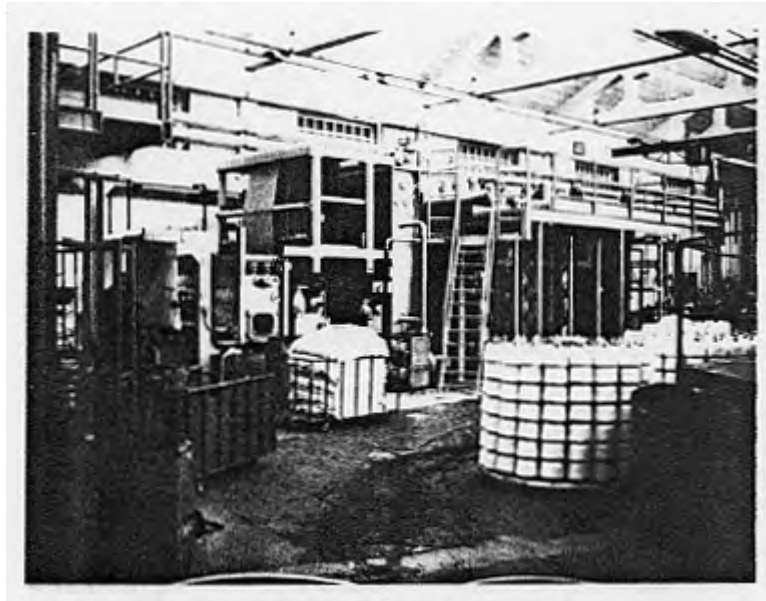


Figure 2

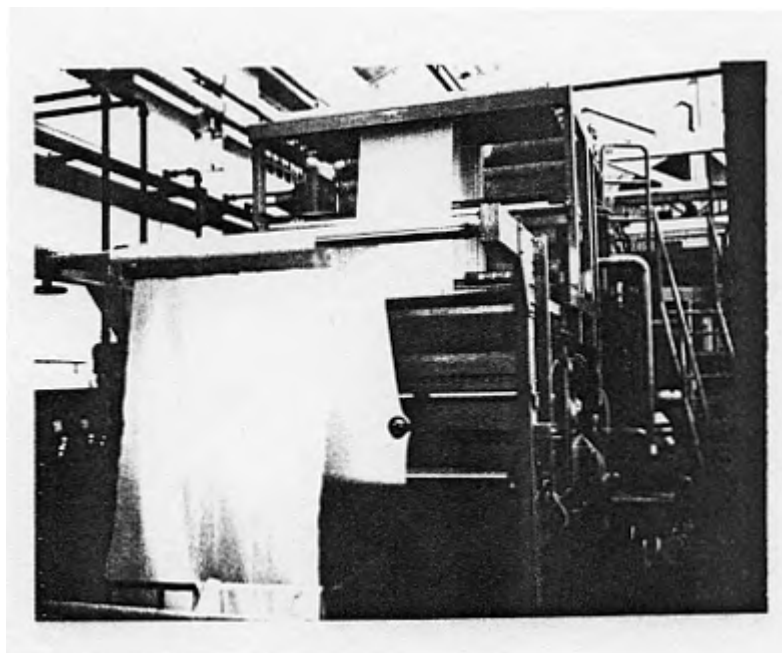


Figure 3

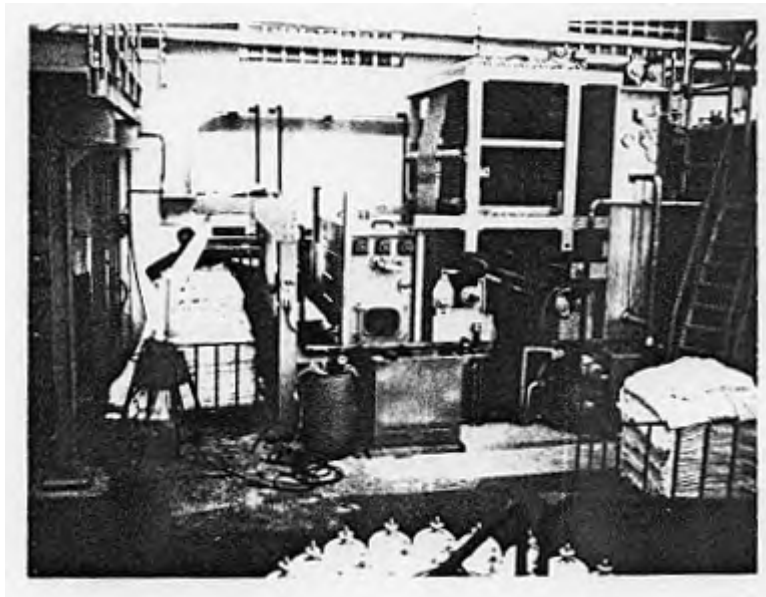


Figure 4

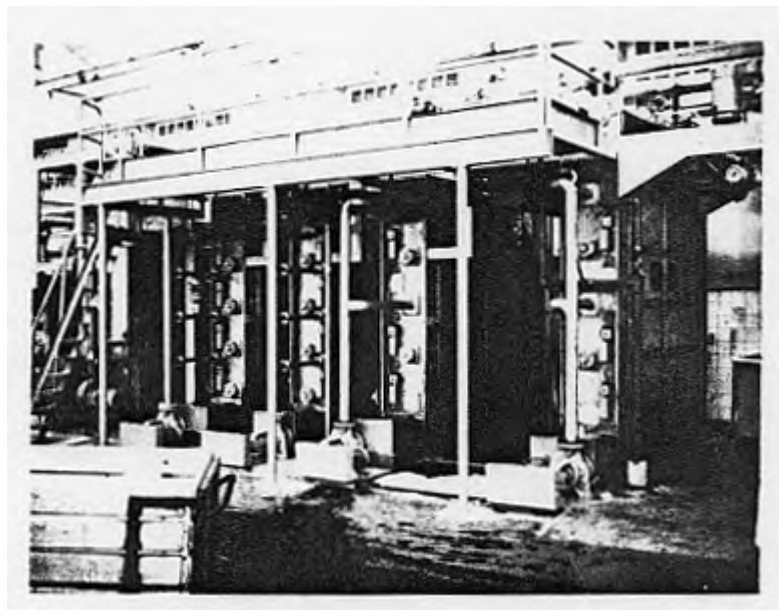


Figure 5

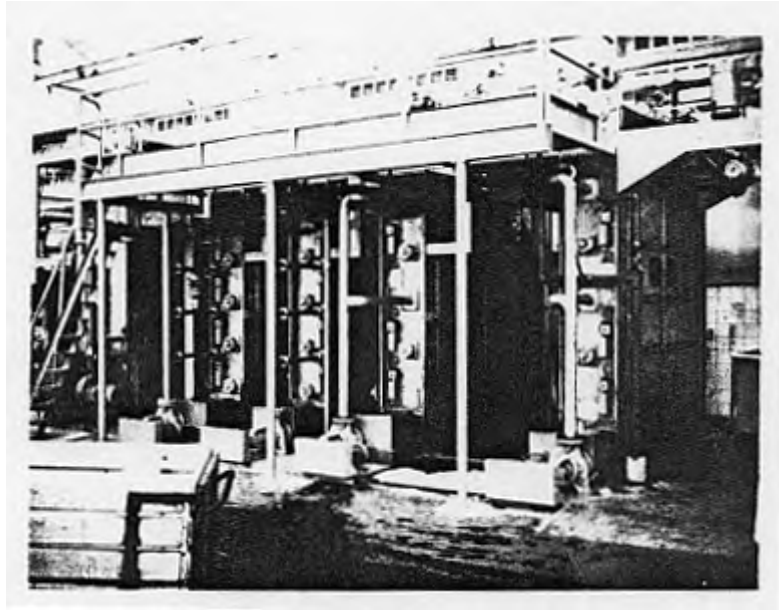


Figure 6

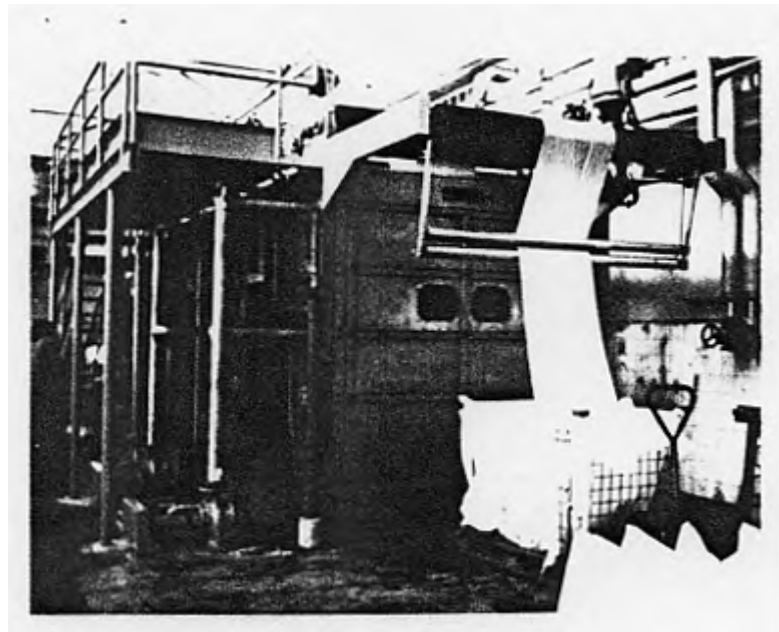


Figure 7

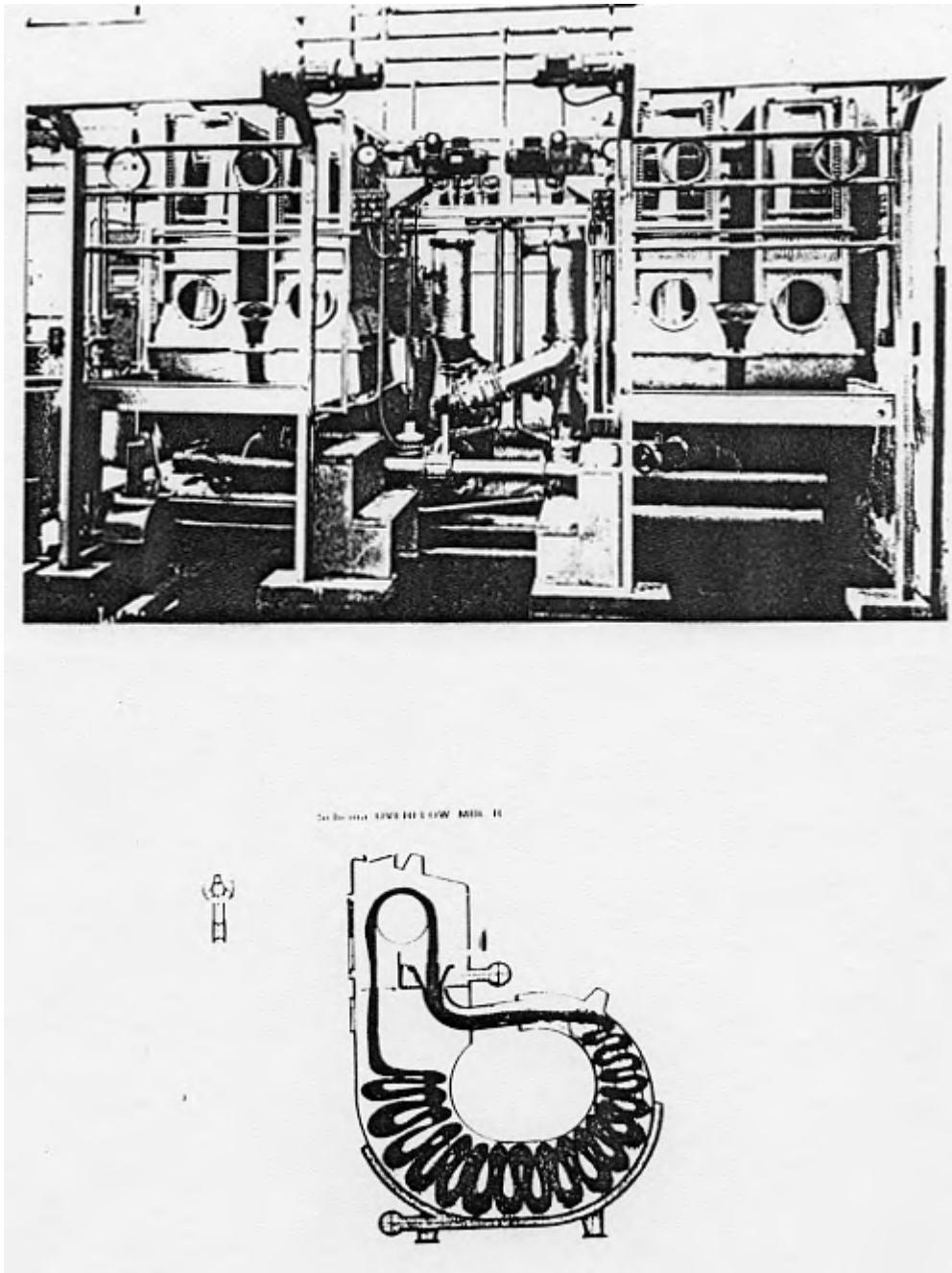


Figure 8

