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ASSISTANCE TO THE TEXTILE INDUSTRY

SI/SYR/84/801

SYRIAN ARAB REPUBLIC

Syria.

Technical report: Technical assistance to the Syrian public underwear industry*

Prepared for the Government of the Syrian Arab Republic
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of John Gordon
Wet Processing Technologist

United Nations Industrial Development Organization
Vienna

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1. INTRODUCTION

1.1 The Purpose of the Project

The textile industry, a traditional sector in Syria, plays an important role in the country's socio-economic development. This industry, however, is presently facing challenging and difficult problems which need to be overcome. The issues involved were discussed extensively between the Minister of Industry of the Syrian Arab Republic and the Executive Director of UNIDO in October 1984, who concluded that there is an urgent need to:

- assess the performance of this sector with respect to production, technical and economic aspects, detecting bottlenecks and weaknesses in the Syrian textile industry compared with similar ones in more developed states:

- set up practical solutions for coping with such obstacles and promoting this traditional industry to better levels of performance.

It was recognised that the above would have to be implemented in successive phases. Under the circumstances, the Government has decided that, as a first stage, the two underwear factories in the public sector, the Orient Manufacturing Company and the Arab Company for Underwear in Aleppo, including their yarn supplying spinning mill, Hamma Company, would receive UNIDO technical assistance.

1.2 The Wet Processing Technologist

As part of a team working in close co-operation with the Technical Director of the Ministry of Industries' General Organisation for the Textile Industry, the expert is expected to carry out the following duties at the Orient Underwear Manufacturing Company in Damascus and at the Arab Company for Underwear in Aleppo to:

- demonstrate improvements in the wet processing technology;

- establish a table for all fabric width for the width stretching operation before drying;

- establish factory standards for dimensional stability of fabrics, including shrinkage allowances.

Prepare a technical report setting out the findings of the mission on all the duties mentioned above and recommendations to the Government on further action which might be taken.

1.3 The Nature and Duration of the Assignment

The purpose of the assignment was to carry out the duties as specified in section 1.2. The assignment was for five weeks duration, commencing the first week of June 1985. Details of the work programme are given in Appendix 1 but can be broken down into the following major areas.

(1) Assessment of current procedures and conducting trials in the Orient Underwear Manufacturing Company, Damascus.

(2) Make a critical survey of the current equipment and methods used in the company.

(3) Give practical advice on how the dimensional stability of the knitted fabrics can be improved to meet International Standards.

(4) Produce a table of calender widths and settings for each knitting machine diameter in use.

2. ACTIVITIES

2.1 Direct Assistance through Technical Consultancy

A study was made of the organisation and flow patterns of fabric from the knitting department through the bleaching, dyeing and finishing department to the final making-up departments at the Orient Underwear Manufacturing Company.

A critical assessment was made of the bleaching, dyeing and finishing machinery currently in use at the company and recommendations were made on the companies current plans for future capital expenditure.

2.2 Processing Trials at Orient Underwear

The major part of the time available on station was taken up with the organisation and implementation of practical trials at Orient Underwear. An analysis was made of each step of the processing sequence and their effect on the stability and final performance of the completed garments was assessed.

A study was made of finished widths, as specified by the making-up department, compared to the original greige and bleached widths for each of the three major qualities and every different knitting machine diameter. Tables of recommended settings were produced from the results.

2.3 Seminar

A one-day seminar on the findings and recommendations of the projects was held at Orient Underwear on the 27th June 1985. The seminar was attended by all the directors, managers and supervisors of the company and an open and lengthy discussion followed the formal presentation.

3. SUMMARY OF FINDINGS AND RECOMMENDATIONS

A critical analysis was made of each machine together with the bleaching methods and current levels of preparation including the level of application of softeners and the resulting handle and sewability of the finished fabric.

An assessment was made of laboratory techniques with respect to their meeting International Standard test procedures.
All the capital equipment within the bleaching and dyeing departments had been purchased between 1974 and 1977 and was generally, with just one or two exceptions in good working order.
The following is a summary of the findings and recommendations extracted from the technical and trials reports. It is obvious from these findings that the major problems consist of poor methods of working and a distinct lack of adequate supervision.

3.1 Kleinewefers J-Box bleaching range

The fabric is coming off harsh and causing difficulties with sewing causing damage in garment making. A large number of rope creases are also being set in during the bleaching process.

It is recommended that the sodium silicate in use should be wholly replaced by the organic stabiliser which is at present in joint use. After discussion with the chemical manufacturer it is recommended that a specific softener with increased stitch lubricant be submitted for the current product.

3.2 Keifer Drum Driers

The Keifer drum driers were running with no overfeed on to the first drum so that very little shrinkage was accurring on drying. Ideally the entry roller should run between 10 and 15% faster than the drum speed therefore allowing the fabric to take up the maximum shrinkage on its passage around the perforated drying drums. During the mission successful trials were undertaken with increased overfeed on the entry roller and length shrinkages during drying of 4-5% were acheived. It was noticed on a number of occasions that the fabric was leaving the driers damp. If due to lack of steam the fabric is coming out of the machine wet the speed of the machine should be reduced.

3.3 Steam Calenders

The finished fabric widths are specified by the making-up department and were found to be up to 100% wider on the rib construction, and 43% wider on the plain interlock than the actual width after tubular drying. The width increase caused massive distortion of the course lines with bowing and stretching. This distortion was released on washing resulting in grossly mishapen hem and necklines of the laundered garments.

It was found that the calenders were being operated with the edge driving wheels running at a slower speed (giving negative overfeed) than the main drive of the machine, there was substantial wear on the edge driving wheels which caused broad distortion stripes along the fabric edge.

An analysis was made of each fabric quality from all the machine diameters, and measurments were made at every processing step and the percentage extension in calendered width over bleach width calculated.

In explaining the effect of the excessive calender widths set up by the making-up department it is important to understand that the only way that a fabric width can be increased, with regard to a given structure and count of yarn, is to either increase the knitted loop length or knit the fabric on a larger diameter machine. It can be seen from the analysis of bleached width and current calender settings that there is absolutely no correlation between the calender settings of the different diameters. If we take the 20 gauge interlock as an example, calender settings vary between 23% increase over the bleached width in the best case, to 43% increase in the worst.

The 20" diameter machine is calendered at 54cms (a 41% increase) and the 22" diameter is calendered at 55cms (a 28% increase) if, as is stated there is currently insufficient capacity on the 20" diameter machines, then fabric from the 22"and 24" diameter machines could successfully fill the short-fall. It is recommended that no further 20" diameter machines are purchased and that more 22" and 24" diameter machines are bought instead. Trials should be undertaken to increase the stitch length by say 5 and 10% to see what reduction in weight and increase in width can be achieved.

All the fabric was batched after calendering, often with a big build-up of fabric at the edges, the batching of fabric after calendering reduces the opportunity for the fabric to relax, if the fabric was plaited at the calender, further relaxation would occur.

It was seen that calenders were often left unattended and on numerous occasions the calenders were stopped halfway through a piece.

Following discussion with the management on calendering problems new instructions on working practices were set out which specified that operators should not leave the calenders when the machines were running. The fabric should be allowed to run out before the machine was stopped, and that fabric edge guiding wheels should be inspected daily.

3.4 Dyehouse

Examination of dyed fabric showed batch to batch shade variation which was too great and resulted in problems at the making-up stage. Garments were being produced in which the sleeves and body of the garment were of different shades. These faults occurred because there was no segregation of dye batches at the making-up stage, so that garments were made of fabric from different dye batches.

There were few records kept in the dyehouse of finished patterns of different dye batches.

Maximum tolerance limits on shade should be set out by the Production Director and cuttings from each of the batches should be mounted on continuity cards so that a quick reference was available to compare against the standard shade.

3.5 Laboratory Procedure

It was recommended that testing schedules should be laid down against the standard methods of the International Standards Organisation and that a tumble drier, together with rub and perspiration testing equipment should be purchased.

4. TECHNICAL REPORT ON THE ORIENT UNDERWEAR MANUFACTURING COMPANY

INTRODUCTION

During the first day at the Orient Underwear Manufacturing Company, discussions were held with Mr Hassan Houri and the Technical Director Mr Yacoub Fayoumi and Mr Madhat Sheikh El-Chabab the Production Director. A subsequent visit round the factory was arranged in the company of the Production Director Mr El Chabab who acted as the Chief counterpart at Orient Underwear. Over 80% of the production of knitted cotton fabric is bleached white for underwear and is processed through a large Kleinewefer J. Box bleaching system which incorporates an integral rope washer and softener applicator. The bleached fabric is then de-watered using one of two Emil Mulhlman bag loading hydro-extraction machines. The hydro-extracted fabric is subsequently opened and plaited on Arbach tubular opening and plaiting machines prior to drying on Keifer perforated drum driers. After drying, the fabric is calendered, two single and two double width Arbach steam calenders are in operation together with a double width Weiss steam calender.

All the fabric after calendering was rolled and transported to either the finished fabric store or to a commission tubular printer.

Approximately 10% of the grige fabric went to be bleached and dyed for subsequent use in coloured T shirts. The dyeing was carried out on one of two, three metre wide atmospheric winches, a one metre width sample winch was also in use. In addition a Thies tubular piece mercerising machine had recently been installed but this was not yet in operation.

A critical analysis was made of each machine together with the bleaching methods and current levels of preparation including the level of application of softeners and the resulting handle and sewability of the finished fabric.

An assessment was made of laboratory techniques with respect to their meeting International Standard test procedures.

An inspection was made of the external printers premises and a request was made for suitable recommendations to be made with regard to Orient Underwear installing its own printing equipment.

4.2 Kleinewefer J. Box Bleaching Line

Findings

The Kleinewefers J-Box bleaching line comprises substantial preliminary rope washer which is followed by the impregnation of bleaching liquor and storage of impregnated fabric in a large heated J-Box. On removal from the J. Box the fabric is continously rope washed before immersion in the softener solution contained within the final saturator.

The hydrogen peroxide recipe in use contains:

Wetting Agent	1 g/l
Hydrogen Peroxide	80 g/l available oxygen
Sodium Silicate	8 gl
Caustic Soda	7 g/l
Stabicol A	6 g/l
Photine BTM Liq.	12 g/l

Softening bath contains:

Edunine OS	35 g/l

The partial substitution of sodium silicate by Stabicol A is recognised as aiding the handle of the finished fabric, however silicate is only necessary if a very high standard of white is required. As an optical whitening agent is being applied from the bleach bath it is felt that total removal of the sodium silicate from the bleach bath and increasing the amount of

Stabicol A (a non silicate hydrogen peroxide stabilising agent) would improve the handle and sewability without having a detrimental effect on the whiteness of the fabric.

The softening agent currently being used is based on a mixture of non ionic ethoxylated esters, which for the fabric being processed does not have sufficient lubricating power. Subsequent to the writers return to the United Kingdom discussions have been held with ICI/Francolor the manufacturers of EDUNINE OS who feel that this is not the most suitable product for the softening and stitch lubrication of knitted cotton fabrics. They recommend that it is replaced by EDUNINE SCL which is a mixture of a cationic softener and a polyethylene emulsion. This product can be applied in exactly the same manner as EDUNINE OS but the inclusion of the polyethylene emulsion will ensure better stitch lubrication. The application of this product on the sewing thread produced at the Hamma Mill would also ease the current sewing problems. The greatest defect is that of fabric creasing during processing, there does not appear to an easy answer to this problem. It is recommended that trials be carried out in which the load in the J. Box is reduced to lessen the pressure on the fabric during bleaching and the optimum load resulting in improvement in creasing determined.

Recommendations

(1) It is recommended that the current amount of sodium silicate being used in the bleach bath be replaced by an increased concentration of the organic stabiliser Stabicol A.

(2) The softener at present in use should be replaced by EDUNINE SCL to improve handle and sewability.

(3) That trials be carried out to reduce the load in the J. Box to ascertain the optimum load consistent with improvements in creasing.

4.3 Arbach Tubular Opening and Plaiting Machines

Findings

The stretcher width of the machines are not changed regularly when processing fabric with different diameters, this caused some fabric distortion. The edge driving rollers, which on these machines are made locally, are manufactured from black rubber and were found to be badly worn and this also led to fabric distortion and edge stripes.

Recommendations

(a) It is important to ensure that the stretcher width is set only marginally wider than the bleach fabric width.

(b) The edge driving wheels should be examined frequently and replaced when necessary.

4.4 Keifer Perforated Drum Drier

Findings

There were two driers, one a four drum and the other a two drum drier. Neither drier was running with overfeed onto the first drum so that very little shrinkage was occurring on drying. Ideally the entry roller should run between 10 - 15% faster than the drum speed, therefore allowing the fabric to take-up the maximum shrinkage on it's passage around the perforated drying drums. There were indicators to show the relative speed of the machine but the scale markings on the indicators had been obliterated. It was found that the overfeed control wheel on one machine was inoperative, this defective control was corrected during the period of investigation. Trials were arranged in which the driers were set with 10-15% overfeed and it was found that with these settings the average length shrinkage of the fabric during drying was 4-5%.

It was noticed that on a number of occasions whilst the temperature setting of the machines was set at 135-150°C the actual temperature of the driers sometimes dropped to 110-120°C and the fabric was then leaving the drier damp. The driers were run at a fixed speed which did not take any account of the actual temperature of the drier or of the dryness of the fabric leaving the machine. If the fabric is not being fully dried in the drier then the opportunities for length shrinkage to occur are being restricted.

Recommendations

(1) The entry roller should always be set at between 10 and 15% faster than the drying drum.

(2) If the temperature of the drier drops, the speed of the drier should be reduced to ensure that all the fabric leaves the machine in a fully dried state.

(3) The supervisors within the finishing department should regularly check during the day that fabric is being overfed onto the drums.

4.5 STEAM CALENDERS

Findings

The finished fabric widths are specified by the making- up department and were found to be up to 100% wider on the rib construction, and 43% wider on the plain interlock than the actual width after tubular drying. Whatever the increase is in finished width over bleached width, because this increase is only temporary, will be reflected in the dimensional stability of the final garments. The width increase caused massive distortion of the course lines with bowing and skewing. This distortion was released on washing resulting in grossly mishapen hem and necklines of the laundered garments. It should be ensured that fabric is overfed during calendering. Rolled fabric should not be placed in the basket which is only intended for plaited fabric, as when the fabric is placed in the basket in roll form it is under too great a tension when being fed into the machine.

It was found that the calenders were being operated with the edge driving wheels running at a slower speed (giving negative overfeed) than the main drive of the machine, there was substantial wear on the edge driving wheels which caused broad distortion stripes along the fabric edge. It was found that a machine had one driving wheel with a circumference 10% less than the other. This was due to the internal stretcher, which had been bent out of alignment, causing excessive wear on the compressed felt wheels. The net result of this wear was that one edge of the fabric was being driven 10% faster than the other

edge giving a skewed course line on the fabrics. All the fabric was batched after calendering often with a big build-up of fabric at the edges, the batching of fabric after calendering reduces the opportunity for the fabric to relax, if the fabric was plaited at the calender, further relaxation would occur. All the Arbach calenders had been supplied with plaiting arms but these had been removed because of the increased risk of fabric getting soiled before use and of the slight difficulty of transporting plaited fabrics.

It was seen that calenders were often left unattended and on numerous occasions the calenders were stopped halfway through a piece.

Recommendations

A meeting was held with the management to discuss the calendering problems and a management instruction was issued setting out new working practices.

(1) An operator was not to leave a calender machine when the machine was running.

(2) The fabric being calendered must be allowed to run out before the machine is stopped.

(3) The fabric edge guiding wheels should be inspected daily.

(4) The fabric for recalendering has to be placed on a bar across the machine rather than placed in the basket.

(5) Additionally, the new calender widths suggested in the table in this report should be implemented.

4.6 DYEHOUSE

Findings

Examination of dyed fabric showed batch shade variation which was too great and resulted in problems at the making-up stage. Garments were being produced in which the sleeves and body of the garment were of different shades, one garment had bindings round the back a different shade from the rest of the T shirt, other similar examples were also seen. These faults occurred because there was no segregation of dye batches at the making-up stage, so that garments were made of fabric from different dye batches. There was not sufficient control to ensure that all bindings and pieces for one garment were cut from the same dye batch.

There were few records kept in the dyehouse of finished patterns of different dye batches.

Recommendations

(1) The Production Director should set maximum tolerance limits with the dyehouse for each shade.

(2) Cutting from each dye batch should be mounted on continuity cards and each batch checked to ensure that it is on shade and not drifting away from the standard.

4.7 Visit to the Commission Printer of Orient Underwear's Fabric

Findings

The external printer uses a simple homemade single colour roller printing machine to print the fabric. There is no facility available to ensure that the fabric is fully flat before the printing operation, and it was found that often the fabric was going to the printing roller in a creased condition which resulted in a lack of print in the creased areas. The fabric after printing is rolled up wet due to the fact that there is no drying cabinet available to dry off the white spirit or cure the prints, and marking off is apparent on the fabric.

The printer is attempting to use the best chemical system available to him and this should not require heat curing. The printing recipe contains:

White Spirit

Emulsifier

Acramin Binder F.D.

Acrafix FH

Acramin Pigments

The Acramin F process allows fixation of pigment prints in air with a subsequent storage for approximately three weeks with satisfactory fastness properties.

Shade variation from batch to batch is obvious in fabric from the printer and reproducibility of shade is not being checked before the fabric is returned to Orient Underwear or even before it is cut into garment panels.

The printed fabrics are not currently checked for shade continuity or crocking fastness before the fabric is made into garments.

The fabric often arrived at the printers in a soiled condition due to its having been transported in unparcelled rolls on the back of an open wagon, further dirt was picked up when the fabric was returned by the same method of transport.

Recommendations

(a) Enclosed vehicles should be used to transport the fabric before and after printing to minimise any soiling.

(b) A tubular opening device should be installed on the entry to the printing machine to prevent creasing.

(c) Drying equipment should be arranged so that printed fabric is not rolled up wet.

(d) Printed goods should be checked for fastness properties and for shade continuity before being made up into garments.

4.8 Examination of Laboratory Procedure

Findings

The current automatic washing machine used for dimensional stability testing was in very good condition but the provision of a domestic tumble drier is highly rcommended. This would allow a faster assessment to be obtained and ensures full relaxation of washed samples to meet the internationally accepted testing standards.

The wash fastness tests were carried out on an atmospheric sample dyeing machine which is suitable for this test, but the fastness tests were carried out randomly and the size of the samples and the required adjacent fabrics varied from test to test. There was no book of International Standard Test Procedures to ensure that standard procedures were being followed. All batches of fabric should be tested as a standard procedure.

There was no apparatus for measuring rub fastness and no standards laid down. Perspiration tests were not done and again no standard set. It is important to set standards in these tests for garments to be acceptable in Western Rurope. Although the laboratory staff were very capa[illegible]illing and helpful they did not have the necessary equipm[illegible]n to be able to do the job properly.

Recommendations

(1) That a book of test methods published by the International Standards Organisation should be obtained and to ensure that all tests are carried out to the precise procedures laid down.

(2) A batch testing schedule should be arranged so that all batches of finished fabric and garments are tested.

(3) To obtain a domestic tumble drier, together with apparatus for measuring rub fastness and glass plates for perspiration testing. All the equipment recommended is relatively inexpensive.

APPENDIX 1

Work Programme

POST	SI/SYR/84/801/11-55/31.7.B.	Wet Processing Expert
Name:	John Gordon	

June 1985

2	Travel to Vienna
3	UNIDO briefing
4	Travel to DAMASCUS
5	UNDP Damascus briefing and meeting with the General Organisation for the Textile Industry and initial visit to Orient Underwear Company
6-8	Investigations at Orient Underwear
9	Travel to Aleppo, via Hamma Spinning Mill and discussions at Arab Underwear Company, Aleppo
10	Survey of Arab Underwear Company, Aleppo and travel to Damscus
11-15	Investigations and trials at Orient Underwear Company
16	Presentation of Interim report to the General Director and the board of Orient Underwear with the Technical Director of the General Organisation
17	Trials at Orient Underwear
18-20	Discussions with colleagues and report writing
22-26	Trials at Orient Underwear
27	Seminar at Orient Underwear with the management and supervisary staff
29-30	Trials at Orient Underwear

July 1985

1-2	Trials at Orient Underwear
3	Final discussions with Orient Underwear and de-briefing at UNDP Damascus
4	Travel to Vienna
5	UNIDO de-briefing
6	Travel to England

APPENDIX 2 PROCESSING TRIALS

Trial No.1 Dimensional changes on bleaching and finishing

Introduction

Shrinkages before relaxation are substantially outside currently acceptable levels and it is only that the fabric relaxes after calendering that allows acceptable dimensional stability results to be achieved. Whilst the dimensional stability is on the border line of acceptability after relaxation the fabric has been considerably distorted by excessively wide calender settings and by the amount of underfeed caused by the edge guiding wheels.

The following table summarises the dimensional stability results achieved in the calendered and relaxed conditions.

This table has been extracted from the acommpanying analysis which indicates the dimensional changes which have occurred during each step of the bleaching and finishing process carried out at Orient Underwear.

Dimensional changes on bleaching and finishing

	From calendered dimension to after 1 wash cycle		After 24 relaxation to after 1 wash cycle	
Fine Rib	Length	Width	Length	Width
18" diameter	-7.0%	-15.4%	-7.0%	-5.9%
30" diameter	-10.0%	-12.5%	-7.6%	-6.5%
Interlock				
30" diameter	-10.4%	-15.2%	-8.2%	-3.0%
Interlock based rib				
30" diameter	-4.6%	-8.0%	-5.4%	-3.0%

The extension which occurs on calendering is not permanent and on subsequent washing the fabric returns as near as possible to the bleached width. The fabric is being finished at a width up to 100% above the bleached and dried width, this width increase being only temporary will be reflected in the poor performance of the finished garments. The batching of fabric on rolls after calendering reduces the opportunity for the fabric to relax, if the fabric was plaited at the calender further relaxation would occur.

A reduction in the loading of the Kleinewefer J-Box bleaching system may help to decrease the length extension by allowing fabric shrinkage to occur under the conditions of reduced fabric loading and higher liquor to goods ratio.

The Keifer drum driers are not being run efficiently, there was no overfeed being applied so that very little shrinkage was occurring on drying. The entry conveyor should be set to run 10-15% faster than the drum speed allowing the fabric to achieve maximum shrinkage on its passage over the drums.

There is a need to extend regular dimensional stability testing of fabrics carried out to International Testing Standards. An assessment should be made of the ratios of bleached dimensions to the finished specification of the fabric from each different knitting machine diameter. Excessive width shrinkage could be avoided by ensuring good correlation between bleached and finished widths for each machine diameter.

A further trial was organised to assess this correlation and then establish more realistic calender settings.

DIMENSIONAL CHANGES ON BLEACHING AND FINISHING

Production Steps	20 Gauge Interlock 1/32' cc Combed Cotton Yarn 30" Diameter				20 Gauge Interlock Based Rib 1/32' cc Combed Cotton Yarn 30" Diameter			
	Cumulative % change		% Change on each step		Cumulative % change		% Change on each step	
	Length	Width	Length	Width	Length	Width	Length	Width
Greige Fabric	-	-	-	-	-	-	-	-
Kleinewefer Bleach	+25.0%	-30.5%	+25.0%	-30.5%	+35.0%	-31.0%	+35.0%	-31.0%
Keifer Dryer	+22.0%	-30.0%	-3.0%	-0.5%	+29.2%	-38.2%	-5.8%	-7.2%
Arbach Calender	+20.2%	-8.2%	-1.8%	+21.8%	+17.8%	+14.0%	-11.4%	+52.2%
After 24 hrs Relaxation	+18.0%	-20.4%	-2.2%	-12.2%	+18.6%	-3.0%	+0.8%	-17.0%
1 Wash Cycle at 95°C Flat Dry	+9.8%	-23.4%	-9.2%	-3.0%	+13.2%	-6.0%	-5.4%	-3.0%

DIMENSIONAL CHANGES ON BLEACHING AND FINISHING

FINE RIB 1/32 cc COMBED COTTON YARN

Production Steps	18" Diameter Cumulative % change Length	Width	% Change on each step Length	Width	30" Diameter Cumulative % change Length	Width	% Change on each step Length	Width
Greige Fabric	-	-	-	-	-	-	-	-
Kleinewefer Bleach	+6.0%	-21.0%	+6.0%	-21.0%	+11.2%	-25.0%	+11.2%	-25.0%
Keifer Dryer	+4.5%	-25.7%	-1.5%	-4.7%	+7.6%	-28.2%	-3.6%	-3.2%
Erbach Calender	+4.0%	-8.8%	-0.5%	+16.9%	+8.2%	-11.5%	+0.6%	+.6.7%
After 24 hrs Relaxation	+4.0%	-18.3%	0	-9.5%	+5.8%	-17.5%	-2.4%	-6.0%
1 wash cycle at 95°C Flat Dry	-3.0%	-24.2%	-7.0%	-5.9%	-1.8%	-24.0%	-7.6%	-6.5%

Trial No.2 Calendering Dimensions

Introduction

A trial was arranged to assess the current dimensions of the fabric at the greige bleached, calendered, relaxed and washed stage of processing. An analysis was made of each fabric quality from all the machine diameters, and measurements were made at every processing step and the percentage extension in calendered width over bleach width calculated. The results are given in the accompanying tables.

In explaining the effect of the excessive calender widths set up by the making-up department it is important to understand that the only way that a fabric width can be increased in width or a given structure and count of yarn, is to either increase the knitted loop length or knit the fabric on a larger diameter machine. It can be seen from the analysis of bleached width and current calender settings that there is absolutely no correlation between the calender settings of the different diameters. If we take the 20 gauge interlock as an example, calender setting vary between 23% increase over the bleached width in the best case, to 43% increase in the worst.

The 20" diameter machine is calendered at 54 cms (a 41% increase) and the 22" diameter is calendered at 55 cms (a 28% increase) if, as is stated there is currently insufficient capacity on the 20" diameter machines, then fabric from the 22" and 24"

diameter machines could successfully fill this short-fall. It is recommended that no further 20" diameter machines are purchased and that more 22" and 24" diameter machines are bought instead. Trials should be undertaken to increase the stitch length by say 5 and 10% to see what reduction in weight and increase in width can be achieved.

A trial was undertaken in which the stretcher width was reduced to the new recommendaions and it was very obvious that the fabric was then being calendered without any bow distortion.

20 GAUGE INTERLOCK PRODUCED FROM 1/32's cc COTTON YARN

Knitting diameter in inches	Greige width in cms flat tube	Width after bleaching and drying	Current calender width settings	Width after 24 hrs relaxation	Width after one wash at 95°C	% Increase of calender width over bleached width	Suggested calender width cm's flat tube
16	44.8	30.0	43	36.5	32.3	43.3%	34
18	50.3	35.5	47	40.3	36.5	32.4%	38
20	52.7	38.3	54	44.2	37.8	41.0%	42
22	58.4	43.0	55	49.7	47.8	28.0%	47
24	63.9	47.8	60	53.2	51.0	25.5%	53
26	70.2	52.8	65	58.9	57.5	23.0%	60
30	81.4	57.3	75	68.0	62.5	31.0%	65

20 GAUGE INTELOCK BASE RIB PRODUCED FROM 1/32's cc COMBED COTTON YARN

Knitting diameter in inches	Greige width in cms flat	tube	Width after bleaching and drying	Current calender width settings	Width after 24 hrs relaxation	Width after one wash at 95°C	% Increase of calender width over bleached width	Suggested calender width
16	25.5		17.8	35	26.5	19.7	96.6%	22
18	31.8		20.3	38	29.8	21.6	87.2%	25
20	35.8		23.6	43	35.1	26.8	82.2%	29
30	56.3		34.6	60	50.7	40.1	73.4%	44

FINE RIB PRODUCED FROM 1/32's cc COMBED COTTON YARN

Knitting diameter in inches	Greige Width in cms flat tube	Width after bleaching and drying	Current calender width settings	Width after 24 hrs relaxation	Width after one wash 95°C	% increase of calender width over bleached width	Suggested calender width
16	39.8	31.3	43	36.7	33.0	37.4%	35
18	47.3	33.8	48	39.8	36.9	42.0%	38
20	51.6	40.4	54	47	43.5	33.7%	45
30	84.6	60.7	81	70	64.3	33.4%	68

APPENDIX 3

Visit to the Arab Company for Underwear in Aleppo

PERSONNEL

A visit was made to the company by Mr J.Gordon and Mr D.M.Elson accompanied by Mr Yacoub Fayoumi, Technical Director of the Orient Underwear Company who acted as counterpart and interpreter in discussion with Mr Noreldin Gurawati, General Director of The Arab Company for underwear in Aleppo.

Introduction

The company is involved in the production of cotton underwear and comprises departments for knitting, bleaching, dyeing, finishing and garment making. The current production is between 800-900 doz garments a day but plans are being formulated to substantially increase this production.

All the bleaching and dyeing carried out at the factory is done on atmospheric winches. Three winches are of 1.5 metre width manufactured by Rudolf Then circa 1971 and are used for bleaching and dyeing, a further two winches of 2.5 metre width are used primarily for bleaching.

The fabric is prepared by pre-scouring followed by bleaching for one hour (the final 15 minutes being at the boil) in a solution

containing, hydrogen peroxide, and Photine SSC, as optical brightening agent is applied.

The hydro-extracted fabric is taken up to the top floor of the building and hung on high level wooden lattice work where it is allowed to dry naturally over a 24 hour period. The dried fabric is hand plaited before being calendered on a Heliot calender. 800 to 1000 kilos of fabric are treated in one day.

TECHNICAL REPORT

With the method of winch bleaching and drying used it should be possible to produce garments with exceptionally good dimensional stability with little residual shrinkage. Unfortunately calender settings are being dictated by the making-up department and these settings are illogical.

Samples of fabric of 18 gauge interlock knitted from single 32's cotton yarn which has been finished and allowed a long period of relaxation before treating were examined. Fabrics from different machine diameters (zoll) were marked up and given one laundering at 95°C, the change in dimensions were then calculated and are given in the accompanying table. These samples showed width and length shrinkages of up to 10%. The main concern was that garments from the 20 zoll machine, after laundering, would be narrower in width than garments made from an 18 zoll machine.

A customer purchasing a size 5 garment would find that after washing, this garment was narrower than a washed size 4 garment. This indicates that no regard has been taken of the width of the fabric after bleaching and drying, and that clearly the actual 20 zoll machine on which the fabric was made was knitting a far tighter construction than the 18 zoll machine.

RECOMMENDATIONS

The levels of whiteness achieved on bleaching are not optimum and it is recommended that a two stage bleach should be introduced consisting of a treatment in cold sodium hypochlorite solution followed by hot bleaching in hydrogen peroxide bleach bath. This would produce an improvement in whiteness levels.

Regular maintenance checks should be carried out in the Heliot calender to ensure that the overfeed control is working and that the edge driving rollers are kept in good condition.

Care should be taken to ensure that the knitting conditions are equalised on all the different zoll machines. Due regard should be taken of the dimensions of the fabric after bleaching and drying when calender widths are set, attention to these matters will help ensure that the maximum dimensional stability is achieved.