SAWTRI BULLETIN

SOUTH AFRICAN
WOOL TEXTILE RESEARCH INSTITUTE
OF THE CSIR
P.O. BOX 1124
PORT ELIZABETH

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Editor: M. A. Strydom, M.Sc.

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WOOL AND TEXTILE RESEARCH INSTITUTE
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PUBLICATIONS COMMITTEE

INSTITUTE NEWS

Quinquennial Wool Textile Conference, 1980

As announced in the March issue of the Bulletin, arrangements are underway for holding the sixth quinquennial conference in Pretoria.

A local Planning Committee has been formed to assist in the preparations for the Conference. The members are:

Prof. D. P. Veldsman	:	Director of SAWTRI – Chairman
Mrs M. de Havilland	:	Head of Conferences and Symposia, Information & Research Services, C.S.I.R. – Secretary
Mr K. R. McCusker	:	Head of Liaison & Visitors, Information & Research Services, C.S.I.R.
Mr N. J. Vogt	:	Regional Liaison Officer of the C.S.I.R. in Port Elizabeth
Mr M. A. Strydom	:	Publications & Information Officer, SAWTRI
Mr J. Z. Moolman	:	Director of Technical Services, S.A. Wool Board
Mr D. S. Uys	:	Manager, Mohair Board
Mr J. Becker	:	Chief of Technical Services, S.A. Wool Board

Prospective participants in the Conference will soon receive a circular letter from the Planning Committee giving them some preliminary information about the envisaged plans.

International Mohair Association (I.M.A.)

The annual meeting of the above-mentioned Association was held in Port Elizabeth during the week of 10–14th May. On the 14th May the members visited SAWTRI, and during the afternoon heard an address by the Director on the progress of mohair research at the Institute; after which they were taken on a tour of the laboratories.

Wool Day held at Queenstown

On 12th May, a Wool Day organised by Mr J. Malan of the Wool Board, was held at Queenstown. During the morning the audience was addressed by the Director on *The Future of Wool as a Textile Fibre.*

An exhibit of the latest achievements by SAWTRI in easy-care garments was presented.

SAWTRI Display at Bathurst Show

The Institute participated in the annual Bathurst Agricultural Union Show by means of a display featuring:

- processing route from raw wool to finished fabric;
- machine washability;
- lightweight all-wool fabrics.

International Research and Development

A meeting of the Research and Development Committee of the International Wool Secretariat (I.W.S.) was attended by Dr Veldsman on 25th and 26th May in Ilkley.

Building Extensions at SAWTRI

Additions to the building complex at SAWTRI have commenced. The Cotton Processing Department will be extended to accommodate the latest facilities in processing while extensions to the north of the main building will provide for offices for the staff of the Information and Research Services Department of the CSIR, regional research laboratories, a new library and technical administration block to cater for SAWTRI and any other branches of the CSIR which may need these services and, finally, bigger and better cafeteria facilities.

New Graduates

Two staff members, Messrs F. A. Barkhuysen and J. Klazar, received their M.Sc. degrees in Textile Science at the graduation ceremony of the University of Port Elizabeth on 30th March.

Mr H. E. Schmidt received a B.Sc. degree (in absentia) from the University of Natal, Durban.

New Staff Member

Dr F. Haiber assumed duty in Port Elizabeth on 13th April, 1976. Dr Haiber is a polymer chemist who graduated at the University of Stuttgart in November 1974. He has joined the Textile Chemistry Group under the leadership of Dr N. J. J. van Rensburg.

Textile Federation

A Textile Federation was formed recently to promote the interests of the textile processing industry in every possible way, and to gather and disseminate all relevant information on behalf of the industry.

The constituent bodies are the National Knitting Industries Federation, S.A. Cotton Textile Manufacturers' Association, S.A. Worsted Textile Manufacturers' Association and the synthetic fibre producers: Hoechst S.A. (Pty) Ltd and S.A. Nylon Spinners (Pty) Ltd.

The President of the Federation is Mr G. C. V. Graham of Veldspun (Pty) Ltd and the Vice-President, Mr E. R. B. Ankers of Berg River Textiles Ltd.

The Executive Director of the Federation is Mr Stanley Shlagman.

Industrial testing services

For the information of all members of Industry making use of the Institute's textile testing services, it should be noted that all enquiries should, in the first instance, be addressed to the Director and not to any individual in the Institute.

Institute Publications

A *classified index* of *all* SAWTRI publications is available to subscribers at a price of only R2 per copy.

Cotton Research for the Rhodesians

On the occasion of the Annual Meeting of the Steering Committee for Research on behalf of the Cotton Promotion Council of Rhodesia, the Rhodesian visitors to SAWTRI handed over the Council's cheque in payment of research undertaken on their behalf during the 1975/76 financial year.

Left to right: Messrs S. Davies, D. A. G. McCormick, W. D. C. Reed, Dr D. P. Veldsman (Director), Mr K. Sanderson, Mr N. J. Vogt (CSIR Regional Liaison Officer)

CSIR Regional Liaison Services

The CSIR Regional Liaison Office in Port Elizabeth was recently appointed to provide liaison services for the National Productivity Institute in the Eastern Cape.

This is a natural development in the light of the complementary nature of the Regional Office's activities vis-à-vis SAWTRI and the establishment of NPI productivity units for the textile industry.

Conference of the International Wool Textile Organisation (IWTO)

The next conference of the IWTO will be held in South Africa from 18th – 26th April, 1977. The venue will be the Mount Nelson Hotel in Cape Town and the S.A. Wool Textile Council will act as hosts.

S.A. Advisory Committee of the Textile Institute

The Director of the Institute, Dr D. P. Veldsman, has again been elected for a period of 3 years as National Chairman of the Advisory committee for the Republic. He last served as chairman in 1974 when he retired on a rotational basis.

New contributor

We have pleasure in welcoming as a new contributor Messrs Consolidated Frame Cotton Corporation Ltd. We look forward to many years of fruitful association with this member.

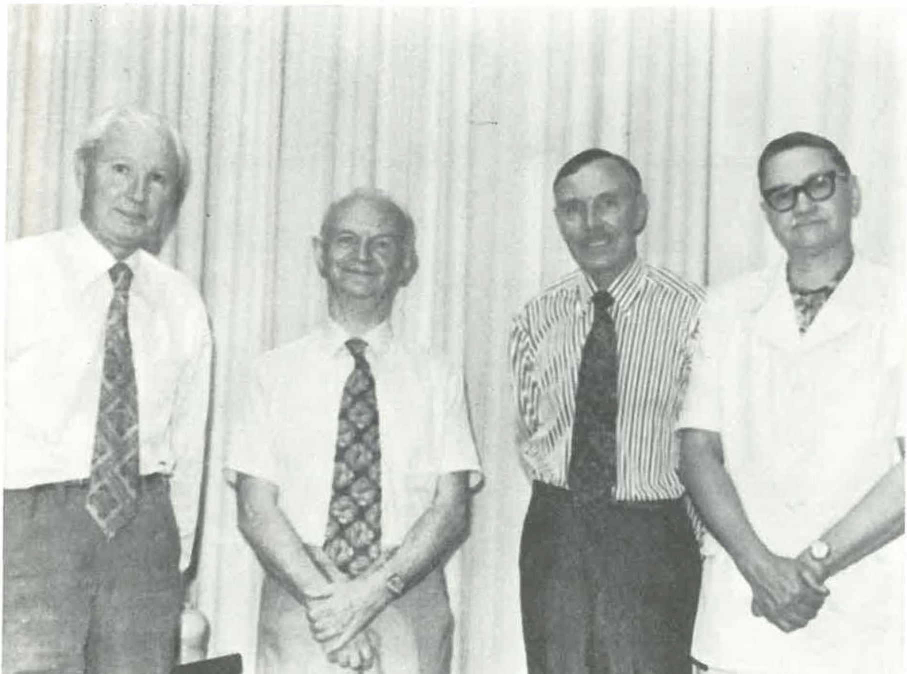
Dr Veldsman in conversation with the President of the State of Israel, the Honourable E. Katzir (left) and Prof. M. Lewin, Director of the Israel Fiber Institute (right). This photograph was taken on the occasion of the Conference on Fibre Science which was held in Arad, near Jerusalem. (See article in Bulletin, March 1976).

Visits and Visitors

On 9th March, SAWTRI was honoured by a visit from Sir Ieuan Maddock, Chief Scientist of the Department of Industries of the United Kingdom. Sir Ieuan, who was accompanied by Dr P. J. Rigden, Vice-President of the CSIR, paid a short visit to Port Elizabeth during a tour of the main centres of the Republic as a guest of the CSIR.

It is the CSIR's policy to invite outstanding scientists and engineers to visit South Africa in order to see CSIR activities for the development of research for industry. Sir Ieuan and Dr Rigden visited the Institute's processing departments and research laboratories, and had discussions with Dr Veldsman and Mr Vogt.

The latter accompanied Sir Ieuan and Dr Rigden on a subsequent visit to the Transkei on 10th and 11th March when Sir Ieuan was shown industrial growth in the Transkei as an example of deployment of manufacturing industry to create employment opportunities. The development of the textile industry in the Transkei is on an important scale.



Left to right: Mr N. J. Vogt, Sir Ieuan Maddock, Dr P. J. Rigden, Dr D. P. Veldsman

Mr W. V. Morgan, Manager, Textile Engineering & Processing of the Ilkley Laboratories of the International Wool Secretariat visited SAWTRI on 25th March to discuss topics of mutual interest and, in particular, the latest in scouring and effluent disposal.

Mr W. V. Morgan (right) in conversation with Dr D. W. F. Turpie

SAWTRI PUBLICATIONS

Technical Reports

No. 283 : Van Rensburg, N. J. J., Treatment of Cotton Fabrics with Aminoplast Resins and Various Silicone and Polyurethane Polymers, (March 1976).

No. 284 : Turpie, D. W. F., The Processing Characteristics of South African Wools, Part IX: The Influence of Limited Variations in both Length and Diameter on the Processing Performance of Mixtures of South African Wools up to Spinning, (March 1976).

No. 285 : Roberts, M. B. and Mountain, F., The Transfer Printing of Cotton, Part I: An Investigation into the Application of Reactive Dyes by the Wet Transfer Technique, (March 1976).

No. 286 : Barkhuysen, F. A., Liquid Ammonia Mercerisation of Cotton, Part II: The Influence of Anhydrous Liquid Ammonia on the Dimensional Stability of Cotton Fabrics, (March 1976).

No. 287 : Smuts, S. and Hunter, L., Studies of Some Wool/Polyester Woven Fabrics, Part IV: Easy-Care Finished Fabrics from Wool Blended with Normal and Special Low Pilling Polyester Respectively, (March 1976).

No. 288 : Turpie, D. W. F. and Gee, E., The Effect of Neutral and Alkaline Scouring on the Yellowness of Wool at the Various Processing Stages, (March 1976).

No. 289 : Barkhuysen, F. A., Liquid Ammonia Mercerisation of Cotton, Part III: The Influence of Anhydrous Liquid Ammonia on the Physical Properties of Cotton Fabrics, (March 1976).

No. 290 : Silver, H. M. and Pam Creed, The Dimensional Stability of All-Wool Single Jersey Fabric, (April 1976).

No. 291 : Robinson, G. A., Cawood, M. P. and Dobson, D. A., Knittability of All-Wool Yarns on a 28 Gauge Single Jersey Machine, (April 1976).

No. 292 : Godawa, T. O. and Turpie, D. W. F., The Use of Faulty Wools in Blends, (April 1976).

No. 293 : Barkhuysen, F. A., Liquid Ammonia Mercerisation of Cotton, Part IV: Liquid Ammonia Mercerisation as a Pretreatment for Subsequent Durable Press Treatments, (April 1976).

No. 294 : Hunter, L., Some Double Jersey Tuck Structures in Wool, Part II: Fabric Physical Properties, (April 1976).

No. 295 : Silver, H. M., Dimensional Stability of Feeder Blended Wool/Texturised Acrylic Single Jersey Fabrics, (April 1976).

No. 296 : Turpie, D. W. F., Marsland, S. G. and Robinson, G. A., Production of Mohair Yarns on the Repco Spinner, Part I: Some Preliminary Spinning Trials, (May 1976).

No. 297 : Hunter, L. and Smuts, S., A Preliminary Report on Certain Physical Properties of Some Commercial Double Jersey Fabrics Produced from Textured Polyester Yarns, (May 1976).

No. 298 : Aldrich, De V., Processing of Blends of Cotton and Wool on the Cotton System, Part II: Yarn and Yarn Fabric Properties of a 67/33 Cotton/Wool Blend, (May 1976).

No. 299 : Aldrich, De V., Blending of Two Cottons Differing Widely in Fibre Properties, (May 1976).

No. 300 : Kelly, I. W., The Correlation Between Certain Parameters Used to Characterise Fabric Wrinkling Properties, (May 1976).

No. 301 : Turpie, D. W. F., Influence of Backwashing on the Combing Performance of Overcrimped Wool, (May 1976).

No. 302 : Hayes, A. P. N., Transfer Printing of Wool with Reactive Dyes, Part II: Use of a Polyethylene/Paper Laminate Support, (May 1976).

Papers Appearing in Local and Overseas Journals

Strydom, M. A., Só Beïnvloed Veseleienskappe Wolverwerking, *Landbouweekblad* No. 6, p.50–53 (13 Feb. 1976).

Strydom, M. A., Physical Properties of Wool Double Jersey Cloth, *S.A. Textiles,* p.14, (March 1976)

Veldsman, D. P., Cotton Research at SAWTRI, *S.A. Textiles,* p.12 (May, 1976).

TEXTILE ABSTRACTS

Transferdruk nu ook op Katoen Weefsels en -mengweefsels mögelyk – *de Tex Textilis,* No. 2, 28 (1976).

As early as 1971, Messrs Ciba-Geigy were granted a patent for the transfer printing of cotton and cotton/polyester. A transfer paper was used which, apart from the dye, also contains a compound which releases water during transfer and is converted into a compound facilitating penetration of the disperse dyes.

The Japanese firm Toyo Boseki used conventional transfer printing papers but the cellulosic fibre was pre-swollen with polyhydric alcohols (b.p. higher than 150°C).

Messrs Heberlein developed the "Hecowa-print" system in which the cotton fabric is pretreated with special resins prior to transfer printing.

Messrs Kolloïd-Chemie GmbH developed the "sublicotton" process which also involves a pretreatment with Sublicotton BW followed by drying. The Sublicotton transfer paper contains a catalyst, apart from the disperse dye (the catalyst is on the back of the transfer paper).

(D.P.V.)

Catalysts for THPO/Amide Resins by A. W. Frank, *Text. Res. J.*, 139 (Feb., 1976).

Lately THPOH (flame-retardant) is being applied with DMDHEU aminoplast resins on cotton fabrics. The problem is which catalyst to use as the THPOH solution has to remain at a pH of 8,0. Yet, acidic catalysts such as $Zn(NO_3)_2$ or $MgCl_2$ are commonly being used for DMDHEU resins.

The author investigated a number of catalysts and found aminesalt catalysts (such as trimethylamine hydrochloride) and $MgCl_2$ to be effective.

These findings should also be compared with those disclosed in B.P. 1423692 and summarised in Intern. Dyer, 215 (March 5th, 1976) where the aminoplast precondensate (aminotriazine type) is first applied to the cotton fabric and polymerised in the *wet* state. Thereafter the pH is adjusted to 7. THPOH is then applied followed by a washing, a curing and a drying operation.

(D.P.V.)

SOME ASPECTS OF THE USE OF STORAGE FEED UNITS ON FULLY-FASHIONED MACHINES

by G. A. ROBINSON and M. V. GREEN

ABSTRACT

The use of two types of storage feed units (revolving drum and stationary drum) on a fully-fashioned machine has been investigated.

In certain very special cases the revolving drum type created a significant difference in the mean twist value of the yarn between cone and fabric. This difference became critical when the knitting machine stopped and the storage feed unit commenced, or continued to wind on. Faults appeared in the fabric in the form of horizontal lines of distorted loops created by the torque present in the yarn due to a variation in twist introduced by the storage feed unit.

INTRODUCTION

The installation of storage feed units on straight bar fully-fashioned knitting machines is becoming increasingly popular. The reasons for employing storage feed units, however, are not always properly motivated. Wignall[1] showed that there was a 36 *per cent* variation in stitch length of a wool worsted fabric when the input tension varied from 2 cN to 20 cN as could occur with imperfect winding. Several types[2, 5] of storage feed units are available and the function of this accessory is to wind the yarn from the original package (cone, spool, cheese, etc.) and so form a reserve of perfectly wound yarn which can be unwound and fed to the knitting head at a regular tension.

Wignall[1] stated that the main advantage of using storage feed units in fully-fashioned knitting is to reduce garment length variations created by inconsistencies in the input tension from the yarn package. This was confirmed elsewhere[6].

There are two basic types of storage feed units in use, the apparently more popular type being the *revolving drum type,* and the other known as the *stationary drum type.* The main difference between these two types is that the former can either insert or remove twist from the yarn while winding on whereas the latter does not alter the amount of twist in the yarn. It is the effect caused by this fundamental difference which is discussed in this report.

It was observed in a previous study on cockling[7] that when the *revolving drum type* storage feed unit commenced winding on, or continued to wind on, during the time the knitting head was stationary (i.e. at the end of a course or fashioning cycle or during a machine stoppage in the course of production), a large change in twist (2,5 t.p.cm) occurred over the short length of yarn between the storage feed unit and the first trapping point (i.e. tension disc or snapper). This change in twist intensity caused loop distortion which was clearly visible in the fabric.

EXPERIMENTAL

A 30 kg lot of *wool* was spun and plied into R64 tex/2 yarn with six levels of twist, viz: S253/2Z380, S280/2Z420, S306/2Z460, S333/2Z500, S360/2Z540 and Z253/2S380. The yarns were steam set, cleared and waxed and tested for physical properties. They then were knitted into garment blanks on a Scheller 24 gg straight bar fully-fashioned knitting machine. These blanks were knitted from each of the six yarns under three distinct knitting conditions, viz.:

(i) direct from cone package (without using a storage feed unit);
(ii) employing a *stationary drum type* storage feed unit; and
(iii) employing a *revolving drum type* storage feed unit.

Each set of blanks was repeated as above, but instead of knitting under normal conditions the knitting machine was stopped at controlled intervals to coincide with the winding-on stage on the storage feed unit. The stopping time was for a minimum of 6 seconds, which was the time taken for the storage feed units to

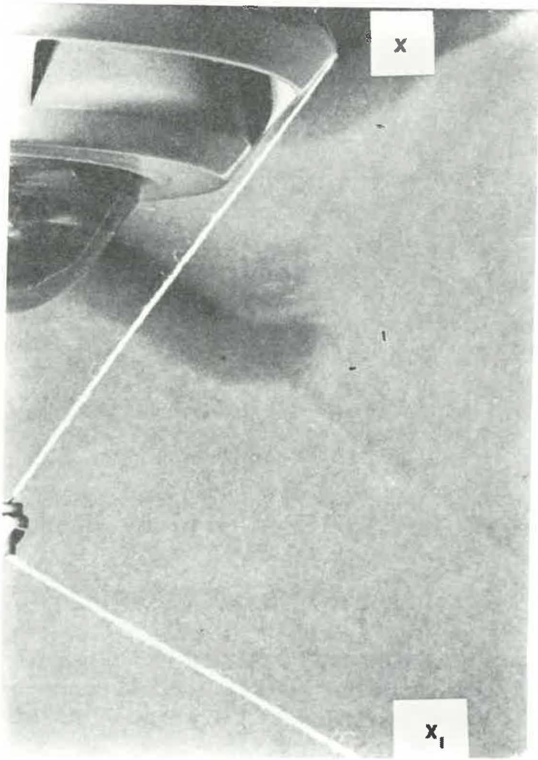


FIGURE 1

Normal yarn unwinding from a *revolving drum type* storage feed unit during knitting

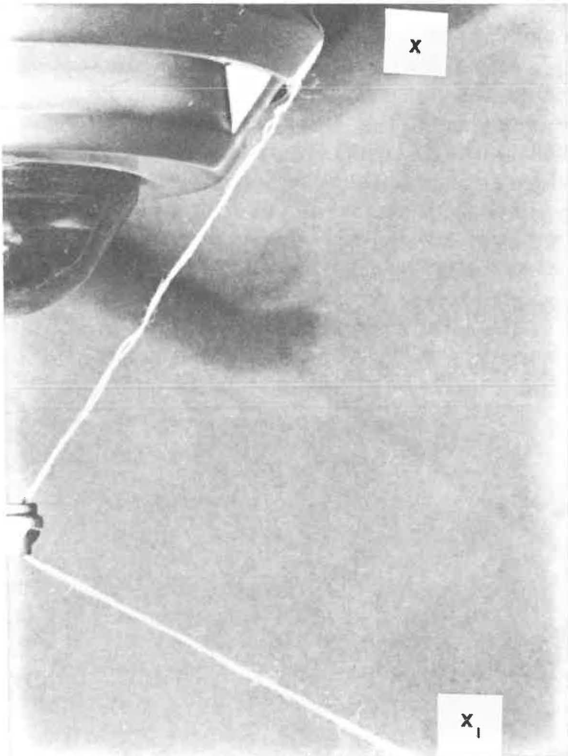


FIGURE 2

The same yarn after the storage feed unit has just wound on its new reservoir of yarn during a stoppage of the knitting machine

wind on the reserve of yarn. This reserve is sufficient to knit 12 courses of the body blank and, therefore, stoppages were controlled to take place every 12 courses.

RESULTS AND DISCUSSION

Fig. 1 is a photograph showing the normal yarn *unwinding* from a revolving drum type storage feed unit during knitting, and Fig. 2 the same yarn after the storage feed unit has just completed its "winding-on" of the reservoir of yarn during a *"stop" period of the knitting machine.*

From Fig. 2 it can be seen that the yarn has very low twist when compared with that shown in Fig. 1. In Fig. 2 the yarn was marked with black ink at the points X and X_1 (i.e. the portion of yarn in which a change of twist had taken place), and called B. The portion of yarn prior to this (from point X_1 to the knitting head) was called A, and that portion of the reserve after the faulty part called C.

The photograph in Fig. 3 shows the position of yarn A-B-C when knitted into fabric. It can be seen that a line of distorted loops is produced coinciding with the black marks at X and X_1 and extending into portions A and C with portion A being more dominant and longer than C.

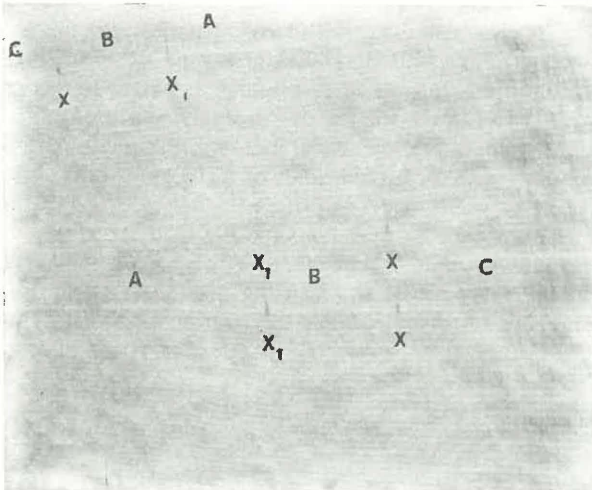


FIGURE 3

Showing portions of yarn A, B and C knitted into fabric, after removal of twist by *revolving drum type* storage feed unit (R64 tex S253/2Z380 yarn)

The results of tests on twist variations obtained for the R64 tex S253/2Z380 yarn when knitted on a fully-fashioned machine are given in Table A (Appendix). Similarly, results were obtained for the other yarns, but these are not given. It can be seen that for yarn 1 (Table A) the 'S' twist at portion B was reduced significantly. When knitting commenced, however, and the yarn moved forward, the torque in portion B caused twist to run from the adjacent portions A and C into portion B. The results show that portion B was unable to recover all its original twist because of the opposite torque built up in the adjacent portions A and C resisting untwisting with the net result that the amount of twist in portions A, B and C were significantly lower than normal, resulting in loop distortion in the fabric (e.g. Fig. 3).

It can further be seen from Table B (Appendix) that in the case of the 'Z' twisted yarn, excessive twist was inserted into portion B with a resultant spread into portions A and C. The result on the fabric is shown in Fig. 4. In this instance the yarn was "twist-lively" and the line of distorted loops produced a clear impression of short term spirality[7].

Table C (Appendix) gives the results obtained when a similar experiment was conducted using a *stationary drum type* of storage feed unit. In this case no difference in twist was observed and, therefore, it was deemed unnecessary to repeat this experiment for the various levels of plying twist.

Table I gives a summary of the comparable twist variations encountered for the three distinct knitting conditions.

A comparison was also made with two knitted blanks; the first one being knit under normal conditions (without any stopping of the machine) and the second under normal conditions but when fashioning was used. It was observed that the variation in yarn twist (due to the use of the revolving drum type storage feed unit) could be seen in the uneven fabric appearance and that the loop distortion appeared even more pronounced, with broken lines of distorted loops, when fashioning was used.

It must be remembered that the variation in twist as shown by this experiment was exaggerated to the extent where it was shown that the maximum fault occurred when the stoppage of the knitting machine coincides exactly with the "winding-on" of the *revolving drum type* storage feed unit. This, however, *can*

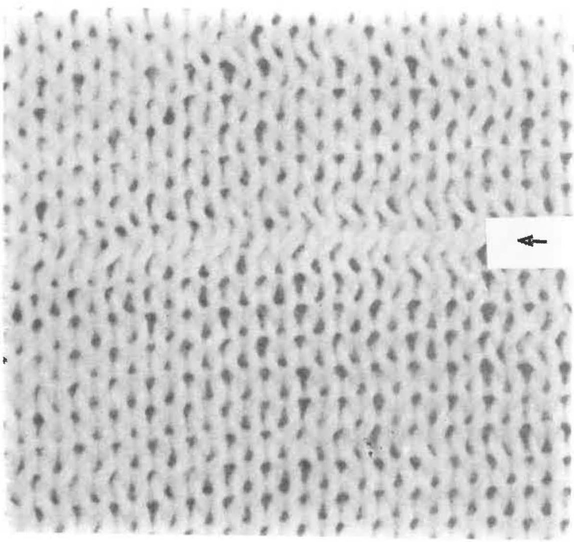


FIGURE 4

Short term spirality caused when extra twist is inserted by a *revolving drum type* storage feed unit (R64 tex Z253/2S380 yarn)

TABLE I

SUMMARY OF TWIST VARIATIONS CAUSED BY DIFFERENT YARN SUPPLIES

Type of Feed	Nominal Twist (t.p.cm)	Actual Twist (t.p.cm)	Yarn Twist at portion X to X_1 (t.p.cm)	Yarn twist at portion A after knitting in fabric (t.p.cm)	Yarn twist at portion B after knitting in fabric (t.p.cm)	Yarn twist at portion C after knitting in fabric (t.p.cm)
Direct from cone	2,53	2,42	–	–	–	2,42
Stationary drum type	2,53	2,42	2,46	2,43	2,56	2,42
Revolving drum type	2,53	2,42	0,05	1,87	1,64	2,15

occur in fully-fashioned knitting and therefore highlights one disadvantage of employing this type of storage feed unit on a single jersey fully-fashioned knitting machine.

SUMMARY

The practice of using storage feed units on fully-fashioned machines has been investigated because of an observation made in respect of loop distortion. It has been shown that of the two general types of storage feed units in use at the present time, the *revolving drum type* can create a significant change in mean twist value of the yarn between the cone and the fabric, which results in loop distortion, when knitted into plain fully-fashioned knitwear. This loop distortion showed up in the fabrics as horizontal rows of distorted loops and that wherever this fault occurred it resulted in the final garment being classed as substandard.

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to Mr S. Marsland for spinning the yarns and to Mr L. Layton for producing the photographs.

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APPENDIX I

RESULTS OF TESTS

TABLE A

YARN TWIST (S) VARIATIONS ON *REVOLVING DRUM TYPE* STORAGE FEED UNITS (R64 TEX S253/2 Z380)

Nominal Twist (t.p.cm)	Actual Twist (t.p.cm)	Yarn Twist at portion X-X_1 in Fig. 2 (t.p.cm)	Yarn Twist when portion A is knitted into fabric (t.p.cm)	Yarn Twist when portion B is knitted into fabric (t.p.cm)	Yarn Twist when portion C is knitted into fabric (t.p.cm)	Yarn Twist in normal fabric (t.p.cm)
2,53	2,64	1,06	2,05	1,89	2,13	2,17
2,53	2,64	-0,20	1,73	1,52	2,28	2,63
2,53	2,13	0,17	2,05	1,63	2,28	2,56
2,53	2,87	0,26	1,57	1,38	2,44	2,56
2,53	2,13	0,28	2,13	1,81	2,13	2,63
2,53	2,40	-0,03	1,73	1,54	2,20	2,52
2,53	2,20	-0,14	1,89	1,81	1,89	2,52
2,53	2,68	-0,03	1,81	1,57	1,89	2,71
2,53	2,24	-0,79	2,05	1,69	2,28	2,31
2,53	2,87	-0,11	1,65	1,57	1,97	2,71
Mean 2,53	2,48	0,05	1,87	1,64	2,15	2,53

TABLE B

YARN TWIST (Z) VARIATIONS ON *REVOLVING DRUM TYPE* STORAGE FEED UNITS. (R64 TEX Z253/2 S380)

Nominal Twist (t.p.cm)	Actual Twist (t.p.cm)	Yarn Twist at portion $X\text{-}X_1$ in Fig. 2 (t.p.cm)	Yarn Twist when portion A is knitted into fabric (t.p.cm)	Yarn Twist when portion B is knitted into fabric (t.p.cm)	Yarn Twist when portion C is knitted into fabric (t.p.cm)	Yarn Twist in normal fabric (t.p.cm)
2,53	2,74	4,44	3,00	3,40	2,85	2,22
2,53	2,40	5,27	2,90	2,90	3,05	2,51
2,53	2,28	4,67	3,05	2,90	2,85	2,46
2,53	2,16	5,03	3,05	3,40	2,71	2,36
2,53	2,24	5,68	3,25	3,00	3,25	2,41
2,53	2,77	4,22	3,00	3,10	2,66	2,56
2,53	2,79	5,34	2,81	3,49	3,10	2,36
2,53	2,40	4,72	2,85	2,85	2,56	2,22
2,53	2,56	5,17	3,54	2,85	3,40	2,36
2,53	2,65	4,60	2,51	3,25	3,05	2,66
Mean 2,53	2,50	4,91	3,00	3,11	2,95	2,41

TABLE C

YARN TWIST (S) VARIATIONS ON *STATIONARY DRUM TYPE* STORAGE FEED UNIT. (R64 TEX S253/2 Z380)

Nominal Twist (t.p.cm)	Actual Twist (t.p.cm)	Yarn Twist at portion $X\text{-}X_1$ in Fig. 2 (t.p.cm)	Yarn Twist when portion A is knitted into fabric (t.p.cm)	Yarn Twist when portion B is knitted into fabric (t.p.cm)	Yarn Twist when portion C is knitted into fabric (t.p.cm)	Yarn Twist in normal fabric (t.p.cm)
2,53	1,82	2,25	2,17	2,26	2,17	2,36
2,53	2,66	2,14	3,25	2,66	1,97	1,97
2,53	2,46	2,93	2,17	2,56	2,56	2,26
2,53	2,36	2,59	2,36	2,85	2,56	2,36
2,53	1,97	2,25	2,26	2,46	2,66	2,46
2,53	2,56	2,81	2,26	3,25	2,66	2,56
2,53	2,46	2,70	2,46	2,26	2,76	2,76
2,53	2,61	1,91	2,66	2,66	2,07	2,36
2,53	2,17	2,70	2,26	2,36	2,66	2,36
2,53	2,61	2,36	2,46	2,26	2,76	2,56
Mean 2,53	2,37	2,46	2,43	2,56	2,48	2,40

A NOTE ON THE EFFECT OF VARIOUS ADDITIVES ON THE SHRINKAGE OF WOOL FABRICS TREATED WITH A P.A.E.* RESIN

by E. WEIDEMAN and HILKE GRABHERR

ABSTRACT

The effect of the degree of chlorination and various additives in the resin bath on the shrinkage of Hercosett-treated woven wool fabrics was investigated. Some additives appeared to be more sensitive to the level of chlorination, while others seemed more sensitive to the level of resin add-on.

INTRODUCTION

It has been known for some time that processing oils or other additives can reduce the effectiveness of a shrink-resist treatment of wool fabrics[1]. Baird[2, 3] investigated the effect of processing oils on the shrinkage of chlorine-Hercosett treated tops which were processed into wool fabrics and came to the conclusion that when less than complete shrink-resistance was achieved, the shrinkage rates were extremely sensitive to many factors, including the presence of certain processing oils.

In the present report, wool fabrics were given a very mild chlorination pretreatment, followed by Hercosett application on a pad mangle. The low levels of treatment were chosen so that additives which had a tendency to interfere could be detected. The effect of various types of additives in the Hercosett bath on the degree of shrink-resistance imparted to the fabrics was studied.

EXPERIMENTAL

All percentages are expressed on mass of fibre. All solutions were used at room temperature.

Fabrics

An undyed woven fabric similar to the IWS fabric SM12A1 with a high felting propensity was used (more than 70 *per cent* area shrinkage). Prior to chlorination the fabrics were drycleaned at 80°C in perchloroethylene.

Chemicals

Technical grade chemicals were used, with the exception of glacial acetic acid which was of reagent grade quality. Basolan DC (BASF) was used for the chlorination and Tergitol Speedwet (Union Carbide) was the wetting agent during chlorina-

*P.A.E. Resin = Polyamide Epichlorohydrin resin (Hercosett, Hercules Inc.)

tion. Hercosett 70 was used as the resin. The additives were commercial softeners, levelling agents, wetting agents and emulsifiers.

Apparatus

A Benz laboratory apparatus for continuous padding and drying comprising a pad mangle, four bowls and an oven were used.

Chlorination Pretreatment

Fabrics (10 m lengths) were chlorinated[4] at 2 m/min at room temperature with the required amounts of DCCA to effect chlorination levels of 0,25, 0,5 and 1 *per cent*. No sulphuric acid was used and the pH values varied from 2,8 to 3,3. Drying was carried out at 60° C for 15 min.

Combined Resin and Additive Treatment

The chlorinated fabrics were padded to a pick-up of 95–105 *per cent* with polyamide epichlorohydrin resin (Hercosett 70) and additives at a ratio of 1 : 1 at three levels of total solid add-on of 1,2 or 4 *per cent*. The solutions were adjusted to a pH of 7,0 with sodium bicarbonate. Fabrics were then cured at 90°C for

Test Method

Fabric samples were washed in a 50 ℓ Cubex machine according to IWS test method TM 185. The percentage total area shrinkage (relaxation and felting) was determined after washing for three hours.

RESULTS AND DISCUSSION

The effect of various softeners, levelling agents and other additives on the degree of shrinkage of shrink-resist treated fabrics can be seen in Table I. In most of the cases, two possible combinations of resin and chlorine were used, namely a low concentration of active chlorine (0,5 *per cent*) and a relatively high concentration of resin, or a higher level of chlorine (1 *per cent*) and less resin. In the absence of any additive, it was found that when the wool was pretreated with a low concentration of chlorine (0,5 *per cent*), a resin add-on level of at least 1,0 *per cent* was required to reduce the shrinkage to acceptable levels. Fabric treated with 0,5 *per cent* resin, had an area shrinkage of about 34 *per cent*.

When additives were added to the resin before application to the wool, it was found that the degree of shrinkage of the fabrics was affected to various degrees by the different additives. This observation is in agreement with the findings of Baird[2, 3] who first gave wool tops a shrink-resist treatment, followed by the application of the softener on the knitted fabrics. The effect of the additive on the shrinkage of the fabrics appeared to be a function of the degree of chlorination as well as the resin/additive concentration. All the additives, however, did not respond in a similar manner to changes in the level of chlorination or resin concentration. Some, such as additive R, required a high level of chlorination in order not to

TABLE I

THE EFFECT OF ADDITIVES AND CHLORINE CONCENTRATION ON THE AREA SHRINKAGE OF HERCOSETT-TREATED FABRICS

Additive	Type*	PERCENTAGE AREA SHRINKAGE			
		0,5% Active Chlorine			1,0% Active Chlorine
		0,5% Res. only	1% Resin/ 1% Additive	2% Resin/ 2% Additive	0,5% Resin/ 0,5% Additive
Chlorine only	–	70	70	70	69
No additive (resin only)	–	34	0	0	1
A	C	–	4	3	4
B	**	–	4	3	3
C	**	–	–	–	14
D	N	–	5	3	1
E	A	–	–	–	10
F	N	–	–	–	31
G	A	–	–	–	32
H	C	–	13	5	4
I	N	–	–	–	27
J	A	–	–	–	12
K	**	–	5	3	3
L	A	–	–	–	60
M	A	–	5	3	4
N	A	–	4	3	2
O	**	–	–	–	30
P	A	–	4	3	2
Q	A/N	–	4	2	2
R	A	–	49	49	3
S	A	68	50	3	5

*Cationic (C), anionic (A) or non-ionic (N).

**Charge not specified by Supplier.

increase the area shrinkage, while others, such as additives H and S, did not increase the area shrinkage at lower levels of chlorination, provided that the resin/additive concentration was increased. The relative contribution of the degree of chlorination

TABLE II

THE EFFECT OF ADDITIVES ON THE AREA SHRINKAGE OF WOVEN WOOL FABRICS PRETREATED WITH 0,25% CHLORINE

Additive	Type*	Percentage Area Shrinkage	
		1% Resin/ 1% Additive	2% Resin/ 2% Additive
No softener	—	2	-1
A	C	2	—
D	N	10	1
N	A	2	—
P	A	2	2
Q	A/N	2	1

*Cationic (C), anionic (A), or non-ionic (N).

and the level of resin/additive add-on to the degree of shrinkage does not appear to be the same for all the different additives used. It is possible, therefore, that different additives may interfere with the shrinkproofing mechanism of the resin in different ways.

Some of the additives which did not have a detrimental effect on the degree of shrinkage were selected to find out whether these would not impair the shrink-resistance when the level of chlorination was reduced further to 0,25 *per cent.* The results are given in Table II. In this particular case, additive D increased the shrinkage of the fabrics, while the other additives had, once again, very little effect when the resin add-on was reduced.

From the results it was not clear whether the charge of the additive had an effect on the degree of shrinkage of the fabric. Some further studies will have to be carried out to evaluate the relative importance of the charge, spreading, adhesion, etc. of the additive on the shrink-resistance of the Hercosett-treated wool fabric.

ACKNOWLEDGEMENTS

The authors wish to thank the S.A. Wool Board for permission to publish this note.

THE USE OF PROPRIETARY NAMES

The fact that chemicals with proprietary names have been mentioned in this report in no way implies that there are not others which are as good or better.

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THE MERCURY-TUNGSTEN FLUORESCENT (MBTF) LAMP AS LIGHT SOURCE FOR THE PHOTODEGRADATION OF COTTON FABRICS

by N. J. J. VAN RENSBURG and MARILYN MICHAU

ABSTRACT

The degradation of cotton fabrics by an MBTF lamp was investigated. The effect of exposure time and the distance between the lamp and the samples on fabric bursting strength was determined.

INTRODUCTION

The use of economical and efficient fading lamps for lightfastness studies has been the subject of several publications in recent years. The fading and tendering of samples by sunlight is normally a slow process and therefore artificial light sources have been developed to accelerate the assessment of lightfastness. Most of the instruments used to date employ a carbon-arc or xenon-arc lamp. Recently, however, Giles *et al*[1] introduced a new instrument in which a mercury-tungsten fluorescent lamp is used as a light source. This lamp, called an MBTF type lamp, is manufactured by several companies and it is readily available. MBTF lamps are relatively cheap and the operating costs are considerably lower than those of methods used hitherto. The lamp can be connected directly to the mains without a choke. The MBTF lamp has a phosphor coating and a tungsten filament which adds yellow and red light to the mercury vapour spectrum at the expense of some ultraviolet light.

Giles and co-workers[1] tested more than 300 dyed or pigmented samples and showed that the MBTF lamp gave lightfastness results identical to xenon light or daylight in 75 *per cent* of the cases, while 25 *per cent* were within one-half of a grade of each other. Park and Davis[2] reported that lightfastness results obtained with MBTF light compared well with results obtained with sunlight and in most cases were within one half-grade of each other. Wool and nylon gave a slightly better correlation than cotton and polyester. At a later stage Park[3, 4] reported that the MBTF results could be improved by exposing the samples at an effective humidity of 45 *per cent* and by removing residual carrier from the polyester fibres in a ventilated oven before exposure. In a recent study Hindson and Southwell[5] found that 81 *per cent* of MBTF light results, 84 *per cent* of carbon-arc results and 68 *per cent* of xenon-arc results agree with daylight results within half a unit. On these grounds they have recommended the use of the MBTF lamp for the determination of the lightfastness of textiles.

Apart from the fading of dyes the MBTF lamp has also been used for studying the tendering or degradation of textile fibres by light. Shah and Srinivasan[6] reported that the tendering of various types of yarn by the MBTF lamp was twice as rapid as that by sunlight. Fincher and co-workers[7] found a good correlation between the effect of the MBTF lamp and sunlight on the degradation of polymers used for the shrinkresist treatment of wool.

SAWTRI at present is studying possible methods to increase the resistance of cotton to degradation by light, and it was decided to evaluate the MBTF lamp as a possible light source for studying photodegradation of cotton fabrics.

EXPERIMENTAL

A scoured and bleached all-cotton handkerchief fabric (70 g/m^2) was used in this investigation. The fabric was cut into 9 cm x 23 cm samples, supported in metal frames and exposed to the MBTF lamp (500 Watt) in a room conditioned at 21°C and 65% RH. The temperature of the fabric during exposure was determined with the aid of a fine thermocouple wire and an electronic thermometer. After exposure the bursting strength of the samples was determined on a Mullen Tester.

RESULTS AND DISCUSSION

The effect of exposure time on the bursting strength of the cotton fabric is shown in Figure 1. All the samples were exposed at a distance of 20 cm from the axis of the MBTF lamp. The figure shows that the bursting strength of the fabric decreased as the time of exposure increased. The loss in bursting strength after an exposure time of 800 hours was about 35 *per cent.*

Figure 2 shows the effect of the distance between the lamp and the sample on the bursting strength of the cotton fabric. All the samples were exposed for 900 hours. The figure shows that the loss in bursting strength increased when the distance between the lamp and the sample was decreased. The sample which was 15 cm from the axis of the lamp, showed a loss in bursting strength of about 55 *per cent.*

The temperature of the fabrics at various distances from the lamp is shown in Figure 3. The temperature increased when the distance between the sample and the lamp was decreased. At a distance of 15 cm from the lamp a temperature of 43,5°C was recorded. Even at a distance of 40 cm from the lamp the sample temperature was still considerably higher (7,1°C) than the ambient temperature. This probably could have reduced the moisture content of the fibres and might also have affected the rate of degradation of the fabric. Fincher *et al*[7] suggested, however, that the operating temperature could be reduced from 60°C to 30°C by a fan sited above the samples.

In general the MBTF lamp appears to be useful as a light source for the photodegradation of cotton. The distance between the lamp and the samples, however, will be affected by several factors. The smaller the distance between the lamp and the samples, the more rapid will be the degradation of the fabrics. When the samples are too close to the lamp, however, the operating temperature becomes

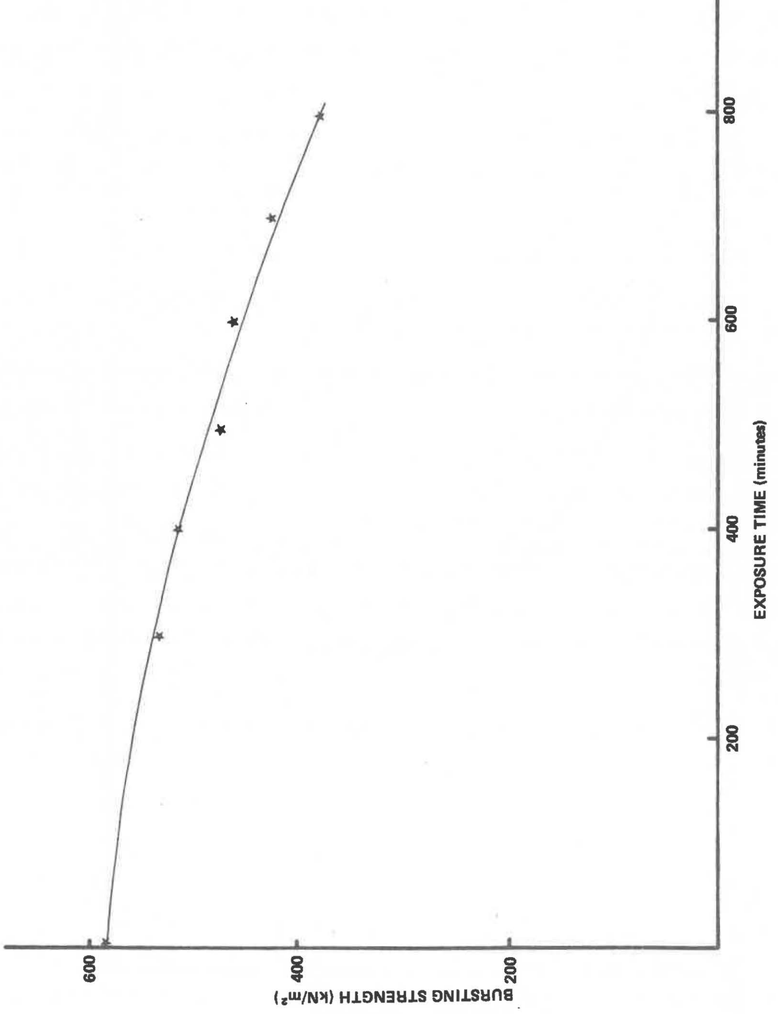

FIGURE 1
The effect of exposure time on the bursting strength of cotton fabrics

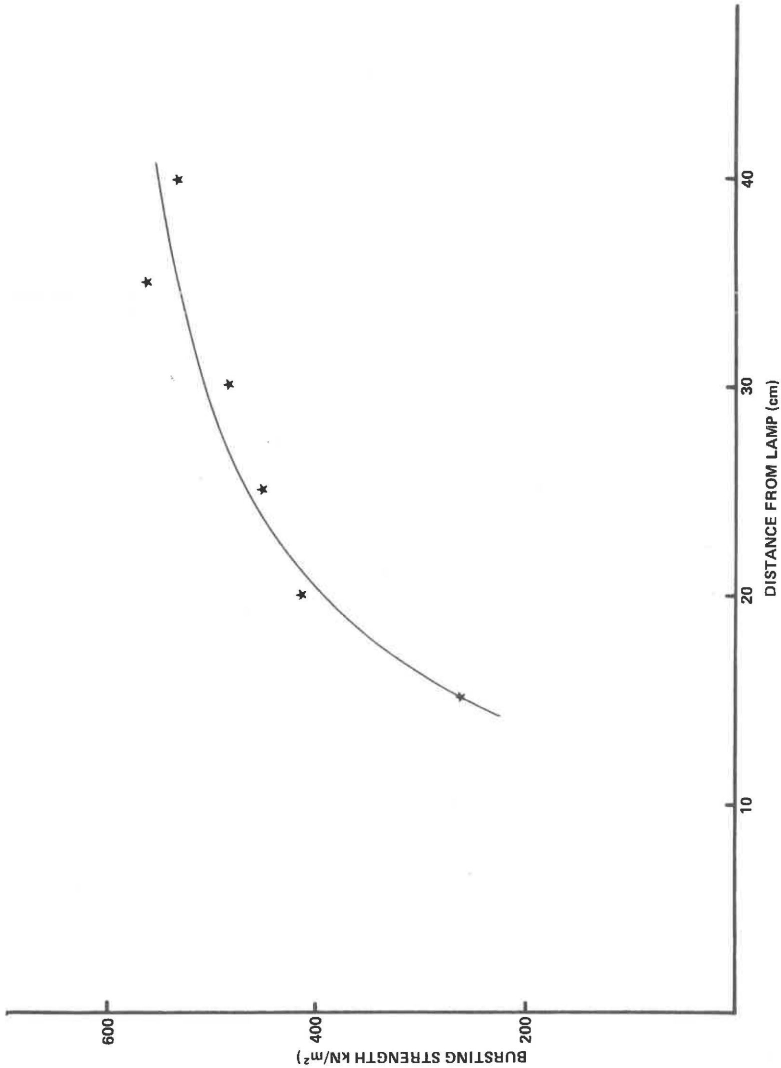

FIGURE 2

The effect of the distance between the lamp and sample on its bursting strength

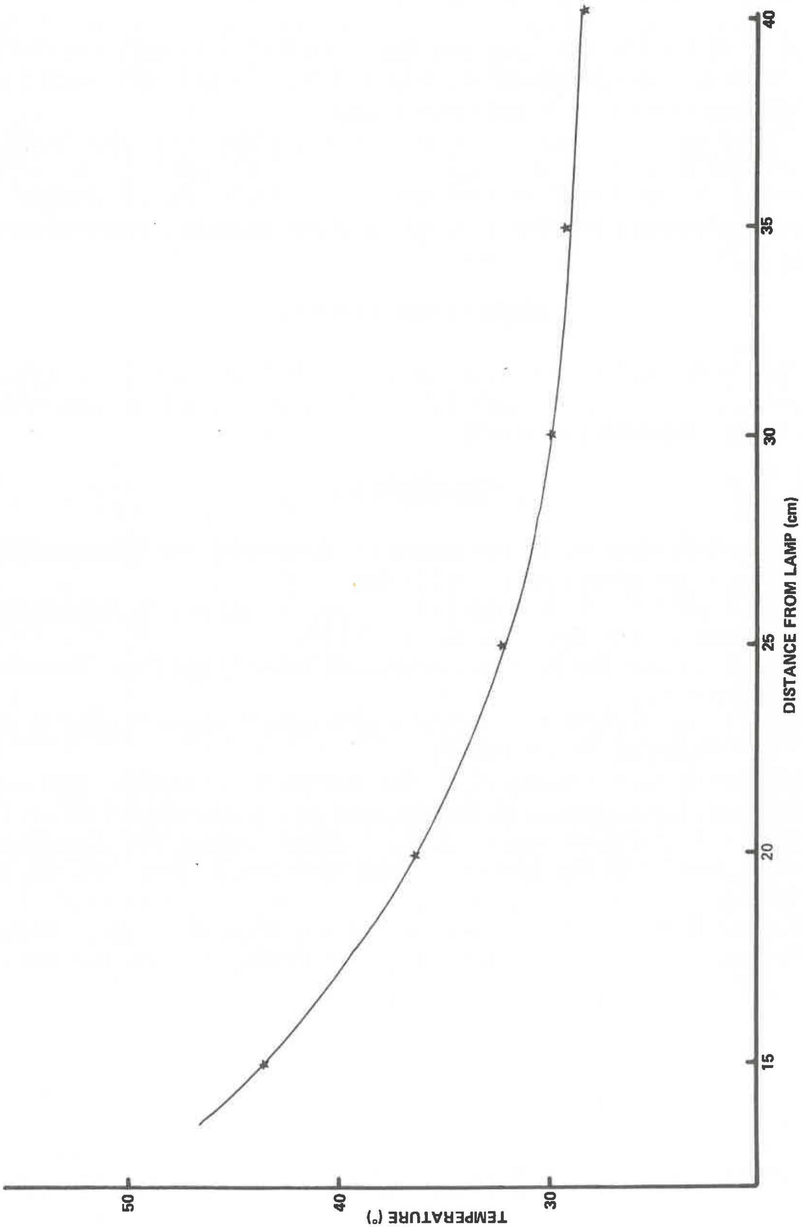

FIGURE 3

The effect of the distance between the lamp and sample on its temperature

relatively high. Furthermore, fairly large fabric samples are normally required for physical testing, and the size and the number of samples to be exposed also will affect the distance between the samples and lamp.

Fincher *et al*[7] showed that there was a good correlation between the MBTF lamp and sunlight in the degradation of polyethylene and polypropylene fabrics. It remains to be established, however, whether the MBTF lamp and sunlight will give good correlations in the case of untreated and chemically modified cotton samples, as far as degradation is concerned.

ACKNOWLEDGEMENTS

The authors wish to thank the Testing Services Department for determining the bursting strength of the samples, and the Rhodesian Cotton Promotion Council for permission to publish these results.

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A NOTE ON THE PRODUCTION OF MOHAIR-BASED SLUB YARNS ON THE REPCO SPINNER

by S. G. MARSLAND and D. W. F. TURPIE

ABSTRACT

An attractive core-spun mohair-based self-twist slub yarn comprising a mohair base and a rayon slub was spun successfully on the Repco Spinner.

INTRODUCTION

The Repco Spinner was originally applied for the processing of wool of 58's quality (about 25,5 μm) or finer, with an oil content of up to 1,5 *per cent*, either alone or blended with synthetic fibres, and 100 *per cent* synthetics of equivalent length and dtex. Subsequently, however, it has been shown that New Zealand cross-bred wools of up to 39 μm in mean fibre diameter can be spun on this machine, although only at extreme conditions of roller weighting[1]. More recently, during some preliminary trials in the spinning of mohair on the Repco, nylon flat multi-filament yarn was used to assist spinning performance[2]. In one method a filament was introduced into each strand of mohair from a position behind the front rollers. This allowed relatively low and practical levels of roller loading (below 400 cN) to be used on Super Kids (24 μm) and Kids (31 μm), but a high loading was still necessary for Adult hair (40 μm).

To further improve the versatility of the Repco machine, it was shown from work carried out at WRONZ on Romcross wool that an ST slub yarn could be produced on the Repco by introducing a woollen slubbing into the drafting zone[3]. The novel yarns and knitted fabrics produced from them aroused commercial interest for such applications as polo-neck jerseys for skiers. It was of interest, in view of the recent work carried out at SAWTRI on mohair spinning on the Repco to ascertain if some attractive slub yarns could be made using mohair. The mohair could be used in the base yarn or in the slub, or both. The work reported in this publication is concerned with using mohair in the base yarn only, and with various other fibres in the slub.

EXPERIMENTAL

Materials:

The materials selected for making the base yarn and slubs are listed in Table I.

The four lots of mohair tops required for the base yarn were each subjected to three operations of drawing on a Schlumberger intersecting gill box followed by one operation on a Schlumberger double apron high draft finisher, type FM 1. The

TABLE I

MATERIALS USED FOR BASE YARN AND SLUBS

LOT NO.	REQUIRED FOR	DESCRIPTION OF MATERIAL
B3	Base yarn	Undyed mohair top produced on worsted system. Mean fibre length 78 mm, CV 62%. Percentage fibres shorter than 25 mm = 19. Mean fibre diameter 26,6 μm.
B4	Base yarn	Dyed mohair top (Red) produced on semi-worsted system. Mean fibre length 61 mm, CV 76%. Percentage fibres shorter than 25 mm = 28. Mean fibre diameter 27,1 μm.
B2	Base yarn	Dyed mohair top (Blue) produced on semi-worsted system. Mean fibre length 77 mm, CV 64%. Percentage fibres shorter than 25 mm = 26. Mean fibre diameter 26,4 μm.
B1	Base yarn	Dyed mohair top (Yellow) produced on semi-worsted system. Mean fibre length 69 mm, CV 70%. Percentage fibres shorter than 25 mm = 26. Mean fibre diameter 26,7 μm.
S1	Slub	Cotton (Brazilian) roving (440 tex)
S2	Slub	Short wool twistless roving (dyed red). Mean fibre length 34 mm, CV 26%. Mean fibre diameter 21,3 μm (500 tex).
S3	Slub	Short wool roving (dyed red) as above, but produced on a Cotton Speed Frame (400 tex).
S4	Slub	Polyester twistless roving (38 mm, 320 tex).
S5	Slub	Polyester roving (38 mm) produced on the Cotton system (470 tex).
S6	Slub	50/50 Wool/Polyester blend roving produced on the Cotton system (400 tex).
S7	Slub	Rayon (6,6 dtex) Woollen condenser slubbing (supplied in four different colours – orange, brown, light brown and dark brown. 400, 350, 140 and 370 tex respectively.

draft on the latter machine was set to produce various linear densities of roving, as required. The various rovings required for the slubs were used as received. In all experiments a 22 dtex f7 flat nylon multifilament yarn was used to assist spinning performance (see below).

Spinning:

Spinning was carried out on a Repco Spinner Mk.I. Only two heads (one at each end of the ST rollers) were run for the tests to facilitate creeling up of all the base and slub components. (A small modification would be necessary to enable all four heads to be used for this purpose in practice).

Initially, the one strand of the ST yarn comprised the *base* yarn material together with one nylon multi-filament yarn, while the other strand comprised the *slub* material together with another nylon filament yarn. The filament yarns were inserted from behind and below the bottom front roller. Subsequently, one strand of the ST yarn was produced from the *base* yarn material together with one nylon filament yarn, and the other strand was produced from the same *base* yarn material plus the *slub* material together with another nylon filament yarn. (See Table II).

The total roller loading was set at 466 cN. Delivery speed was set at 220 m/min. The ratch was set at 21,6 cm. The draft was varied for different lots (see text).

RESULTS AND DISCUSSION

Due mainly to the nylon filament yarns in each of the strands, no difficulties were experienced in producing ST yarns from the various lots. Difficulties were experienced, however, in producing a satisfactory slub. Results of the spinning trials are given in Table II.

From Table II it can be seen that initially trials were carried out using cotton, then short wool (twistless roving) and then polyester (twistless roving) for the slub, but without a base yarn in the right-hand strand. The linear density of the input rovings and also the spinning draft, were varied as shown in the table: The twistless rovings did not produce a slub in spite of their short fibre length, and even increasing the draft up to 30 was unsuccessful. The cotton roving, however, (containing a low twist) produced a fairly good slub. In all cases there was a small continuation of drafted cotton fibres between each slub.

Further results concerning the use of cotton, wool, polyester and wool/polyester rovings are given in Table II. All of these had a low twist and were used in conjunction with a mohair base in both strands. None of the combinations used was able to produce a slub.

Finally, results on the use of rayon woollen slubbings together with a mohair base in both strands are also given in Table II. These slubbings produced an attractive, well defined slub with variable clear spaces in between successive slubs. The slubs were tapered at each end into the body of the yarn, a factor which could be advantageous in subsequent knitting.

TABLE II

RESULTS OF SPINNING TRIALS

INPUT TO MACHINE: For right-hand strand (one nylon multifilament yarn plus:) — Slub Lot	Slub Tex	Base Lot	Base Tex	For left-hand strand (one nylon multifilament yarn plus:) — Base Lot	Base Tex	SPINNING DRAFT	RESULTANT LINEAR DENSITY OF STANDARD YARN (includes nylon) (tex)	REMARKS
S1 Cotton	880	None		B1 (Yellow mohair)	760	15	114	Fair slub
	880				1000	15	130	Fair slub
	1320				1000	15	159	Fair slub
	1320				2000	25	137	Fair slub
	1320				2000	30	115	Fair slub
S2 (Short wool, twistless)	1000	None		B1 (Yellow mohair)	1000	15	138	No slub
					1000	20	105	No slub
					1000	30	71	No slub
					2000	15	205	No slub
					2000	20	155	No slub
S4 (Polyester twistless)	640	None		B1 (Yellow mohair)	2000	15	180	No slub
					2000	20	137	No slub
S1 (Cotton)	440	B2 (Blue mohair)	1000	B2 (Blue mohair)	1000	15	167	No slub
S3 (Wool, low twist)	400	B3 (Undyed mohair)	1000	B3 (Undyed mohair)	1000	15	165	No slub
S5 (Polyester, low twist)	470	B2 (Blue mohair)	1000	B2 (Blue mohair)	1000	15	169	No slub
S6 (Wool/Polyester)	400	B2 (Blue mohair)	1000	B2 (Blue mohair)	1000	15	165	No slub
S7 (Rayon) -Orange	800	B1 (Yellow mohair)	1000	B1 (Yellow mohair)	1000	15	191	V.Good slub
	400		1000		1000	15	165	V.Good slub
	400	B3 (Undyed mohair)	1000	B3 (Undyed mohair)	1000	15	165	V.Good slub
-L.Brown	140		1130		1130	15	165	V.Good slub
-D.Brown	370		1810		1810	25	164	V.Good slub
-Brown	350	B4 (Red mohair)	1820	B4 (Red mohair)	1820	25	164	V.Good slub

TABLE III

	MOHAIR BASE	RAYON (ACRYLIC) SLUB	NYLON FILAMENT
Sample 1	81% (Undyed)	16% (Orange)	3%
Sample 2	92% (Undyed)	5% (Light Brown)	3%
Sample 3	88% (Undyed)	9% (Dark Brown)	3%
Sample 4	89% (Red)	8% (Brown)	3%

About 5 kg of each of the last four combinations shown in Table II for the rayon condenser slubbing were spun into yarn sample lots for further trials without experiencing any technical problems. The composition of these yarns (Table III) was varied according to the effect desired. The resultant yarns were very attractive, having the appearance of space-dyed material with the slub giving a two-tone effect. This initial work would appear worthwhile following up to find the most suitable fabric for this type of yarn, and also to see whether a *mohair* slub could be made successfully on this machine.

CONCLUSION

A core-spun self-twist mohair-based slub yarn, comprising a mohair base and a rayon slub, was spun successfully on the Repco Spinner. The rayon slub was produced from a woollen slubbing of rayon (acrylic) introduced into the drafting zone. The slub yarn was attractive, having the appearance of space-dyed material.

ACKNOWLEDGEMENTS

The authors wish to record their thanks to Messrs Table Bay Spinners for supplying the rayon (acrylic) condenser slubbings, Mr H. Taylor of the Department of Cotton Processing for supplying the various speed frame rovings and the staff of the Department of Carding and Combing for supplying the remaining materials. Permission by the Mohair Board to publish this paper is gratefully acknowledged.

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A PRELIMINARY REPORT ON THE TREATMENT OF 70/30 COTTON/WOOL BLENDS WITH LIQUID AMMONIA AND DURABLE PRESS RESINS

by F. A. BARKHUYSEN and N. J. J. VAN RENSBURG

ABSTRACT

The effect of liquid ammonia and durable press resins on the dimensional stability and crease recovery angle of 70/30 cotton/wool blended fabrics was investigated. A pretreatment with liquid ammonia, and the subsequent removal of ammonia by hot water, followed by a resin treatment, produced fabrics which changed less than 2 per cent in area after a two-hour wash test.

INTRODUCTION

The treatment of cotton with liquid ammonia is a relatively new development and yet a considerable amount of research has been carried out in this field. Fundamental studies as well as technological investigations have been carried out by various groups and the effect of liquid ammonia on the properties of cotton is well documented[1]. Mercerising with liquid ammonia can produce profound changes in the structure and morphology of the cotton fibre. Liquid ammonia acts as a swelling agent and changes the ribbon-like cotton fibre into a cylindrical form, which is recrystallised in a more uniform way by removal of the ammonia under tension. Treatment of cotton with liquid ammonia offers several advantages. It is, for example, well-known that cotton fabrics can shrink considerably during washing. Treatment of the fabrics with liquid ammonia, however, can reduce this shrinkage to acceptable levels[2]. It was furthermore established that a liquid ammonia pretreatment of cotton significantly reduced strength losses caused by durable press resin treatments[3, 4].

Recently the treatment of *wool* with liquid ammonia also has received a fair amount of attention. Pitts found that supercontraction of the wool fibre occurred in liquid ammonia[5]. This was characterised by a crimp reversal, with the ortho- and paracortices changing position as a consequence of their differential contraction. This reversal was accompanied by a substantial increase in the fibre crimp frequency[5, 6].

SAWTRI at present is studying the properties and behaviour of cotton/wool blends and it was decided to also investigate the effect of liquid ammonia on the dimensional stability of a 70/30 cotton/wool blend. The effect of liquid ammonia as a *pretreatment* for durable press finishing using an aminoplast resin and a silicone polymer was also studied.

EXPERIMENTAL

Two woven 70/30 cotton/wool 2/2 twill fabrics with mass/unit area of 140 g/m^2 and 280 g/m^2, respectively, were used in this investigation. The fabrics were treated with liquid ammonia on the SAWTRI liquid ammonia merceriser as was described earlier[2]. The fabrics were stretched 6 *per cent* in the warp direction, the contact time in the liquid ammonia was 15 seconds and the ammonia was removed from the fabrics by heat or hot water. Some of these fabrics were treated with a DMDHEU type resin (Fixapret CP conc, BASF) together with a silicone polymer (Dow Corning Q2-4011B emulsion, T4-0149 additive and 182A catalyst) as was described earlier for all-cotton fabrics[7]. The consolidation of the fabrics during the liquid ammonia treatment and the dimensional stability of the treated fabrics during washing in a Cubex apparatus were determined in the normal manner. The various physical properties of the fabrics were determined as usual.

RESULTS AND DISCUSSION

The effect of liquid ammonia and various resin treatments on the dimensional stability of the cotton/wool blended fabrics is given in Table I. Prior to the treatments the fabrics were crabbed and subsequently scoured to remove size and other impurities from the fibres. This resulted in a consolidation of approximately 9 *per cent* in area in the case of the lightweight fabric, and 5 *per cent* in the case of the heavyweight fabric. There was little change in the dimensions of the fabrics during treatment in liquid ammonia. When the ammonia was removed from the fabric by water, the fabric area appeared to increase slightly. The liquid ammonia, however, had a significant effect on the dimensional stability of the fabrics during washing tests. It reduced the degree of shrinkage of the fabrics, especially the heavyweight fabric. Although the effect was smaller in the case of the lightweight fabric, the *surface appearance* or *smoothness* of the samples treated with ammonia was far better than that of the untreated samples after washing. The removal of the ammonia by water treatment produced fabrics with a slightly better dimensional stability than removal by heat treatment.

The resin treatments generally had little effect on the degree of shrinkage of the fabrics which had not been treated with liquid ammonia. Pretreatment with liquid ammonia, however, resulted in a significant improvement in the dimensional stability of the fabrics. Removal of the ammonia by water produced better results than removal by heat. When the liquid ammonia was removed from the fabrics by water, followed by the resin treatment, the total change in fabric dimensions after a two hour wash test was less than 2 *per cent.*

The effect of liquid ammonia and various resin treatments on the crease recovery angle and bursting strength of the fabrics is shown in Table II. The liquid ammonia increased the crease recovery angles of the fabrics (not resin treated) slightly. In the case of the resin treatments, it was found that the liquid ammonia pretreatment had a significant effect on the crease recovery angle of the fabrics.

TABLE I
THE EFFECT OF LIQUID AMMONIA AND VARIOUS DURABLE PRESS RESINS ON THE DIMENSIONAL STABILITY OF 70/30 COTTON/WOOL BLENDS

Fabric	Treatment	% Area Shrinkage after*				
		Ammonia Treatment	Relaxation	30 Min Wash	60 Min Wash	120 Min Wash
Lightweight	Untreated Control		6,4	7,7	7,9	9,0
	NH_3 (heat removal)	2,5	5,3	7,1	6,3	5,0
	NH_3 (water removal)	-0,8	3,3	4,8	4,4	4,8
	Control + 2% Silicone		13,8	9,0	10,2	10,2
	Control + 2% Silicone + 8% DMDHEU		6,2	6,7	6,2	6,6
	Control + 8% DMDHEU		7,6	7,1	8,5	6,7
	NH_3 (heat removal) + 2% Silicone		7,2	7,3	5,4	5,4
	NH_3 (heat removal) + 2% Silicone + 8% DMDHEU		4,9	4,9	4,9	3,9
	NH_3 (Heat removal) + 8% DMDHEU		4,4	4,4	4,4	4,9
	NH_3 (water removal) + 2% Silicone		3,1	2,1	0,1	1,6
	NH_3 (water removal) + 2% Silicone + 8% DMDHEU		2,1	0,6	0,6	1,1
	NH_3 (water removal) + 8% DMDHEU		2,1	0,6	0,2	0,6
Heavyweight	Untreated Control		6,1	8,0	7,3	8,0
	NH_3 (heat removal)	-1,8	1,4	1,8	2,5	3,0
	NH_3 (water removal)	-3,5	0,1	-0,4	-0,4	0,1
	Control + 2% Silicone		6,7	8,5	8,6	8,1
	Control + 2% Silicone + 8% DMDHEU		3,8	3,8	2,9	3,8
	Control + 8% DMDHEU		1,9	2,4	1,4	1,4
	NH_3 (heat removal) + 2% Silicone		–	3,5	3,5	2,5
	NH_3 (heat removal) + 2% Silicone + 8% DMDHEU		–	0,6	1,1	1,1
	NH_3 (heat removal) + 8% DMDHEU		–	-0,9	-0,4	-0,4
	NH_3 (water removal) + 2% Silicone		-1,6	-1,1	-1,1	-1,1
	NH_3 (water removal) + 2% Silicone + 8% DMDHEU		-2,5	-1,1	-1,1	-0,6
	NH_3 (water removal) + 8% DMDHEU		-2,5	-2,5	-3,5	-2,1

*All values are based on the dimensions of the fabrics after crabbing and scouring

Removal of the ammonia by heat generally produced slightly higher crease recovery angles and removal by water produced slightly lower crease recovery angles, compared with the resin-treated control fabrics. No clear trends could be observed when

TABLE II

THE EFFECT OF LIQUID AMMONIA AND DURABLE PRESS RESINS ON THE CREASE RECOVERY ANGLE AND BURSTING STRENGTH OF 70/30 COTTON/WOOL BLENDS

Fabric	Treatment	Crease Recovery Angle (de-aged) (°)	Bursting Strength (kN/m²)
Light-weight	Control	250	937
	Control + 2% Silicone	252	809
	Control + 2% Silicone + 5% DMDHEU	281	579
	Control + 2% Silicone + 8% DMDHEU	296	478
	Control + 5% DMDHEU	290	557
	Control + 8% DMDHEU	293	468
	NH_3 (heat removal)	263	738
	NH_3 (heat removal) + 2% Silicone	263	665
	NH_3 (heat removal) + 2% Silicone + 5% DMDHEU	288	557
	NH_3 (heat removal) + 2% Silicone + 8% DMDHEU	292	547
	NH_3 (heat removal) + 5% DMDHEU	295	561
	NH_3 (heat removal) + 8% DMDHEU	299	497
	NH_3 (water removal)	258	657
	NH_3 (water removal) + 2% Silicone	263	652
	NH_3 (water removal) + 2% Silicone + 5% DMDHEU	275	546
	NH_3 (water removal) + 2% Silicone + 8% DMDHEU	284	517
	NH_3 (water removal) + 5% DMDHEU	285	600
	NH_3 (water removal) + 8% DMDHEU	283	590
Heavy-weight	Control	232	1824
	Control + 2% Silicone	257	1726
	Control + 2% Silicone + 5% DMDHEU	276	1353
	Control + 2% Silicone + 8% DMDHEU	284	1197
	Control + 5% DMDHEU	264	1370
	Control + 8% DMDHEU	275	1002
	NH_3 (heat removal)	242	1731
	NH_3 (heat removal) + 2% Silicone	265	1689
	NH_3 (heat removal) + 2% Silicone + 5% DMDHEU	272	1437
	NH_3 (heat removal) + 2% Silicone + 8% DMDHEU	280	1331
	NH_3 (heat removal) + 5% DMDHEU	265	1453
	NH_3 (heat removal) + 8% DMDHEU	276	1252
	NH_3 (water removal)	233	1636
	NH_3 (water removal) + 2% Silicone	262	1610
	NH_3 (water removal) + 2% Silicone + 5% DMDHEU	271	1437
	NH_3 (water removal) + 2% Silicone + 8% DMDHEU	275	1301
	NH_3 (water removal) + 5% DMDHEU	253	1424
	NH_3 (water removal) + 8% DMDHEU	269	1262

the bursting strength values of the various samples were considered, but where DMDHEU resin was used, pretreatment with liquid ammonia resulted in slightly higher bursting strength values compared to fabrics not given this pretreatment.

A comparison of the different resin treatments shows that for the lightweight fabric, the crease recovery angle was in most of the cases increased to values higher than 280° except for the 2 *per cent* silicone polymer treatment. On average, the DMDHEU and DMDHEU plus silicone polymer treatments increased the crease recovery angle by approximately 28 degrees. For the heavyweight fabric these resin treatments increased the crease recovery angle by about 34 degrees, but in most cases it was still lower than 280°.

SUMMARY

The effect of liquid ammonia and various resin treatments on the dimensional stability and crease recovery angles of lightweight and heavyweight 70/30 cotton/wool blended fabrics was investigated. The liquid ammonia treatment reduced the degree of shrinkage of the fabrics during washing and also improved the surface appearance of the fabrics.

The liquid ammonia treatment did not, however, inhibit the shrinkage of the fabrics completely. When the liquid ammonia was removed from the fabrics by water, followed by a resin treatment, the change in fabric dimensions after a two hour wash test was less than 2 *per cent*.

The liquid ammonia treatment had a significant effect on the crease recovery angles of the resin-treated fabrics. Removal of the ammonia by heat generally produced slightly higher crease recovery angles, and removal by water slightly lower crease recovery angles, compared with the resin-treated control fabrics. The effect of liquid ammonia on the bursting strength of the fabrics was not quite clear. In the case of the DMDHEU resin, the fabrics pretreated with liquid ammonia had slightly higher bursting strength values than those not given this pretreatment.

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THE USE OF PROPRIETARY NAMES

The fact that chemicals with proprietary names have been used in this investigation in no way implies that SAWTRI recommends them or that there are not substitutes which may be of equal or even better value.

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