SAWTRI BULLETIN

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

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Editor: P. de W. Olivier, B.Sc.

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SOUTH AFRICAN WOOL AND TEXTILE RESEARCH INSTITUTE OF THE CSIR

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P.O. Box 1124,
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EDITORIAL

The completion of the Institute's new cotton processing divisions during this past quarter has added a new dimension to the facilities for textile research at the Institute which is of considerable importance to the future of the cotton industry in Southern Africa. The importance of this development in SAWTRI's research work has been accentuated by the enormously changed situation in the world supply of fibres, now aggravated by the oil crisis. In this situation cotton growers will undoubtedly meet an increasing demand for their product. Even before the momentous events of the past few months there had been a swing back to natural fibres which boosted prices and stimulated production in South Africa to a level previously considered unattainable.

It is generally accepted in commodity trading circles that what goes up must eventually come down and history has proved this to be true – the vital difference today being, however, that all things being equal, cotton prices are not likely to recede to anywhere near previous levels. Cotton, and more cotton, is needed by the world – growers have an unequalled opportunity to produce cotton with the confidence that a ready market awaits their product and at a far more lucrative price level than in the past.

Little, however, remains static in the commercial world and man's resourcefulness is such that this market situation is not likely to remain free from attack by competitive fibres but time is on the side of the cotton industry and now is the time to prepare defences. How better then to do this than through vigorous scientifically based technological innovation? The South African Wool and Textile Research Institute's new cotton processing and finishing divisions, notably by virtue of the employment of liquid ammonia mercerisation, the gas phase reactor for durable press treatment, offer this prospect to the entire cotton industry of Southern Africa – from grower to manufacturer. If all segments of the industry work together making the fullest use of the Institute's facilities and knowledge there is every reason to believe that cotton's present sound position can be even strenghtened so that the future may be faced with confidence by all.

INSTITUTE NEWS

Director to relinquish important post

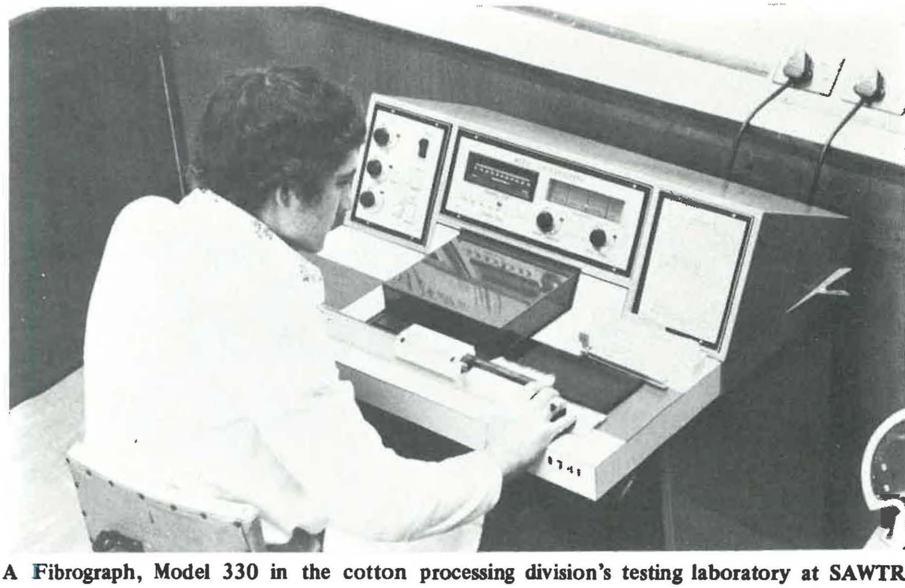
It is with regret that we have to announce the decision by SAWTRI's Director Dr. D. P. Veldsman to resign from the Wool Board on which he had been serving as a member representing the processing industry for the past five years. Dr. Veldsman's resignation took effect on March 4th.

Director's Visits

During the latter half of January, the Director paid a visit to Cape Town where he attended the first meeting for 1974 of the Textile Advisory Committee to the Textile Institute. While in Cape Town he addressed the Cape Knitters' Association on textile training and paid visits to a number of member firms.

Opening of New Cotton Processing Division

To mark the opening of the cotton processing division, a COTTON DAY is to be held at the Institute on May 1st. The opening ceremony will be performed by the President of the CSIR, Dr. C. van der Merwe Brink and will be attended by many leading personalities of the cotton industry in Southern Africa. Invitations have been sent to Swaziland, Malawi, Rhodesia and South Africa. A full day's programme has been arranged which makes provision for a number of prominent speakers, all specialists in their respective fields, to present papers dealing with cotton production in Southern Africa, mechanical harvesting and ginning of cotton, cotton



A Fibrograph, Model 330 in the cotton processing division's testing laboratory at SAWTRI

grading and cotton processing. This panel discussion will be preceded by a conducted tour of the Institute's weaving and knitting divisions, the cotton processing division, as well as through the new extension to the existing dyeing and finishing division which will accommodate apparatus for the finishing of cotton products.

New Textile Science Graduates

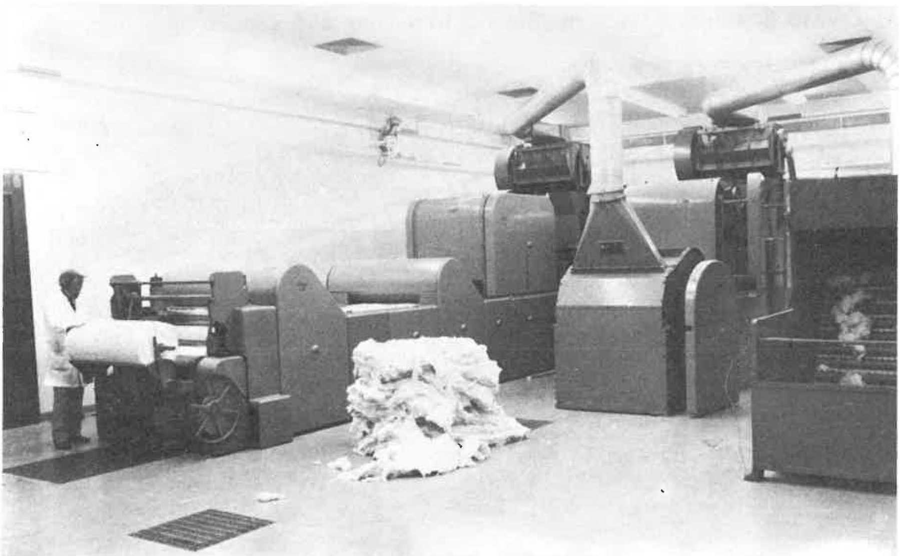
The Graduation Ceremony of the University of Port Elizabeth on March 28th will mark the end of textile training at under-graduate level at the University. The last batch of B.Sc. (Textiles) students will receive their degrees. They are: Messrs. S. Silverman (*cum laude*); M. Cawood, A. Slevin and R. Large.

The following candidates are to receive the degree of M.Sc. (Textiles): Messrs. H. M. Silver, M. A. Strydom and J. G. Buys.

The degree of Ph.D. is to be conferred on Messrs. D. W. F. Turpie and L. Hunter.

Honorary Doctorate

An Honorary Doctorate in Textiles is to be conferred by the University of Port Elizabeth at the March graduation ceremony on Mr. Norman Cryer who, at the end of 1972 retired from the S.A. Bureau of Standards and who is now a textile consultant to the Bureau.



SAWTRI's blowroom equipment in the new cotton processing plant. Appearing from left to right are a double beater scutcher; a porcupine opener; and part of a bale breaker on the extreme right

Mr. Neville Vogt, Regional Liaison Officer for the CSIR, Mr. Derek Turpie, Group Leader for Carding, Combing, Worsted Spinning and Scouring at SAWTRI; Lord Barnby and Mr. W. F. Reynolds photographed during discussions on the occasion of Lord Barnby's visit to SAWTRI recently

New Adviser

Dr. Sanderson of the University of Stellenbosch has been appointed Adviser to the Institute on matters relating to Textile Chemistry, Dyeing and Finishing in the place of Dr. F. Joubert.

Replacement of Dr. F. Joubert on the Research Advisory Committee

Mr. J. Visser, Director of the National Productivity Institute is to replace Dr. F. Joubert on the Research Advisory Committee as the CSIR's representative appointed by the President.

Fact Finding Survey of the *Phormium tenax* Industry

A fact finding committee has been formed by the Department of Industries to survey the existing production of *Phormium tenax* leaf in the Transkei and Kwazulu as well as fibre production over the next few years. Mr. N. J. Vogt, Regional Liaison Officer of the CSIR stationed at SAWTRI is a member of the committee. The committee visited Butterworth, Lusikisiki, Nkandla, Nkonisa and Ntwinge by aircraft and have now made certain recommendations to the Department of Industries. The Committee met again at SAWTRI on March 11th for further discussions.

Visitors to the Institute

SAWTRI was once again honoured by a visit from Lord Barnby, a wellknown personality renowned in world wool circles and a staunch friend of South Africa. Accompanied by his business associate in South Africa, Mr. W. F. Reynolds, Lord Barnby was shown through the Institute on February 8th.

A smiling group of representatives of Messrs. Johnson and Johnson during a visit to the Institute on January 18th. The gentlemen were taken through the processing departments and laboratories by Mr. Neville Vogt, fourth from the right

Miss M. A. Murray of Information and Research Services of the CSIR in Pretoria had discussions with Mr. Vogt on possible future articles for publication in "Scientific Progress", a CSIR publication regularly reporting scientific achievements in South Africa, on February 15th. The annual visit to the Institute by the final year Industrial Economics students from the University of Port Elizabeth took place on February 22nd when they were given a short talk on the activities of the Institute and shown around the processing divisions.

New Members

The following firms are welcomed to the fold of Textile Research supporters:

Messrs. Johnson and Johnson

Messrs. Dunlop Flooring

We trust that these new members will derive much benefit from their now closer association with the Institute to their mutual benefit.

Regional Office Activities

The Regional Office is at present making arrangements in collaboration with the CSIR for a course in Low Cost Automation to be held at SAWTRI from 28th April to 8th May.

The Regional Office and the Institution of Mechanical Engineers are organising a Symposium "The Future of the Motor Industry in South Africa" to be held in Port Elizabeth on June 3rd, 4th and 5th.

SAWTRI PUBLICATIONS

Technical Reports

No. 211 : Hunter, L., The Relationship between certain Yarn and Fibre Properties.

No. 212 : Musmeci, S. A. and Turpie, D. W. F., Application of a Cobalto-thiocyanate Method for the Rapid Determination of Synthetic Non-ionic Detergent (Ethylene Oxide Type) in Wool Scouring Liquors and in Recovered Wool Grease.

No. 213 : Turpie, D. W. F. and Godawa, T. O., The Production of Tops from very Seedy Mohair with and without Carbonising.

No. 214 : Robinson, G. A., Ellis, R. and Gee, E., Incorporation of Leno Weave Units into Lightweight All-Wool Worsted Fabric.

No. 215 : Smuts, S. and Hunter, L., A Comparison of the Tenacity and Extension of Mohair and Kemp Fibres.

No. 216 : Robinson, G. A. and McNaughton, D., An Unconventional Method of Producing a Mohair Pile Fabric on a Sinker Wheel Knitting Machine to Obtain Improved Fibre Retention.

No. 217 : Hunter, L. and Smuts, S., A Preliminary Report on the Measurement of the Unevenness of Plain Jersey Fabrics.

No. 218 : Buys, G., Van der Merwe, J. P. and Van Rooyen, Annette, The Dimensional Stability of Single Jersey Fabrics from Wool-Rich Blends.

TEXTILE ABSTRACTS

Spuntex – a new air-textured polyester yarn that shows a high performance with low cost: Anon., Textile Manufacturer, 46 (Nov., 1973).

This process appears to be a modification of the well-known Taslan process. Taslan-textured filament suffers from a serious drawback – it has a multitude of tiny loops across its surface. These loops produce a rough surface which causes scratchiness.

Apparently, "spuntex" yarn has no such problem and will, it is claimed, introduce a new dimension in the single and double jersey textured field. In addition, the fabrics made from this type of yarn closely resemble those made from worsted spun yarns.

Spuntex yarns are made without heat setting and offer distinct advantages in terms of even dyeings. These yarns may also find considerable application in woven cloths as warp and weft.

D.P.V.

Effect of Feeding Conditions at the Ring Frame Upon Yarn Quality and Spinning Performance: N. Balasubramanian and G. K. Trivedi, Textile Res. Journal, 43, (1973) 1–9.

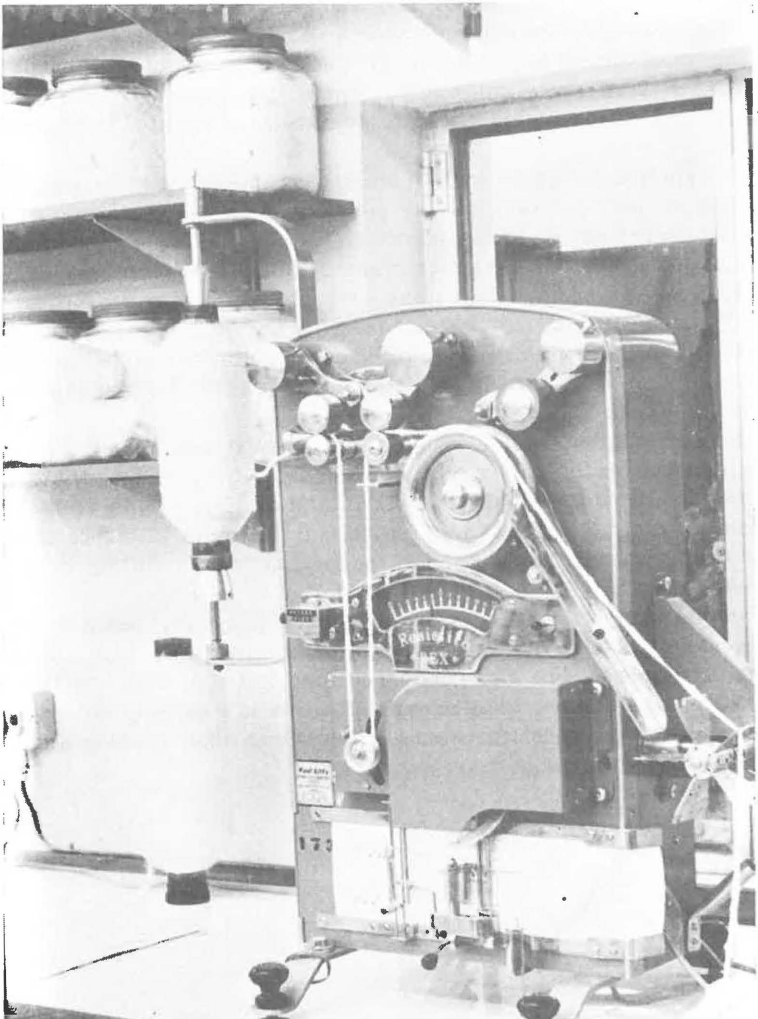
Roving tex (or the ring frame draft in the range 14 to 35) had little effect on either strength or regularity of the yarn for coarse and medium varieties of cotton. For long staple cottons the quality of yarn deteriorated when roving tex and ring frame drafts were decreased. It appeared, therefore, that for long staple cottons the quality of drafting at the ring frame deteriorated with the use of fine rovings and low drafts.

The use of double rovings led to improvements in strength and evenness of yarns compared with single rovings of the same tex for all cottons tested. The improvement in yarn quality was, however, only marginal for long staple cottons. Thus, doubling at the ring frame offered a convenient method of improving yarn quality when coarse and medium staple cottons were used.

Because of the greater strand widths, with double feed, spinning performance was found to be poorer for coarse, medium staple cottons. The spinning performance, however, not only depended on the mixing but also deteriorated more rapidly as spindle speed increased and yarn tex decreased. The application of a condenser reduced the end-breakage rate in double-roving spinning and brought it to a level comparable to or even slightly better than the single roving spinning.

The practical importance of the investigations reported in this paper is that the quality of the yarn spun from coarse and medium staple cottons can be significantly improved by the use of doubling at the ring frame, and the use of a condenser at the ring frame.

De V. A.



A cotton roving tester at SAWTRI for measuring drafting force

Techniques for Evaluating Carding Efficiency and Sliver Quality: Jack Simpson, SRRL, America's Textiles Reporter/Bulletin AT-1(6), 40, 42, 44, 50, 52, (1972).

The measurement of parameters such as cylinder loading, cylinder to doffer fibre transfer, card sliver uniformity, neps in the card web, card sliver fibre orientation and waste removal efficiency are considered essential to describe carding efficiency.

The author describes methods of measuring some of the above parameters and gives some interesting results on the effect of micronaire reading, carding rate, sliver linear density etc. on these parameters.

The percentage fibre transfer from cylinder to doffer was significantly reduced when low micronaire cottons were processed. For the high micronaire cotton, fibre transfer generally increased slightly as carding rate increased while for the low micronaire cotton, fibre transfer decreased. The results showed that to increase carding rates further, much better cylinder to doffer fibre transfer at high carding rates must be obtained.

The nep content of the web showed a linear relationship with cylinder loading (cylinder loading is inversely proportional to the percentage fibre transfer). The slopes of the lines are always positive and increase rapidly with decreasing micronaire reading. It becomes more important therefore to reduce the cylinder loading to improve the carding action for low micronaire cottons than for high micronaire cottons.

For low nepping cottons an increase in carding rates caused a decrease in majority hooks and only a moderate increase in minority hooks resulting in improved spinning performance. For high nepping cottons optimum fibre orientation could only be obtained at lower carding rates than that for low nepping cottons.

The author also concludes from his results that fibres with high fibre friction and low recovery from compression, card poorly.

DE V. A.

ABSTRACTS OF RECENT SAWTRI TECHNICAL REPORTS

No. 211 : The Relationship Between Certain Yarn and Fibre Properties for Single Wool Worsted Yarns. Part I: Short term Yarn Irregularity – L. Hunter

A wide range (306) of commercial wool worsted hosiery yarns has been analysed to relate the fibre properties to the yarn properties. This allows a fairly accurate prediction of the extent of yarn irregularity (i.e. as % CV, thick and thin places and neps) if the fibre properties of the fibres comprising the yarns are known. The fibre properties, which were found to influence the yarn properties, included the mean fibre diameter and length and the proportion of the fibres in a yarn which had a mean length of less than a given predetermined length.

It was found that certain fibre properties affect the yarn irregularity more than others. In general, it was found that both the yarn irregularity and the number of thick and thin places (per kilometre of yarn) decrease with an increase in the number of fibres in the yarn cross-section. It was also established that the yarn irregularity depends to a high degree on the number of thick and thin places, and they should therefore not be regarded as independent properties of the yarn.

Apart from the average number of fibres in the yarn cross-section, the other fibre properties were found to have a less pronounced effect on yarn properties. The variation in fibre length was found to influence the frequency of nep formation, but the latter property was found to be most unpredictable. The proportion of short fibre apparently had no effect on any of the yarn properties.

From the mathematical equations that were established tables have been drawn up which may be used in practice to predict the performance of any wool worsted yarn.

No. 212 : Application of a Cobaltothiocyanate Method for the Rapid Determination of Synthetic Non-ionic Detergent (Ethylene Oxide Type) in Wool Scouring Liquors and in Recovered Wool Grease – S.A. Musmeci and D. W. F. Turpie

A methylene chloride solution containing cobaltothiocyanate is added to a test solution of scouring liquor containing wool grease, suint and non-ionic detergent. The methylene chloride phase settles out and develops a blue colour, which, after appropriate dilution with isopropanol, may be measured optically in a colorimeter. This is possible since it has been established that the intensity of the blue colour increases with the amount of non-ionic detergent present. It is therefore possible to determine the concentration of detergent by firstly drawing a calibration curve for a given detergent which is present in known quantities in an isopropanol/methylene chloride mixture.

It is, however, necessary to dilute the test liquors sufficiently to prevent the presence of wool grease and suint to influence the absorbance of the samples. Experiments were performed to determine the concentration levels which would increase the absorbance significantly, and it is suggested that a sample dilution of 1:25 would be sufficient for testing both conventional and unconventional first bowl scouring liquors. For testing wool grease itself, which may contain ± 6% of detergent, a dilution of 1:100 is recommended.

No. 213 : The Production of Tops from Very Seedy Mohair with and without Carbonising – D. W. F. Turpie and T. O. Godawa

It is shown that very seedy mohair (containing 15 *per cent* vegetable matter) can successfully be converted into tops after either conventional scouring and carbonising or scouring without subsequent carbonising. The tops produced from the scoured only mohair contained only slightly more residual impurities than did the tops from mohair that had been scoured and carbonised, but the combing yield (top plus noil) in the former case was 3 *per cent* higher and the tear was also slightly better. The tops produced from the mohair that had been scoured only were found to have a better fibre length distribution as well as a slightly longer mean fibre length than those produced from the hair that had been scoured and carbonised.

Subjective evaluation also indicated that the mohair which had been scoured only yielded a better top as regards lustre and colour, the handle having been found to be only slightly harsher.

No. 214 : Incorporation of Leno Weave Units into Lightweight All-Wool Worsted Fabric – G. A. Robinson, R. Ellis and E. Gee

Leno weave units were incorporated into a plain all-wool ladies' dress material of approximately 160–180 g/m^2 in various percentages and it is shown that there are possible advantages accruing from this practice in respect of fabric wrinkling propensity and stiffness without detracting unduly from the original fabric appearance. No attempt, however, was made to incorporate leno twist for design purposes. Disadvantages were found to be slight increases in thickness of the fabrics and slightly higher air permeabilities as well as a deterioration of abrasion resistance when high percentages of leno are incorporated into the fabric.

No. 215 : A Comparison of the Tenacity and Extension of Mohair and Kemp Fibres – S. Smuts and L. Hunter

The tensile properties (extension at break and tenacity) of mohair and kemp fibres were compared at different gauge lengths for different Cape and Basuto mohair types. At a gauge length of 10 mm the extension at break of the mohair and kemp fibres generally did not differ significantly while at the longer gauge lengths (40 mm, 50 mm, or 100 mm) the extension at break of the mohair fibres was generally, but not consistently, higher than that of the kemp fibres. Very few kemp fibres in the Cape mohair types investigated were, however, long enough to be tested at gauge lenghts of 50 mm and longer.

The tenacity (gm/tex) of the mohair fibres was nearly always higher than that of the kemp fibres, although, more often than not, the reverse was true in the case of the absolute fibre breaking strength.

No. 216 : An Unconventional Method of Producing a Mohair Pile Fabric on a Singer Wheel Knitting Machine to Obtain Improved Fibre Retention – G. A. Robinson and D. McNaughton

A modified method of laying-in mohair twisted roving on the Sinker Wheel knitting machine is described. This technique resulted in a much firmer fabric than that obtained by conventional methods. Fibre retention in the fabric was increased and there was a reduction in fibre loss during the raising process and subsequent use. About 30 *per cent* of the mohair twisted roving was actually incorporated into every fourth stitch, the other 70 *per cent* being laid-in. The roving twist and fibre length ensured that all fibres were secured into the fabric.

No. 217 : A Preliminary Report on the Measurement of the Unevenness of Plain Jersey Fabrics – L. Hunter and S. Smuts

The variation in surface irregularity, measured by means of a stylus lightly resting on, and traversed along the fabric surface as well as the variation in transmitted light measured by means of a photodensitometer, of single jersey fabrics were related to yarn irregularity. The latter method however, appeared to be the more promising as a practical method of obtaining a measure of the unevenness of knitted fabrics. An increase in yarn irregularity was found to be associated with an increase in fabric unevenness. Subjective rankings of fabric streakiness were correlated with all these variables. The effect of an increase in stitch length on the results obtained for surface irregularity was different from that on the fabric irregularity results measured by transmitted light. In the case of the surface irregularity test, the sample had to be mounted carefully since slight variations in mounting tension caused large variations in the results.

No. 218 : The Dimensional Stability of Single Jersey Fabrics from Wool-Rich Blends – G. Buys, J. P. van der Merwe and Annette van Rooyen

"Semi-locknit" single jersey fabrics of about 220 g/m^2 were produced employing feeder blending of either untreated wool yarns or DCCA treated wool yarns, with either polyester (continuous filament) or cotton yarns. In the case of untreated 70/30 wool/polyester filament or 50/50 wool/cotton fabrics autoclave decatising followed by a 1,5 *per cent* Synthappret LKF treatment, produced machine washability.

In the case of DCCA-treated wool/polyester fabrics, autoclave decatising or heat-setting with 2 *per cent* aminoplast resin added, also produced machine washability. The 50/50 wool/cotton blends could also be rendered machine washable after a KD and aminoplast resin treatment.

The mechanical properties of the various finished fabrics were similar in some cases but significant differences were found for some properties, depending on the finishing procedure.

SOME INTERESTING OBSERVATIONS IN THE COTTON RESEARCH FIELD

by DR. D. P. VELDSMAN

Although cotton research constitutes one of the oldest fields of textile research, efforts are continuing unabatedly to keep this fibre in the forefront of a highly competitive field comprising natural as well as synthetic fibres.

The purpose of this review is to outline very briefly some interesting observations which have been made in the research field recently.

Fibre hooks:

It is well-known that during the mechanical processing of cotton, fibre hooks are formed. The carding process, of course, is the main culprit in this respect and the trailing ends of the fibres contain more hooks (in the order of 60%) than the leading ends (in the order of 30%). Hence, the terms "majority hooks" and "minority hooks", are used. The best way of removing these hooks which, *inter alia*, affect the final properties of the yarn, is to draft the card sliver as many times as possible in the *same* direction as it came off the card. If the sliver is to be combed, drawing the precombed sliver as many times as is practical with the majority of hooks trailing, ensures that minimum removal of noil is effected without sacrificing quality. To obtain maximum yarn strength and minimum ends down the majority hooks must always *trail* in the *spinning* process whether slivers are carded or combed.

It is the general consensus of opinion today that where cards are coupled through a railhead system with a drawframe[1], either this passage alone, or else three drawframe passages should be used to maintain the correct fibre direction at the spinning frame. Because adequate yarn count regularity was unattainable at first, the railhead system with only one drawframe passage became feasible only with the development of efficient leveller drawframes. The modern tendency is, therefore, to use only one drawframe coupled to a number of cards.

Fibre alignment is also of major importance during early processing and the degree of fibre orientation or parallelisation can be tested by means of the SRRL triple clamp instrument[1].

"Discount cottons":

The blending of low micronaire (2,9) with high micronaire cotton (5,2) is commercially feasible according to recent publications[2, 3].

A 50/50-blend of mature and immature cotton was processed into woven fabric and to overcome the problem of unlevel or skittery dyeing, the fabrics were pre-treated by padding on (100% pick-up) a 4% caustic soda solution and 1% Lufibrol KB (BASF), the latter being a reductive bleach. The fabrics were subsequently steamed for one hour, washed and dried whereupon a padding with reactive dyes, to ensure even dyeings, followed.

Use of UV radiation to sort cottons:

It was recently observed[4] that cottons from different lots exhibited different degrees of UV-reflectance. When such lots are blended and dyed, streakiness is obtained. By using an UV-radiation screening technique, only lots having similar reflectances could be blended whereupon streak-free dyeings are obtained. An instrument has now been developed to carry out this screening operation. Such an instrument is produced by Messrs. Spinlab.

It is claimed that some cultivars produced in South Africa, are particularly prone to this variation in UV-reflectance and SAWTRI is currently engaged in making an in-depth investigation of the basic cause(s) of these differences.

Frictional properties of cotton fibres and spinning properties:

For many years it was known that at the *drawframe* the cotton fibres should have a low coefficient of friction whereas at the *spinning* frame high frictional properties are advantageous to spinnability. Recently this knowledge has been extended by an investigation[5] showing that increased friction at the spinning stage could be brought about by spraying an emulsion of colloidal silica onto the fibres as they emerge from the front rollers into the twisting zone. Even by spraying with water increased friction could be obtained. This reminds one of the TNO twistless spinning technique where water is used on the spinning frame. Processes such as bleaching and mercerisation would also increase the frictional properties of the cotton fibres. In view of the high negative correlation between yarn strength and coefficient of friction of raw cotton, however, it is not desirable to carry out such chemical treatments in the fibrous state. In this connection it should also be noted that although single fibre strength affects yarn strength most significantly, this parameter is not all that important for processing performance up to the spinning stage[6].

Resin treatments to obtain durable press (DP):

It is commonly known that aminoplast resin treatments to obtain DP-properties in all cotton will adversely affect the flex abrasion properties of the treated fabric. It is not commonly known to what extent this parameter can be affected before a fabric should be considered as commercially unacceptable.

A recent study[7] has shown that if resin-treated fabrics were to survive 40 wash cycles then the flex abrasion resistance must be round 1 000–2 000 abrasion cycles.

If the DP-treated fabrics could withstand 25 wash cycles and at least 500 flex abrasion cycles, such fabrics can be considered as having satisfactory wear life. At high levels of resin add-on the log flex abrasion resistance is linearly related to the number of wet wash cycles required for the first sign of damage to appear during the washing of dummy sleeves. The observations on dummy sleeves, therefore, appear to simulate actual wear.

Since liquid ammonia is becoming increasingly popular for the mercerising of cotton, it is interesting to observe what effect this treatment has on DP-treatments. A recent article[8] summarises the situation. Liquid ammonia treatment of resinated fabrics tends to adversely affect the treatment thereby reducing the crease recovery angle (angle decreased from 280° to 255° for a 10% resin add on). Nevertheless, the treatment tends to plasticize the resinated fabric so that permanent creases or embossed effects can be obtained.

When the resin treatment is preceded by liquid ammonia treatment followed by a proper removal of the ammonia (by air drying) improved overall DP-performance is obtained.

Methylol compounds cannot be applied simultaneously with a liquid ammonia treatment.

The rôle of silicone polymers in achieving DP properties, improved handle, and abrasion resistance should not be under-estimated. A system comprising a polymerised dimethyl polysiloxane with terminal silanol reactivity, a multi-functional silanol reactive silane coupler and an organo-metallic catalyst applied through padding followed by airing[9] produced favourable properties.

Improved exhaustion and fixation of reactive dyes on cotton:

The main drawback of the application of reactive dyes to cotton is the hydrolysis of the reactive dye molecules which occurs during the dyeing cycle.

An attempt to effect improved colour value of reactives on cellulose has apparently met with great success through the application of a sensitiser designated as Reactive Sensitiser J (RSJ[10]. The cotton fabric is padded (2 dips and two nips) with an aqueous solution of RSJ to a pick-up of 70%. The fabric is dried at 100°C for 3 minutes followed by curing at 150°C for 3 minutes whereupon it is washed on an open soaper or on a jigger using dilute acetic acid and water until the fabric is free of RSJ.

When this sensitised fabric is dyed by any of the standard procedures for reactive dyeing, it is claimed that a saving of 50–70% of dye can be effected for the same depth of shade. It is also claimed that the dyed fabric is fuller, stronger and has extra lustre and a smooth handle.

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THE SIMULTANEOUS AND CONTINUOUS DYEING AND SHRINKPROOFING OF ALL-WOOL FABRIC OR TOP SLIVER BY MEANS OF POLYACRYLATE HERCOSETT RESIN AND REACTIVE DYES

PART I: FABRIC TREATMENT

by J. P. VAN DER MERWE and N. VAN HEERDEN

ABSTRACT

It was found that an all-wool fabric subjected to a chlorination pretreatment followed by a polyacrylate/Hercosett resin/reactive dye padding treatment and steaming could be rendered machine-washable. Satisfactory dyeing was obtained at the same time. The fabric handle was rather harsh.

KEY WORDS

Chlorination pretreatment – polyacrylate resin – Hercosett resin – steaming – reactive dye – machine washable.

INTRODUCTION

The use of resins for continuous shrinkproofing of fabric or top sliver has become standard practice. Incorporating a dye at the same time is a relatively new approach. Recently Lewis *et al*[1] advocated the use of the pad/batch technique for achieving this objective. The use of the Bunte-salts of Hercosett 57 or a S-thiosulphato-polyol derivative plus a reactive dye (Procion) was suggested. The advantages and disadvantages of the two alternative routes were clearly outlined.

The object of this report is to describe very briefly some attempts made at SAWTRI to achieve a similar result by using other types of resins.

EXPERIMENTAL

Materials:

All-wool doctors' flannel was used throughout.

Treatment:

A Benz laboratory pad mangle-and-steamer was used for all treatments.

In all cases the fabric was subjected to a chlorination pretreatment with hypochlorite at pH 1,8 (sulphuric acid) and Melafix DM (Ciba-Geigy) to effect an active chlorine uptake of 1,5% using an exhaustion technique*. The chlorination

*Footnote: A continuous chlorination technique involving padding-on of DCCA at a pH of 1,5 has since been used process lasted one hour. Thereafter an anti-chlorination treatment followed using a 1% sodium bisulphite solution at pH 4,5 followed by a warm rinse. A final cold rinse was applied at pH 7,0 using sodium bicarbonate followed by drying.

After the chlorination pre-treatment the fabric was padded to a 100% pick-up to effect an uptake of 2,8% Revertex A275 (Revertex) plus 0,5% Hercosett 70 (Hercules). This resin formulation was prepared as follows:—

To Revertex A275 resin emulsion, 30% of a 10% solution of Sodium dodecylbenzenesulphonate was added and stirred. The solution was adjusted to a pH of 7,0 using ammonia. Thereafter the Hercosett resin was introduced whilst stirring followed by the reactive dye. The final pH was adjusted to 7,0 again.

After resin application the fabric was steamed at atmospheric pressure for a period of 10 min, subsequently rinsed and dried.

To compare the colour values of the resin-treated fabrics with those from continuous dyeing only, a similar experiment was carried out on the Benz using the dye only, *300 g/l* urea, a wetting agent (Tergitol Speedwet) at pH 4,5 (acetic acid) and following the procedure as described elsewhere[2].

Testing of Fabric

1. The fabric was tested for complete machine washability following the IWS test procedure No. 185.
2. The chromaticity coordinates of the dyed fabrics, with resin and without, were determined on a Harrison-Shirley Digital colorimeter.
3. The extent of covalent fixation was determined by using the method described previously[3].
4. Fastness to light, perspiration and washing tests were also carried out following standard procedures.

DISCUSSION OF RESULTS OBTAINED

The shrinkage results obtained on fabric treated for machine washability are shown in Table I.

It can be seen that the shrinkage results are sufficiently low to ensure machine washability.

The chromaticity values and the percentage covalent fixation of the two series of pad-dyeings are summarised in Table II.

In respect of chromaticity values the results in Table II show that there was no significant difference in the x, y and Y-values when the two series of values were compared.

The dyeings also appeared to be level in all treatments.

TABLE I

FELTING SHRINKAGE OF TREATED FABRIC

SAMPLE NO.	REACTIVE DYE (on mass of fibre)	% TOTAL AREA SHRINKAGE
1	2% C.I. Reactive Blue 69	1,0
2	2% C.I. Reactive Yellow 39	0,5
3	2% C.I. Reactive Red 84	1,0
4	2% C.I. Reactive Blue	3,3
5	2% C.I. Reactive Yellow 25	1,0
6	2% C.I. Reactive Red 40	1,5
7	2% C.I. Reactive Blue 94	1,0
8	2% C.I. Reactive Yellow 69	1,4
9	2% C.I. Reactive Red 100	1,0
10	2% C.I. Reactive Red 99	1,9

TABLE II

CHROMATICITY VALUES AND % COVALENT FIXATION OF RESIN-DYED AND UREA-DYED FABRICS

SAMPLE NO.	CHROMATICITY VALUES						% COVALENT FIXATION	
	Resin-dyed			Urea-dyed				
	x	y	Y	x	y	Y	Resin-dyed	Urea-dyed
1	0,1838	0,1593	4,02	0,1826	0,1607	3,78	71,94	75,5
2	0,4453	0,4977	64,74	0,4468	0,4970	64,24	81,99	85,6
3	0,5841	0,3284	13,70	0,5930	0,3261	12,48	80,18	84,1
4	0,1912	0,1667	5,99	0,1893	0,1590	5,40	41,45	53,6
5	0,4489	0,4911	62,02	0,4523	0,4967	61,75	59,69	92,8
6	0,5202	0,2647	11,45	0,5461	0,2709	9,82	57,62	63,4
7	0,1807	0,1730	5,74	0,1814	0,1644	4,58	55,24	73,3
8	0,4523	0,4971	63,63	0,4563	0,4925	64,27	92,91	94,0
9	0,4867	0,2638	11,66	0,5378	0,2720	7,88	87,45	90,2
10	0,5713	0,3064	12,22	0,5727	0,3066	11,45	92,00	95,4

As far as covalent fixation is concerned the results varied from one reactive dye to another, both for the resin-dyed fabric and between the resin-dyed and urea-dyed samples. In general the urea-dyed samples had a higher covalent fixation value of about 4% (absolute). In the case of the CI Reactive Blue 29, C.I. Reactive Yellow 25, C.I. Reactive Blue 94, however, the urea-dyed samples had much higher covalent fixation values.

The fastness properties shown in Table III (Xenon arc, fastness to washing and perspiration), were almost identical. Although the covalent fixation values were generally higher for the urea-dyed samples fastness to washing was not really better. This can most likely be attributed to the effect of the resin on fastness to washing.

CONCLUSIONS

It was found that after a chlorination pre-treatment an all-wool fabric can be dyed and shrinkproofed simultaneously by padding on 2,8% Revertex 275, 0,5% Hercosett 70 and up to 2% of a reactive dye (o.m.f.) followed by steaming at atmospheric pressure and drying. The treated fabric showed hardly any felting shrinkage during washing and the colour values were very similar to those obtained by a continuous pad-dyeing using 300 g/l urea and a wetting agent. Covalent fixation values were somewhat poorer than for the urea-dyed samples whereas the fastness properties were almost identical. The handle of the treated fabric was rather harsh.

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PROPRIETARY NAMES

The fact that chemicals with proprietary names have been mentioned in this report does not in any way imply that SAWTRI recommends them or that there are no substitutes which may be of equal value or even better.

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TABLE III

FASTNESS PROPERTIES OF RESIN-DYED AND UREA-DYED FABRICS

REACTIVE DYE (o.m.f.)	LIGHT FASTNESS		FASTNESS TO WASHING						PERSPIRATION FASTNESS					
			Resin-dyed			Urea-dyed			Resin-dyed			Urea-dyed		
				Staining			Staining			Staining			Staining	
	Resin-dyed	Urea-dyed	Change in Shade	Wool	Cotton	Change in Shade	Wool	Cotton	Change in Shade	Wool	Cotton	Change in Shade	Wool	Cotton
2% C.I. Reactive Blue 69	7	7	3	5	4	2	4	4	3	4	4	2	4	3–4
2% C.I. Reactive Yellow 39	7	7	3D	5	5	4	5	5	4	5	5	4	5	5
2% C.I. Reactive Red 84	7	7	3	4	4	3	5	4	2–3	5	4	4	5	4
2% C.I. Reactive Blue 29	7	7	2	4	4	2	5	5	3	4	4	3D	5	4
2% C.I. Reactive Yellow 25	7	7	4	5	5	4	5	5	5	5	5	4–5	5	4
2% C.I. Reactive Red 40	7	7	3–4D	5	3–4	3–4	4	3–4	4D	4–5	4	3–4	4	3–4
2% C.I. Reactive Blue 94	7	7	2–3	5	4	1–2	3–4	4	3	5	4	1–2	4	4
2% C.I. Reactive Yellow 69	7	7	3	5	5	3D	5	5	4	5	5	4	5	5
2% C.I. Reactive Red 100	7	7	2–3	5	3	3D	4	2–3	3	4	3–4	3–4	4	4–5
2% C.I. Reactive Red 99	7	7	3	5	4	4	5	4	3–4	4	3–4	4	5	4

D = Duller

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