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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EDITORIAL

The past year has been one of the busiest the Institute has seen for some considerable time. Overseas visits by the Director, local meetings and lectures, a SAWTRI/Textile Institute symposium, participation in the Textile Fabrics Fair, visits to the local industry and extensive consultancy services to the Rhodesian textile industry made heavy demands on the Institute. This, however, is the essence of what we consider our role in the local textile environment, namely one of a communicator of R & D, whose prime function it is to stimulate an exchange of information in the best interests of the South African economy. We, therefore, consider that the time spent on "non-research" activities in 1977, has in fact been quite productive.

The concept of communication is today becoming of ever-increasing importance, and in particular in a strategic industry such as textiles. Although the political threats of economic isolation may not, at this point in time, pose a serious problem for the immediate future, it is something that looms threateningly on the horizon. We cannot ignore it, and we shall have to communicate more in order to prepare ourselves to stand up to economic blackmail and to the possibility of the "drying-up" of foreign technology. We feel confident that we have the expertise in South Africa to do this, and SAWTRI again offers all its facilities, knowledge and fullest cooperation in this respect.

We are now approaching 1978 and there appears to be all indications that the long awaited economic upturn will, in fact, be realised, although perhaps not quite on the magnitude expected. A recent Barclays Bank survey indicated that some 47% of the manufacturing industry (textiles included) is fairly confident that profit growth will be maintained at least at last year's levels, and 36% forecast a slight improvement. Confidence in the South African economy is not at such a low ebb as is generally believed, and we share that confidence.

On behalf of the Director and staff of SAWTRI, we wish all our readers a happy Christmas and a most prosperous New Year.

INSTITUTE NEWS

Meetings

The last quarter of the year is normally marked by meetings of the various steering committees and the Research Advisory Council. Members of these committees then review the year's research work and plan and coordinate research projects for the coming financial year. The Mohair Board steering committee met on the 3rd October and the Wool Board steering committee on the 17th November. Both these took place in Port Elizabeth, with Drs McPhee and Baird of the IWS attending the latter. The Rhodesian Cotton Promotion Council steering committee met on the 4th November in Salisbury.

The Research Advisory Committee met in Port Elizabeth on the 17th November, to discuss national research projects. The meeting was chaired by Dr Danie Joubert, who took over from Dr C. van der Merwe Brink as member of the CSIR Executive responsible for SAWTRI.

Dr Veldsman attended various meetings of constituent committees of the SABS in Durban during the week which commenced on the 24th October. During these meetings assessment of defects, labelling and marking of textiles and flammability tests were discussed. On the 23rd November he also attended the meeting of the Advisory Committee on Mohair Production of the Department of Agricultural Technical Services, held at Irene.

Mr A. Paul to retire from RAC and Wool Board Steering Committee

It is with regret that we have to announce the retirement of Mr Fonnie Paul from these two committees after many years of fruitful service to Wool Research. Mr Paul served for 13 years on the RAC, and of the 20 meetings to date he attended 17. Through his many faceted personal contacts with the wool industry, he brought a wealth of knowledge to these committees. Mr Paul's sound understanding of the complexities involved often assisted in difficult debates which led to harmonious relations between the various segments of the industry. His absence from our future discussions will be greatly missed and his services are gratefully acknowledged.

Lectures

Dr Veldsman addressed the Transvaal branch of the S.A. Dyers and Finishers Association in Johannesburg on the 26th September on various aspects of liquid ammonia mercerisation and recent trends in finishing. On the 29th September, he addressed the Eastern Cape branch of SADFA in Port Elizabeth on the same topic.

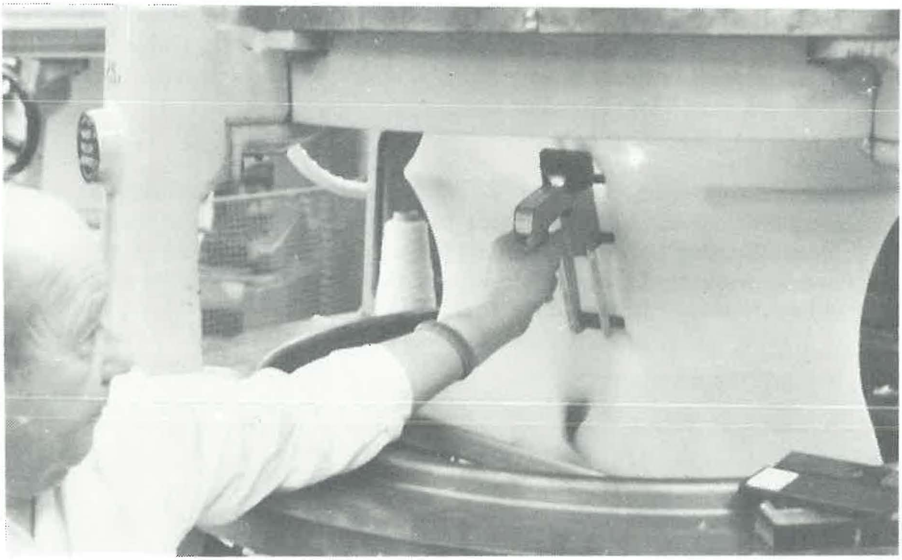
Dr M. Roberts, head of Dyeing and Finishing, has been invited to deliver a paper to the next national convention of the S.A. Dyers and Finishers Association. Natcon '78 will be organised by the Transvaal section of the Association and will take place on the 10th and 11th March, 1978, at the Southern Suns Airport Hotel, Johannesburg. Dr Roberts will read a paper on "Developments in Processing to Conserve Energy, Time and Effort". Dr Veldsman will chair a final panel discussion.

Dr A. Basch, visiting research officer of the Israel Fibre Institute, lectured to the Textile Institute members and SAWTRI staff on the 9th November. He dealt with various aspects of the chemistry of flame retardants and referred to work done in Israel as well as at SAWTRI in this field.

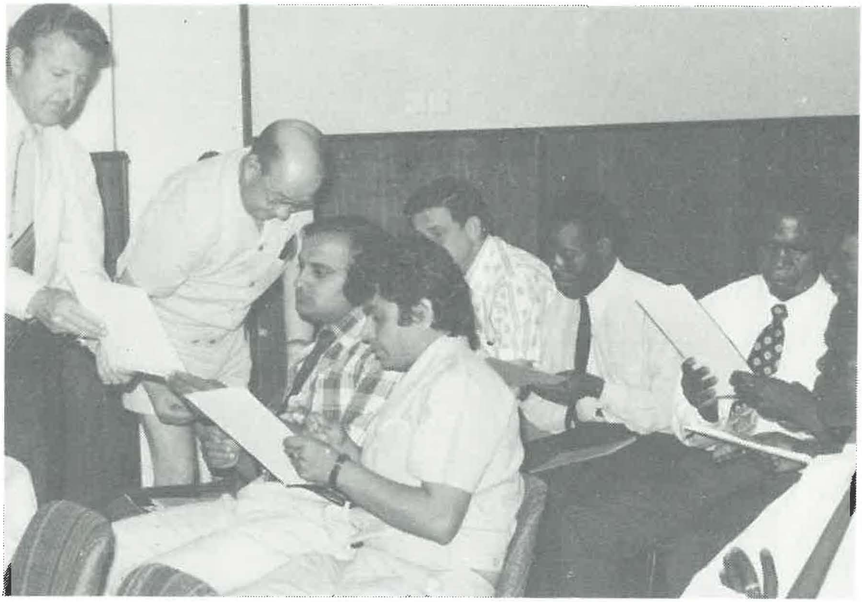
Visits and Visitors

Messrs Godden, Lerche and Versveld visited SAWTRI's *Phormium tenax* processing division on the 16th August to discuss the latest developments in this field. Messrs Godden and Versveld are with the Ciskeian Department of Agriculture and Forestry while Mr Lerche is in charge of Industrial Crops Section of the South African Department of Bantu Administration.

Mr Alan Robinson giving a practical demonstration on a loom in a weaving mill in Hartley.



Variations in take-down tension being monitored by means of an Esotex take-down tension device recently acquired by the knitting division.



Messrs Alan Robinson and Dennis Dobson lecturing to knitting mill employees in Salisbury.

A contingent of Australian Mohair farmers visited SAWTRI on the 11th October. There is a growing mohair industry emerging in Australia and Australian farmers are eager to build up contacts with South Africa for agricultural advice and processing technology.

Messrs P. Strijland and P. Marois of the IWS visited the processing departments and testing laboratories on the 19th October. Mr Strijland is IWS branch director in the Netherlands, while Mr Marois heads the Canadian branch of the IWS.

Mr Dennis Mosenthal, Chairman of Messrs Valley Textiles, Port Elizabeth, visited SAWTRI on the 21st October, to familiarise himself with SAWTRI and its research and testing facilities.

Messrs A. Robinson and L. Layton of SAWTRI visited Good Hope Textiles in King William's Town on the 12th October, while Dr Veldsman visited Pep Homeland industries and Tramatex in Butterworth, for techincal discussions. He also visited various mills around the Durban area from the 24th to the 27th October.

A group of 10 senior SAWTRI staff members visited a number of sheep farms in the Highlands district of Grahamstown on the 13th October. Various aspects in connection with shearing and classing were studied in order to assist in the meaningful planning and researching of projects on the characteristics and processing of the South African wool clip.

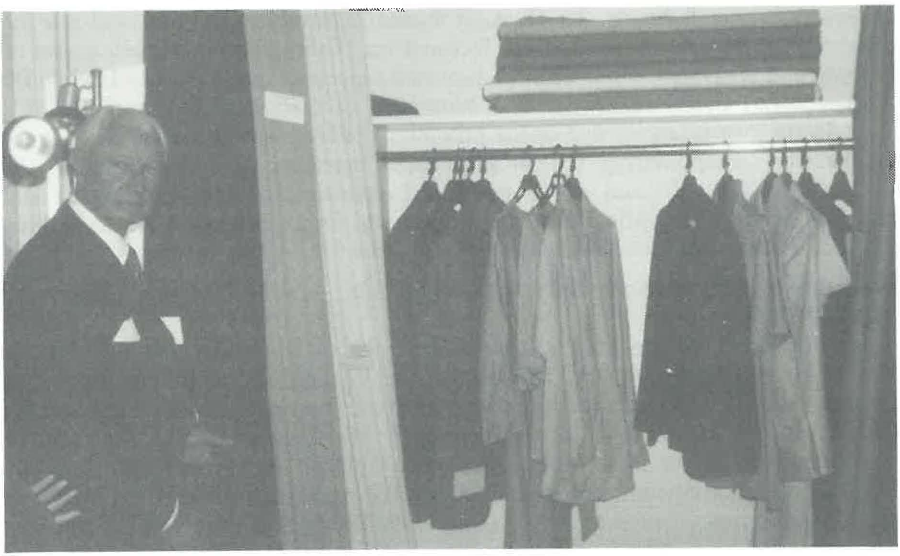
Dr Veldsman, accompanied by several senior staff members visited Rhodesia during the first week of November. The purpose of this visit was to present a series of lectures and in-plant demonstrations on correct usage of machinery and instruments. The latter was aimed at improving quality and productivity within the Rhodesian textile industry. Mr G. A. Robinson, assisted on the practical side by Messrs L. Layton and D. A. Dobson, lectured on "Fabric faults and their causes in Knitting and Weaving". Dr L. Hunter discussed aspects of quality control, while Dr M. B. Roberts dealt with "The Wet Processing of Cotton and Cotton Blends".

In the event, largely due to the prevailing conditions in Rhodesia, attendance figures were disappointing but in subsequent meetings with the sponsors, the Cotton Promotion Council of Rhodesia, and representatives of Government and the textile industry, confidence in the project was firmly expressed. It was decided that similar exercises should be undertaken at some future date.

Maintenance of electronic machine components – a new service offered by SAWTRI

SAWTRI now offers the services of its electronic laboratory and maintenance section to the local industry. Maintenance and/or reparation of faulty control systems, testing instruments or other electronic machine components can be undertaken, provided that no infringement of existing service contracts or arrangements with suppliers of such items takes place. The service conditions and tariff schedules are negotiable, depending on the particular service to be rendered and the estimated costs in terms of labour and material. For more information, the Director can be contacted, or in his absence, Mr J. Klazar, Group Leader for the Machine Development and Maintenance Workshop Group.

Mr John Mullins, well-known Grahamstown wool producer, explaining certain aspects of fleece quality to some visitors from SAWTRI.



Mr Neville Vogt in attendance at the SAWTRI exhibit during the recent Fabrics Fair in Johannesburg.

SAWTRI's participation in the Fabrics Fair

Approximately 40 firms, double the number that participated in the first Fair, exhibited in the second Fabric Fair staged by the Textile Federation in the Carlton Hotel. The overall success of the second Fair proved that it will most probably become an annual event. SAWTRI's first-time exhibit included a photographic display of the scientific and technological back-up facilities available to the textile industry, as well as a display of fabrics recently developed at SAWTRI.

Approximately 300 people visited the SAWTRI exhibit over the three days, and, in particular, retailers and makers-up displayed genuine interest in the exhibits. As some 80-90% of the other exhibits comprised synthetic fabrics or cotton/synthetic blends, SAWTRI'S "natural fibre" look elicited many favourable comments.

Our congratulations to BMD Knitting Mills who won the trophy for the best display of the Fair.

New Subscriber

We would like to welcome Meritex Ltd of Cape Town as a new subscriber to the work of the Institute. We hope that our newly-established liaison will be to the mutual benefit of both our organisations.

Staff Matters

We wish to welcome two new staff members to SAWTRI. Mr A. R. Adriaanzen has been appointed Chief Technician in the Carding and Combing division. Mr Adriaanzen has had 20 years industrial experience in this field. Mrs M. S. Heideman, who holds a NDT qualification, has been appointed Technician in the Scouring division.

A hearty word of welcome to these new staff members.

SAWTRI PUBLICATIONS

No. 369 : Smuts, S. and Hunter, L., Studies on some Wool/Polyester Woven Fabrics, Part V : Untreated and Easy-Care Finished 2/2 twill fabrics from Wool blended with Normal and Special Low Pilling Polyester, Respectively (September 1977).

No. 370 : Brandt, J. P. M., Dyeing of Nylon 66 from a Charged Solvent System using some Reactive Disperse and Acid Dyes (October 1977).

No. 371 : Roberts, M. B. and Mountain, F., The Transfer Printing of Cotton, Part II : Further Studies of Important Variables using a Commercial Polyethylene/Paper Laminate Support (October 1977).

No. 372 : Hunter, L., Smuts, S. and Barkhuysen, F. A., The Effect of Liquid Ammonia Treatment on Some Physical Properties of Mohair Fibres (October 1977).

No. 373 : Van Rensburg, N. J. J., Du Plessis, Marilyn and Barkhuysen, F. A., The Effect of Liquid Ammonia and Various DP Treatments on Certain Properties of 67/33 Cotton/Wool Blends (October, 1977).

No. 374 : Turpie, D. W. F., The Processing Performance of South African Wool Part XIV : The Processing Performance during Topmaking of a Range of Breeds (October 1977).

No. 375 : Robinson, G. A., Cawood, M. P. and Dobson, D. A., Repco Wrapped Core-Spun Wool Yarns, Part I : Performance of Repco Wrapped Core-Spun Wool Yarns in Fine Gauge Double Jersey (November 1977).

No. 376 : Turpie, D. W. F., The Effect of Speed and Production Rate During Carding on Carding and Subsequent Combing Performance (November 1977).

No. 377 : Robinson, G. A. and Layton, L., Sizing of Singles Wool-Worsted Yarns, Part I : An Introductory Investigation (November 1977).

No. 378 : Roberts, M. B., The Dyeing of Phormium tenax Fibres (November 1977).

No. 379 : Turpie, D. W. F., Unconventional Scouring, Part XI: A Note on the Effect of Suint on Scouring Performance (November 1977).

No. 380 : Turpie, D. W. F., Unconventional Scouring, Part XII : An Attempt at Semi-Closed Loop Re-Cycling of the First Bowl Liquor (November 1977).

No. 381 : Weideman, E., Van der Walt, L. T. and Van Rensburg, N. J. J., The Surface Chemistry of Wool, Part III : The Swelling of Various Polymers and the Shrinkage of Polymer-Treated Wool (November 1977).

No. 382 : Hunter, L., and Smuts, S., A Comparison of the Wrinkling Properties of Aged and Deaged Wool/Synthetic Blend Fabrics using Different Wrinkling Tests (December 1977).

No. 383 : Turpie, D. W. F., An Attempt to Quantify the Effect of Staple Crimp on the Measurement of the Length Characteristics of Wool Tops on the Almeter (December 1977).

No. 384 : Turpie, D. W. F., and Mozes, T. E., Treatment of Wool Scouring Liquors Part VIII : The Particle Size Distribution of Solid Dirt Particles in a Range of S.A. Fleece Wools (December 1977).

Papers appearing in Other Journals

Strydom, M. A., Dimensional Stability in Fabrics Containing Natural Fibres, Part II, *Text, Ind. Southern Africa,* 1 (2), 27 (1977).

Veldsman, D. P., Electromagnetic Frequency Heating, *Text. Ind. Southern Africa,* **1** (2), 21 (1977).

(c) Saving of water by recycling of the filtered effluent and reconstituting of the size liquor with the required concentration of size.
(d) Saving of energy by re-use of the hot, filtered liquors.

The authors discuss three filter systems, viz. the Abcor filter, the Krupp-Berghof filter and the Union Carbide filter. Differences in these filters are discussed in relation to their operating characteristics and their performance in treating liquors containing PVA. Softening agents and waxes remain in the concentrate. The better sizing effect of the recovered PVA may be ascribed to the loss of the short-chain PVA components to the effluent. The authors also show that the amortisation period of such a system varies from 0,4 to 3,4 years.

(MAS)

Rapid dyeing of polyester

Von der Eltz, H. U. and Weingarten, R., Critical Observations on the "High-Effiency Dyeing Method" for Polyester Fibres, *Chemiefasern/Textilindustrie*, 27, 79 (January 1977).

The authors present a critical review of the existing knowledge of rapid polyester dyeings. The first aspect which they dealt with is the application of the *migration test* (in which dyed and undyed specimens are treated together in a blank liquor). The authors are of the opinion that for dyeings where the fibre cross-section has not been fully penetrated (ring dyeing) this test may be misleading.

It is possible to heat up the dye liquor fairly rapidly in the *low temperature range* where little exhaustion takes place. Furthermore, once the dyeing temperature is reached, dyeing should be continued at 135°C for 20 minutes. Very often a marked changed in depth of shade takes place as boiling proceeds. This is due to desorption of unstable dyes from the fibre. If, therefore, a stable and an unstable dye are combined, a *shade change* will most likely take place during the dyeing process.

Another important aspect is the reversal rate for high liquor flows. The authors are of the opinion that a reversal after every 4 to 6 minutes is a practical approach. Levelness is improved by a higher circulation rate and to a lesser extent by adding a levelling auxiliary. (DPV)

Release of formaldehyde and BCME in finishing plants

North, B. F., Formaldehyde release in textile finishing, *Text. Chem. Col.* 9, 223/75 (Sept. 1977).

The relationship between the formaldehyde release during drying and curing for a number of typical resin/catalyst systems and the potential for the formation of bis(chloromethyl) ether (BCME) under these conditions was studied. Generally increases in evolved formaldehyde were shown to be produced by increases in cure time, cure temperature and resin concentration, and dry decreases in catalyst concentration.

DMDHEU reactants gave the lowest levels of evolved formaldehyde and urea-formaldehyde, melamine-formaldehyde and carbamates gave the highest levels.

Simple identification of acrylics

Heinkel, H., Einfache PAC-Faser Identifizierung für den Praktiker, *Textilveredling,* 12 (9), 403 (1977).

A simple laboratory test is described to answer the following questions which are very often of the utmost importance to the practical dyer : Is the fibre in question in fact an acrylic? Is it an acrylic or a modified acrylic? What type of acrylic fibre? What are the dyeing characteristics of the fibre? The test method involves the well-known burn test to ascertain whether the sample is acrylic fibre. This is followed by a test dyeing with 1% Acid Red 151 plus 1% Basic Blue to distinguish between acrylics and modacrylics (Acrylics dye blue and modacrylics red).

Acrylics with carboxylic groups (such as ®Courtelle) are identified by dyeing with 2% ® Maxilon Black T at pH 2,0. Acrylic fibres with carboxylic groups dye a bright blue, while ® Orlon 42 dyes a matt khaki and ® Exlan DK a deep olive green.

(MAS)

Automated piecening of end breaks and cleaning of rotors in OE spinning

Stahlecker, F., Automation of the rotor spinning machine with CleanCat and SpinCat – Aspects and Prospects, *Text. Praxis Int.* 32 (9) IV (1977).

The advantages of using Suessen's SpinCat and CleanCat systems on rotor spinning equipment are discussed. Manual piecening becomes virtually impossible above 50 000 rev/min, necessitating automatic piecening. Automated periodic rotor cleaning by the CleanCat also ensures that yarn quality does not deteriorate with time due to build up of rotor deposits. There are several working programmes for the CleanCat/SpinCat system. The "WFB" programme involves piecening of ends-down which occur when changing either cans or packages, and piecening of ends-down where a normal endbreak takes place. The "PIC" programme involves preventative cleaning of the rotor. There is also the combined WFB/PIC programme, where the CleanCat is followed by the SpinCat. The spinning process is interrupted for a short period, cleaning takes place and the piecening is performed by the SpinCat following closely, and spinning is resumed.

(MAS)

Recovery of PVA Sizes by Ultrafiltration

Trauter, J. and Ruess, B., Die Rückgewinnung von PVA-Schlichten durch Ultrafiltration, *Melliand Textilberichte Int.* 58 (9), 711 (1977).

The authors give the following as the four major aims of ultrafiltering sizing effluents:

(a) Removal of solid wastes from the effluent (soluble sizes comprise 50–80% of the pollution load of finishing effluent)

(b) Recycling of the recovered sizes

The low levels of formaldehyde which would be expected when the released formaldehyde is diluted with the air in the ovens may be the reason that recent tests show no BMCE in textile finishing plants. (NJJvR)

Wetting agents for mercerisation

Shenai, V.A., Synthesis and evaluation of mercerising wetting agents, *Int. Dyer,* 158, 246 (2 Sept., 1977).

Details of a synthesis of *n*-butylsulphate and -ethyl hexyl sulphate are given. The latter is a better wetting agent under mercerising conditions than either the former or a commercial cresylic wetting agent. (NJJvR)

Economy of Rotor vs Ring Spinning

Anon, Comparison between OE yarn and ring yarn in economical efficiency, Uniteka Ltd., *Japan Text. News,* 87 (July 1977).

It is pointed out that fibre length and strength both make a contribution when OE yarns are compared with ring yarns. An example is quoted to bear this out. If a 20's cotton yarn is spun from a cotton of the following properties, namely length 1,06 inches, Pressley 76, micronaire 4,0, the ring yarn has a lea strength of 105 lbs and the OE yarn only 85 lbs (i.e. 19% weaker). If however, a cotton with the following properties is used; namely length 0,94 inches, Pressley 92, micronaire 5,0, the lea strength of the ring yarn is only 101 lbs whereas that of the OE yarn is 94 (i.e. only 7% lower). Fibre strength is, therefore, of major importance.

In spinning counts finer than 30's cotton count, OE spinning is not advantageous in terms of production efficientv. In fact, the *coarser* the count, the greater the difference in favour of OE spinning. Power savings could be substantial if OE yarns are spun straight from carded sliver. Normally power consumption is higher than for ring spinning.

Mending costs for fine yarn going into cloth is higher with OE yarn. This can be reduced by savings in winding costs.

The cost of replacement of worn spinning rotors may also be considerable. The wear on rotors is twofold: wear due to friction by the fibres on the inside of the rotor and wear of the bearings supporting the rotor. Another problem is the wear of the combing rollers which is especially bad in the case of polyester fibre. In total, the cost of replacement on OE spinning machines is about *twice* that on ring spinning frames.

The higher speed of OE machines is about the most important factor in reducing costs. (DPV)

Dyestuff Chemistry

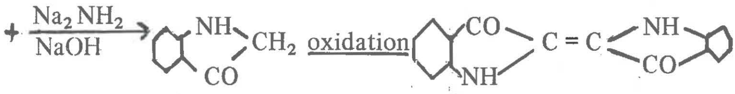
Kunihiro, T., Review of indigo dye, *Japan Text. News,* 71 (July, 1977).

Although in its natural state indigo is present in the leaves and stems of indigo plants (in the form of indican, the glucoside of indoxyl) the use of the natural dye has been completely replaced by the synthetic dye.

Various methods for the synthesis of indigo have been put forward over the years. The most modern process is to convert aniline to phenylglycine which in turn is crosslinked by means of sodium amide:

$$C_6H_5NH_2 \xrightarrow[C\ell CH_2COOH]{NaOH} C_6H_5.NH.CH_2COOH$$

(Phenylglycine)



(Indoxyl) (Indigo)

Indigo is insoluble in water, dilute acids or alkalis. However, in the presence of a reducing agent and alkali it is soluble and absorbs on to the fibre. It is then converted into indigo by air oxidation. The most economical quantity of NaOH to use is 70 parts of NaOH/100 parts of indigo (pH 11,5–12,0). In the case of hydrosulphite 90 parts/100 parts indigo is normally used. Sometimes 10–30% glucose is also added to the bath as an auxiliary in the reduction process. The best temperature for reducing indigo is 60–65°C. Dyeing with indigo should preferably take place below 30°C. (DPV)

A NOVEL METHOD FOR THE CREASE-RESIST FINISHING AND DYEING OF COTTON FABRICS USING A PHENOLIC-FORMALDEHYDE RESIN AND DIAZONIUM SALTS
PART II : SOME FURTHER POSSIBLE MODIFICATIONS TO THE PROCESS

by G. VAN DER WALT

ABSTRACT

Three possible methods are described by which cotton fabrics can be treated with a phenolic-formaldehyde resin and then 'dyed' with stabilised diazonium salts which couple to the resin. The modifications were carried out in an attempt to increase the colour range and to shorten the process. These involved treating cotton with a resin and diazonium salt in one pad bath, a resin and coupling component in one bath, and a resin followed by screen-printing[1]*. Of the three methods the best results, as far as colour is concerned, were obtained with the screenprinting technique. However, the crease-resist and tensile properties of the fabrics were generally unacceptable.*

INTRODUCTION

A novel method was devised by Horn[2] for the crease-resist finishing and dyeing of cotton fabrics. In this process a phenolic-formaldehyde resin is prepared and applied to cotton fabrics by the pad-dry-cure method. After soaping, rinsing and drying, the fabrics enter, for 30 s, a bath containing NaOH at a concentration of 3,0% or 1,0% or 0,5%, depending upon the depth of shade required, and are then immersed for 1 min in a solution of a stabilised diazonium salt. In this bath the diazonium salt is coupled to the phenolic-formaldehyde resin on the cotton and when the fabric enters an alkaline soap solution, the colour is fully developed. Fabrics treated in this way were found to have satisfactory crease-resist and tensile properties, together with a soft handle. The main drawback of this process is the limited colour range produced and the large number of intermediate steps.

The above limitations led to the investigation of certain modifications to the process in an attempt to increase the colour range and shorten the process.

EXPERIMENTAL

A plain weave, bleached, all-cotton poplin fabric of the following specifications was used throughout this study: The fabric density was 131 g/m^2 with a sett of 33,5 ends and 22,8 picks per cm. The yarn linear densities were warp

17,7 tex Z879 and weft 24,5 tex Z859. Samples of fabric measuring 30 cm x 30 cm were used for each treatment.

The phenolic-formaldehyde resin was prepared by the following method: Phenol (25 g, 0,27 mole), 40% formaldehyde solution (22 g, 0,25 mole) and 20% NaOH solution (4 g) were boiled, under reflux, for 15 min. The solution was allowed to cool to room temperature after which it was diluted to 90 g with water, to give a resin concentration of 38% (mass/vol).

The prepared solution was padded (3 dips, 3 nips) at 100% expression, onto samples of cotton fabrics by means of a Benz pad mangle, dried for 3 min at 100°C and cured for 5 min at 150°C. The samples were then soaped at the boil for 10 min in a solution containing 0,2% ®Ultravon HD and 0,2% Na_2CO_3, after which they were rinsed and dried.

The following modifications of the original treatment were studied.

Modification 1

This involved the addition of 2,0 g diazonium salt (C.I. Azoic Diazo Component 36) to the resin pad bath (90 g) and applying both resin and dye together. The samples were then dried, cured and soaped.

Modification 2

The coupling component (2,0 g of C.I. Azoic Coupling Component 35) was added to the resin pad bath and then proceeded with the process as described previously[2].

Modification 3

This involved the application of a diazonium salt from a printing paste to the one side of the uncured resin finished fabric, followed by curing.

The screen printing thickener solution contained:

8,0% ®Manutex F
4,0% Sodium hexametaphosphate
x% C.I. Azoic Diazo Component 36, or
C.I. Azoic Diazo Component 4, or
C.I. Azoic Diazo Component 3.

Test Methods

The crease recovery angle of the fabric was measured, at 65% RH and 20°C, on a Monsanto wrinkle recovery tester[3]. The tear strength was measured on an Elmendorf tear strength tester and the bursting strength on a Mullen tester.

RESULTS AND DISCUSSION

Modification 1

The addition of the "dye" to the normal pad bath produced much brighter and deeper shades than those obtained originally[2]. A serious drawback with modification 1, however, was the poor pad bath stability. The diazonium salt in the pad bath reacted with the resin before the resin could react with the fibre. This then led to precipitation of the resin and diazonium salt in the pad bath, normally within 5 minutes. This instability of the pad bath would make the process impractical on a large scale. Several attempts to increase the pad bath stability were made, but were unsuccessful and this process was finally discarded.

Modification 2

Pad baths prepared according to modification 2 were stable and could be used for treatment of the fabrics. Some results, given in Table I, show that the addition of the coupling component to the resin caused a considerable decrease in the crease recovery angle, when compared with a phenol-formaldehyde resin-finished sample without coupling component. This was despite an increase in the amount of the resin on the fabric.

The colours produced by modification 2 were no different to the colours produced by the original method[2]. Furthermore, the fabrics prepared by this modification had a very rigid cardboard-like handle and this, together with the very low crease recovery angles, made them completely unacceptable.

Modification 3

The most promising feature of the experiments conducted thus far had been that the diazonium salt could be coupled to the resin before curing. The colours produced were much brighter and deeper than the colours produced when the

TABLE I

THE EFFECT OF THE ADDITION OF C.I. AZOIC COUPLING COMPONENT 35 TO THE RESIN PAD BATH ON FABRIC PROPERTIES

Sample	Diazonium salt (%)	Resin Add-on % (omf)	Monsanto Crease Recovery Angle (W+F)°	Bursting Strength kN/m²
Untreated control	–	–	180	662
Resin finished	0	14,0	240	640
Phenol-formaldehyde	2	18,3	187	655
	6	18,4	190	646

diazonium salt was coupled after curing. This prompted a study of the possibility of applying the diazonium salt to the uncured resin-treated fabric by a screen-printing techneque. Initially the effect of various concentrations of diazonium compound in the printing paste on some properties of the fabrics was investigated.

The results obtained are shown in Table II.

TABLE II
THE EFFECT OF VARIOUS CONCENTRATIONS OF C.I. AZOIC DIAZO COMPONENT 3 ON FABRIC PROPERTIES

% C.I. Azoic Diazo Component 3	Resin Add-on % (omf)	Monsanto Crease Recovery Angle (W + F)°	Tear Strength (N)	Bursting Strength kN/m²
Untreated	—	180	14,7	737
0% (Not printed)	12,9	246	6,8	684
0%	7,3	228	6,0	655
2%	8,1	232	6,1	652
4%	9,9	230	5,8	659
6%	8,5	231	6,1	691

Table II shows that the use of the printing process caused a reduction in the resin concentration on the fabric and a slight decrease in the crease recovery angle. This was probably due to the fact that the resin was cured prior to printing. These results were subjected to a statistical analysis of variance and it was found that, in the range studied, the concentration of the diazonium salt had no significant effect on any of the physical properties. The increase in diazonium salt concentration had no effect on the high colour strength and all the screen-printed fabrics had the same depth of shade.

It was then decided to investigate the effect of resin concentration and different diazonium salts on certain properties of the fabrics. The results are given in Table III, which shows that the resin add-on decreased with an increase in the dilution of the normal phenolic-formaldehyde resin solution. A high amount of resin add-on resulted in a very low tear strength and the fabrics had a cardboard-like handle. Statistical analysis showed that the resin concentration had no significant effect on the crease recovery angle and the bursting strength of the fabric. Furthermore, no difference was observed between the different azoic diazo components used. There was a definite increase in colour strength as well as in dullness with an increase in resin concentration for the three diazonium salts used.

TABLE III
THE EFFECT OF RESIN CONCENTRATION AND DIFFERENT DIAZONIUM SALTS ON CERTAIN PROPERTIES OF THE COTTON FABRICS

2% C.I. Azoic Diazo Component Number	Resin concentration (% solids)	Resin Add-on % (omf)	Monsanto Crease Recovery Angle (W + F)°	Tear Strength (N)	Bursting Strength kN/m²
Control	–	–	178	14,4	655
Normal Solution	38	16,0	244	6,9	640
36	62	50,0	217	1,0	522
	46	23,0	220	2,5	571
	37	21,0	214	4,0	493
	31	14,0	211	5,5	505
4	62	36,0	211	1,2	473
	46	29,0	219	2,3	530
	37	22,0	220	3,3	512
	31	17,0	218	4,7	593
3	62	34,0	217	1,5	508
	46	24,0	220	3,1	559
	37	18,0	219	4,2	552
	31	14,0	220	4,7	557

SUMMARY AND CONCLUSIONS

Various modifications of the crease-resist finishing and dyeing of cotton with phenolic-formaldehyde resin and diazonium salts were investigated in an attempt to reduce the number of steps involved and to increase the colour range. The addition of the diazonium salt to the resin pad bath or the coupling component did not improve the original process. The most useful modification involved the use of screen-printing. The colours were deep and bright and completely different from those obtained previously[2]. Attempts were made to find the optimum amount of resin required for each diazonium salt, but the results were not consistent.

In general, fabrics treated by these modifications were found to have unsatisfactory crease-resistant and tensile properties, as well as a very stiff handle. Further attempts to modify the original process will, therefore, not be carried out.

ACKNOWLEDGEMENTS

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THE USE OF PROPRIETARY NAMES

® Manutex F is the registered trade mark of ICI Ltd. ® Ultravon HD is the registered trade mark of Ciba-Geigy Ltd. The fact that chemicals with proprietary names have been mentioned in this investigation in no way implies that SAWTRI recommends them or that there are not others of equal or greater merit.

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THE EFFECT OF COMB SPEED ON RECTILINEAR COMBING PERFORMANCE

by D. W. F. TURPIE and J. KLAZAR

ABSTRACT

No detectable change in the combing performance of the rectilinear comb could be observed over the range of speeds from 50 to 165 nips/min.

INTRODUCTION

The effect of comb speed on rectilinear combing performance is of importance when consideration is given to overall production costs and also the cost of conversion from raw wool to top. Modern combs have nip speeds which can go up to as high as 200 nips per minute, but are generally equipped with step pulleys to enable a range of nip speeds to be selected. For some types of material, especially those having poor cohesion, the rapid change in direction of the delivery lattice of the comb associated with very high nip speeds can cause disintegration of the combed web. In such cases, therefore, it is not practical to operate at high nip speeds and the speed must be reduced to a level where the problem can be adequately controlled. One comb manufacturer has introduced a plate above the delivery lattice which helps to prevent disintegration of the web so that higher nip speeds can be tolerated.

Aldrich[1] carried out some studies on different wools using a Schlumberger PB 26 comb and reported that at the three different speeds which could be selected on the comb, namely 130, 150 and 165 nips per minute, no significant effect could be detected as far as percentage noil and top cleanliness were concerned.

Assuming that control of the web is satisfactory, however, it was still not clear whether there exists a threshold value below which combing performance could be improved. A few experiments were undertaken to clarify this point.

EXPERIMENTAL

A series of nine experiments were carried out on a Schlumberger PB 26 comb using a gilled sliver which had been prepared from a 10/12 months 64's quality fleece wool. The driving motor of the comb was replaced by a variable speed motor which enabled nip speeds to be varied from zero to 165 nips per minute.

The comb gauge was set at 28 mm and the feed at 6 mm. Tests were made for percentage noil, and the cleanliness and length characteristics of the combed slivers were measured on a Toenniessen top testing machine and an Almeter, respectively, after two finishing operations.

RESULTS AND DISCUSSION

Results of the experiment are given in Table I. The range of speeds at which the comb was operated varied from as little as 7 to as high as 165 nips/min. At 7 and 15 nips/min the comb was combing virtually at slow motion, and it was clearly observed that quite a number of neps and vegetable particles were slipping through to the top. Pin penetration at these speeds was clearly inefficient, and this is confirmed by the somewhat higher nep and vegetable counts shown in the table. Percentage noil appeared to be significantly lower at these low speeds and levelled off at a value of about 6,2% when the speed of the comb reached 50 nips per minute, after which it remained constant.

The mean fibre length of the tops, its coefficient of variation as well as the distribution of the various length groups, showed no significant trends with an increase in comb speed. It would seem, therefore, that there was no change in the

TABLE I
COMBING PERFORMANCE AT VARIOUS COMB SPEEDS

Parameter	Nips per minute								
	7	15	25	50	75	100	115	150	165
Percentage noil	4,05	4,97	6,03	6,23	6,15	6,26	6,22	6,21	6,22
Neps per 20g	20	12	11	14	9	9	12	6	6
Veg. particles per 20g	35	53	40	24	38	32	47	33	31
Mean fibre length (mm)	54,9	54,9	54,9	54,2	55,0	54,9	53,6	55,1	54,8
CV (%)	50,2	49,9	50,7	51,0	50,3	50,7	51,9	49,5	50,0
% fibres shorter than:									
25mm	14,3	13,9	14,8	14,9	14,3	14,2	15,8	13,2	14,0
35mm	27,5	27,4	28,0	28,8	27,5	27,4	29,3	26,2	27,1
45mm	41,2	41,0	41,5	42,2	40,7	40,8	42,6	40,0	40,7
55mm	53,3	54,0	54,3	54,8	53,6	53,6	55,2	53,1	53,5
5% length (mm)	103,9	103,1	104,1	103,2	103,2	103,8	103,2	103,4	102,7

fibre breakage pattern with an increase in comb speed. The reason for the lower percentage noil at the low speeds appeared, therefore, to be mainly due to the reduced cleanliness of the combed fibres. It is also possible in the present case, however, that due to the relatively short duration of the experiments fly from the wool was able to accumulate on certain parts of the comb instead of joining the noil, so giving the impression of a greater reduction than was really the case.

It can be concluded that over the range of speeds from 50 to 165 nips/min (the latter being the fastest the comb was designed to be used), no detectable change in the combing performance of the rectilinear comb could be observed when combing the particular 64's wool investigated.

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