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# SAWTRI BULLETIN

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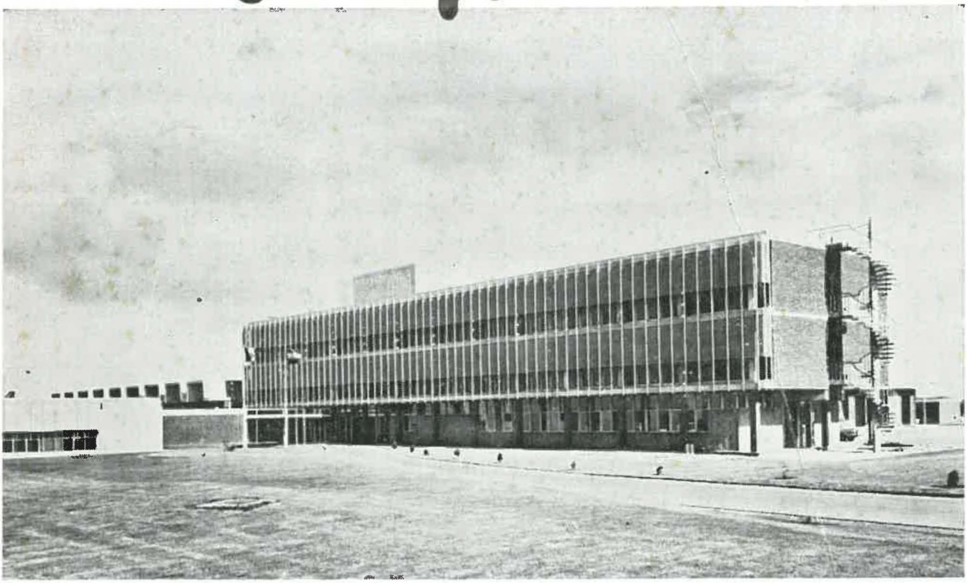

SOUTH AFRICAN
WOOL TEXTILE RESEARCH INSTITUTE
OF THE CSIR

P.O. BOX 1124
PORT ELIZABETH

Vol. 5 JUNE, 1971 No. 2

# SAWTRI BULLETIN

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

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SOUTH AFRICAN

WOOL TEXTILE RESEARCH INSTITUTE

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# INSTITUTE NEWS

**SAWTRI becomes a National Institute of the CSIR**

The announcement of SAWTRI's new status as a National Institute is an expression of confidence in the future of the research which has been this Institute's livelihood for many years inasmuch as it is an expression of faith in the future of the textile industry of South Africa.

Readers of the Bulletin are not all aware of the circumstances which have given rise to this epoch-making announcement issued jointly by the Council for Scientific and Industrial Research, the S.A. Wool Board and the Mohair Board.

The decision to convert SAWTRI to a National Institute is aimed in the first place, at giving greater impetus to wool and mohair research. Recently, the International Wool Secretariat decided that, besides its efforts to promote pure wool products, it should also undertake research into products which, by their nature, tend to satisfy more needs if blended with synthetics. The field of SAWTRI's activity must therefore be broadened to include research of this kind in terms of the new mandate.

For a bigger research effort more funds are needed. SAWTRI has not escaped the consequences of spiralling costs. With the downward trend of wool and mohair prices and the rising costs of research, coupled with a need for a more aggressive approach in research, the S.A. Wool Board and Mohair Board are simultaneously faced with lower income and greater expenditure on research and development.

In terms of SAWTRI's new status, the CSIR may decide whether projects which cannot be financed as cooperative projects on a R-for-R-basis, should be undertaken as projects of national importance and financed entirely by the annual Parliamentary allocation. In this way, the Government becomes more deeply involved in research on behalf of wool and mohair producers. This obviously does not mean that the CSIR, or State, has unlimited funds at its disposal to augment whatever shortfall there may be and so attend to the full programmes of the sponsors. Due to limitations imposed by the State, at the present time the CSIR is allowed an annual increase of only 7½ *per cent* in its Parliamentary grant – the CSIR may be obliged to seek income-earning contract projects to augment its funds. Such projects will then serve to finance any portion of the activities of the National Institute. There are other Institutes and more demands on the national resources to contend with than textiles.

The national interests of textile research are however not limited to wool, mohair and blends of these in some form or another or with synthetics, as directed by the Wool Board or Mohair Board, but are also aimed at providing research facilities to the textile industry as a whole. A living example is the worsted industry which has in the past, through its representative in SAWTRI, reiterated that its contribution towards research at SAWTRI is in conformity with the industry's interest in pure wool. The world consumption of wool is only 8 *per cent* of the total textile fibre consumption, and understandably so. The population explosion and increased standards of living have led to increased consumption of textile products to the extent where natural fibres can no longer play a dominant role. This in passing, is in no way intended to detract from the value of the natural fibres, but it should be carefully noted that *the intrinsic properties acclaimed to wool and others by no means safeguard the future. This is all the more reason why research efforts should continue unabated, possibly more aggressively.*

As has already been explained, the CSIR may in future itself consider to undertake research other than programmes approved by the Wool Board and Mohair Board and financed on a 50:50 basis. The CSIR may also out of its own resources decide what unattended programmes of these Boards to undertake for the balance of the Institute's unfinanced capacity, or alternatively, whether the Institute should undertake research for industry on a contractual basis in order to obtain other earnings.

From the administrative point of view, the conversion of SAWTRI to a National Institute of the CSIR implies very little change, both internally as well as externally. The responsibility for the management has been vested in the CSIR since August, 1964. The Institute will continue to function on the basis of a decentralised Institute of the CSIR. Externally, it will operate as **SAWTRI**. Its financial accounts will no longer be published as separate final or year-end accounts in the Annual Report but will be integrated in the CSIR's final accounts.

In conclusion, the Director and staff of the Institute wish to convey to all their friends – industrialists, fellow research scientists, sponsoring bodies, private enterprise and individuals alike – their appreciation for the wonderful cooperation, support and loyalty during all these years. They can be assured of the Institute's unabated devotion to the interests of all segments of the industry as the change to a National Institute so aptly epitomizes.

**IWTO Technical Committees**

The CSIR has agreed that a senior officer of the Institute represent the South African Wool Textile Council, of which the Director is an honorary member, at the technical committee meetings of the International Wool Textile Organization to which the Council is affiliated. Dr. R. I. Slinger attended these meetings in Milan from May 9th to 12th. At the meetings discussions were held on coring and sampling of wool; airflow testing of raw wool and bundle breaking strength testing of wool. A delegation from these working committees will attend the main IWTO meeting in Washington later in June. While in Europe, he visited the Zegnia factory in Triviro, Italy, which is wellknown for its fine worsteds. In Frankfurt he discussed with senior personnel of the Hoechst factory their activities in the field of wool/synthetics blends. Dr. Slinger also spent a day at the Deutsche Wollforschungs-institut in Aachen where he had discussions with Dr. Blanckenburg. On his return from Europe, Dr. Slinger had discussions with Dr. Miriam Shiloh of the Fibre and Forest Products Research Institute in Jerusalem, who will shortly take up an appointment with the South African Wool Textile Research Institute. While in Jerusalem he attended a lecture by Dr. Tovey of the American National Bureau of

Standards on the flammability of textile materials. Dr. Slinger's Israeli visit was rounded off with a visit to a worsted factory at Kiryat-gat.

**Open Day at SAWTRI:**

Fourteen managers of Messrs. Fine Wool Products and Hex River Textiles attended another open day seminar at the Institute on May 3rd. Six senior members of SAWTRI's personnel gave lectures on important research projects and the ensuing discussions were most interesting and valuable.

**Director to serve on NCRL Advisory Committee**

Dr. D. P. Veldsman has been invited to serve on the advisory committee of the National Chemical Research Laboratory of the CSIR for a term of two years with effect from January 1st, 1971. Previously, during 1965/66, Dr. Veldsman also served on this committee.

**CSIR publicity and public relations (PAP).**

The Committee for Publicity and Public Relations (PAP Committee) is one of the standing committees of the CSIR which was established about four years ago with a view to projecting the image of the CSIR. The Committee is responsible for the formulation of the different facets of the image of science particularly the activities of the CSIR. The Committee advises the CSIR Executive in connection with policy in this respect. Dr. D. P. Veldsman, Director of SAWTRI has been appointed to this Committee for a period of three years with effect from January 1st, 1971.

## MEETINGS AND ADDRESSES

**Research Advisory Committee Meetings:**

An important meeting of SAWTRI's Research Advisory Committee was held at the Institute on April 7th. The most important matter under discussion was the future financing of the Institute in the light of the latter becoming a National Institute of the CSIR. Dr. E. G. Carter, the IWS representative on the Committee, reported on important decisions reached by the Research and Development Committee of the IWS in connection with research on blends, and the project allocations made to the various Institutes operating in conjunction with the IWS.

The meeting also took leave of Dr. Carter who is shortly to retire from his post as Director of Research of the IWS. He is being replaced on the Committee by Dr. Gerald Laxer, Director of Product Development of the IWS.

SAWTRI wishes to extend to Dr. Carter its best wishes for a happy retirement and well earned rest at the same time welcoming to the fold Dr. Laxer with whom the Institute has already enjoyed a long and fruitful association.

**SAWTRI/UPE Meetings:**

The four subject committees of the Department of Textile Science namely those for Textile Chemistry, Yarn Manufacture, Fabric Construction and Textile Physics met during April under the chairmanship of Prof. D. P. Veldsman to discuss the present curriculum and to recommend certain amendments. These recommendations were discussed at the meeting of the Science Faculty at the beginning of June for eventual approval by the Senate.

**UPE Ecology Action Week:**

The Students Science Society of the University staged a most successful Ecology Action Week during April. One of the addresses was delivered by the Director, Prof. D. P. Veldsman in which he dealt with "Industrial Pollution in the Eastern Cape".

Prof. Veldsman said that he had to paint a grim picture of mankind choking in the filthy by-products of his own technological ingenuity. Unless he can devise adequate measures timely, the human being will be very rapidly paving the way to his own destruction. In fact, the whole world stands threatened with destruction from the by-products of the so-called advanced age of technology resulting in the wanton pollution of our air, our water and land.

Dealing with *textile* effluents and their effects on the degree of pollution and referring to the local *engineering* industries, Dr. Veldsman briefly pointed out that there were solutions to many of the pollution problems if only we were prepared to implement them before it became too late.

The removal of water soluble pollutants still posed a problem, he said, because not all flocculating agents can coagulate them. In Japan, a cationic chemical, called *Kuribest*, has been marketed which reacts very effectively with negatively charged suspended matter but also with soluble anionic materials such as dyestuffs and detergents.

As far as *plastics* are concerned, their disposal remains a problem. Polyvinylchloride which is the most common plastic, produces hydrochloric acid gas, which is very harmful to the human body, when incinerated; it also damages the incinerator. One way of overcoming this problem is to install a washing machine at the rear of the incinerator. The smoke, containing the hydrochloric acid fumes, from the incinerator, is let through this washer, thereby preventing air pollution.

Recently, a Japanese firm also claimed that they had developed a non-polluting plastic. This new plastic is obtained by mixing calcium sulphite or sulphate with a special poly-olefine. The plastic has a combustion heat nearly the same as that of wood or paper and only about one-third of that of polyethylene. It also does not damage the incinerator.

Prof. Veldsman also referred to *air pollution* and said that motor cars produced a lot of carbon monoxide, apart from nitrogen oxides and hydrocarbons. The Japanese have patented a device whereby the carbon monoxide in the exhaust gases during idling is reduced to 1,5 *per cent* from 10 *per cent* for motor cars which had already done 40 000 Km. This device, utilizing a type of thermister, allows heated air at about 70°C to be blown onto the wall of the inlet valve of the carburettor.

He finally referred to *noise* as being a factor also to be considered as a typical form of environmental disruption. Anti-vibration rubber products are now available for use in industrial machines for reduction of noise and improvement of general performance.

SAWTRI's Head of Publications, Mr. P. de W. Olivier, presided over a scholars' symposium on Pollution which formed part of the Ecology Action Week.

**Dr. D. P. Veldsman addressing the staff of the I.W.S. Technical Centre at Ichinomiya, Japan, and members of the wool textile industry in the Aichi prefecture who had also been invited to attend**

**Director lectures in Japan:**

During Dr. Veldsman's recent visit to the Far East he gave several lectures on topical textile subjects. Great interest was shown in his lectures on the solvent processing of textiles, pollution of public streams in Japan having become a major problem in this highly industrialized country.

On his return from Japan, Dr. Veldsman attended the first of the 1971 meetings of the Research and Development Committee of the IWS in Sydney, Australia.

**Meeting of the Colesberg Farmer's Association:**

Addressing the Colesberg Farmer's Association on Tuesday, May 4th, Dr. D. P. Veldsman, Director of the S.A. Wool Textile Research Institute said that wool production no longer was a way of life as regarded by some people in the past. Those days are gone forever – wool production has now become a serious commercial activity faced with vicious competition from the man-made fibre industry. The Technological advancement and productive capacity of the latter industry enable them to sell their end-commodities at competitive prices and to conquer those territories which in the past belonged to wool, Dr. Veldsman said.

Dr. Veldsman said that he strongly supported the idea of processing a larger part of the South African wool clip to end-commodities locally. If such an effort is to be successful, he said, it is necessary that the local textile industry engage in some house cleaning. The local industry will have to study intensively possible overseas markets but at the same time it will have to increase productivity.

Dr. Veldsman said that we had reached the stage in our national life where we were no longer dedicated to our work and where it was no longer our life's ideal to devote all our efforts to our work. Much of our time, he said, was taken up by the quest for better positions and by the effort of adaptation caused by frequent changing of jobs. In this respect we can learn much from the Japanese people.

A month ago, Dr. Veldsman said, he paid a visit to Japan where he was most impressed by the dedication with which the Japanese approach their work. The Japanese worker joins a firm for life. He does not change his occupation – there is no time for that type of thing. It is a life task to which he devotes all his time. No wonder the Japanese have a productivity which makes the Western world hang its head in shame, Dr. Veldsman said.

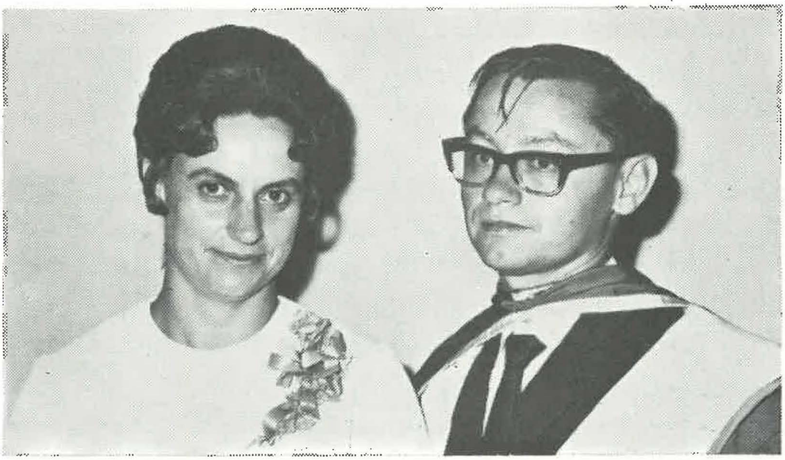
Referring to the fact that the weaving industry is rapidly losing ground to the knitting industry, Dr. Veldsman said that many men's garments which had traditionally been woven were now being produced on double jersey knitting machines. This has brought about that wool must adapt itself to these changed production conditions. If we were to succeed, wool would retain its important position in men's wear. We must continually think in terms of the needs of a modern world and its rapidly changing tastes, its casual wear and its acute consciousness of colour and design. Dr. Veldsman said that we must endeavour to fit wool into this new pattern. This can be done, he said, thanks to scientific research here and overseas.

The Association was also addressed by Mr. de Wet Olivier on the importance of fibre fineness in classing and quality assessment for not only the brokers and buyers, but also for the producer of wool.

## STAFF MATTERS

**U.P.E. Graduation Ceremony**

SAWTRI was well represented at the graduation ceremony of the University of Port Elizabeth on April 1st.



**Dr. and Mrs. R. I. Slinger at the U.P.E. graduation ceremony on April 1st. Dr. Slinger received a Ph.D.**

(Photo: Die Oosterlig)

**Mr. G. A. Robinson, Head of Weaving at SAWTRI who obtained a M.Sc. (Textiles) degree from the University of Port Elizabeth on April 1st**

(Photo: Evening Post)

Dr. R. I. Slinger, Chief Research Officer received a Ph.D.-degree for his thesis: "The Influence of Fabric Geometry and Certain Fibre Parameters on the Mechanical Properties of Wool Worsted Fabrics". Mr. G. A. Robinson, Chief Technical Officer, obtained his M.Sc. for his thesis: "A Study of Weft Skewing in Wool Worsted Fabrics".

**South Africa's first locally trained B.Sc. (Textile Science) graduates, who were capped at the University of Port Elizabeth on April 1st. L. to R. Messrs. G. van der Walt; G. Buys and H. Silver**

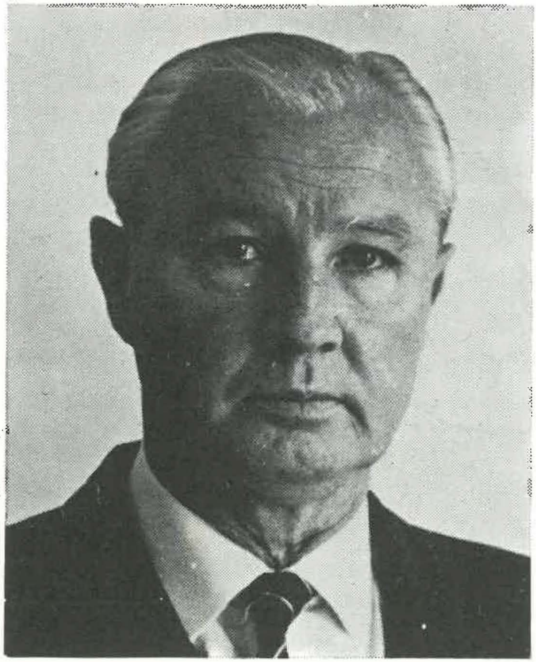
(Photo: Die Oosterlig)

History was made when at the same ceremony the first three South African trained Textile Science graduates received their B.Sc. (Textile Science) degrees. They are Messrs. G. Buys, H. Silver and G. van der Walt. The former two are on the staff of the Institute and Mr. van der Walt works in the Department of Technical Services of the South African Wool Board in Port Elizabeth.

**New Appointments:**

Dr. Miriam Shiloh of the Institute for Fibres and Forest Products, Jerusalem, is expected to take up appointment as Chief Research Officer in the Textile Physics Division during July.

Dr. Dieter Grenner has been appointed Research Officer in the Textile Physics Division. Dr. Grenner hails from Aachen, where he worked at the Deutsche Wollforschungsinstitut.



**Mr. Neville J. Vogt, the CSIR's newly appointed liaison officer for the Eastern Cape and Border**

Mr. David D. McNaughton has joined the Knitting Department as a Technical Officer. Mr. McNaughton is from Leicester in the United Kingdom.

Mr. Neville Vogt, a prominent figure in the wool trade is the new liaison officer of the CSIR in the Eastern Cape. Mr. Vogt took charge of the regional office of the CSIR on May 1st. His appointment makes provision for general liaison between the CSIR and industry with initial emphasis on the textile industry. This means that in the light of SAWTRI becoming a national institute of the CSIR, Mr. Vogt will endeavour to make closer contact with the organizations already associated with the Institute and establish liaison with that sector of the industry, which has hitherto, because of SAWTRI's commitment to the study of natural animal fibres only, remained outside the Institute's field of activities. It is hoped, therefore, that the cotton and synthetic fibre industries will in future avail themselves of the facilities for research offered by SAWTRI. Mr. de Wet Olivier, who has hitherto performed the functions of liaison will now, as Head of Publications, devote all his time to editorial and publication matters.

## VISITS AND VISITORS

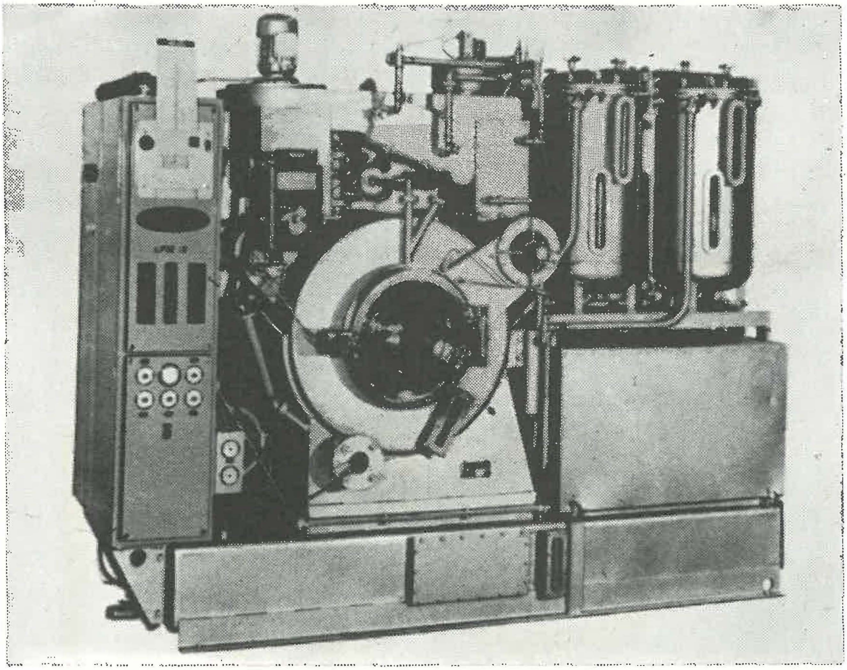
Thirty members of the P.E. Womens' Club were taken through the Institute on April 21st, and the Newton Park branch of the Womens' Agricultural Association visited the Institute on May 6th. The ladies were particularly interested in the growing range of SAWTRI's Co-we-nit fabrics.

**Mr. and Mrs. Bernat Klein inspecting a sample of knitted cloth with Mr. I. Hunter (left) and Mr. J. Engelbrecht of the Mohair Board (centre)**

Mr. and Mrs. Bernat Klein, guests of the Mohair Board were conducted through the Institute on April 29th. Mr. Klein who is a design consultant with Messrs. Goldshields, Scotland, was on a three weeks visit to South Africa.

Dr. P. J. Kruger, Senior Chief Research Officer, departs for France on June 18th to attend the I.T.M.A. in Paris. While in Europe, Dr. Kruger will visit textile organizations in France and Germany after which he will proceed to the United Kingdom where he will be engaged in discussions with the I.W.S. While in Ilkley, Dr. Kruger will address research scientists at the I.W.S. technical centre. Dr. Kruger is expected back in South Africa on July 16th.

Dr. D. P. Veldsman, Director of SAWTRI, visited factories in Port Elizabeth and Uitenhage as part of his annual programme. He was accompanied on some of these visits by Mr. Neville Vogt, newly appointed liaison officer of the CSIR in the Eastern Cape.



**Sawtri's new Solvent Dyeing and Finishing Machine to be installed shortly**

**SAWTRI Testing Apparatus:**

A number of testing units are still available from the Institute. While the SAWTRI fibre length, and sliver withdrawal force measuring instruments are approaching the production stage, the following instruments are on hand:

SAWTRI Yarn Friction Tester at R480,00
The MIKRONMETER at R49,50
The SAWTRI Compressibility Tester at R90,00

These instruments may be purchased directly from the Institute.

## SAWTRI PUBLICATIONS

R. I. Slinger: The Influence of Fabric Geometry and Certain Fibre Parameters on the Mechanical Properties of Wool Worsted Fabrics, Ph.D. Thesis, University of Port Elizabeth (1971).

G. A. Robinson: A study of Weft Skewing in Wool Worsted Fabrics, M.Sc. Thesis, University of Port Elizabeth (1971).

**Accepted for Publication:**

Haylett, T., Swart, L. S. and Parris, D.: Studies of the High Sulphur Proteins of Reduced Merino Wool: The Amino Acid Sequence of Protein SCMKB III B3, *The Biochemical Journal.*

# KEMP (MEDULLATED FIBRE) REDUCTION BY NOBLE COMBING

*by D. W. F. TURPIE*

## ABSTRACT

*The quality of a kempy punch sliver with respect to the amount and type of medullated fibre present was improved by combing on the Noble Comb. Wide settings of the drawing-off rollers together with the use of lower pin densities on the large circle were recommended. For higher efficiency in medullated fibre removal unconventional techniques were found to be worth consideration.*

## KEY WORDS

Kemp, medullated fibre, Noble combing, drawing-off roller settings, pin density, sliver separation, circle temperatures, mean fibre diameter, mean fibre length.

## INTRODUCTION

While traces of kemp are sometimes found in the "Inferior Topmaking" group of South African Wools, larger amounts of kemp are often found in the groups of wools described as "Fine Natives, Basutos and Transkeis" and significant amounts of kemp are found in the group of wools described as "Coarse and Coloured". Until fairly recently very kempy wools have been used in the manufacture, inter alia, of cheap woollens, blankets and felts. It is interesting to note, however, that there is now apparently an outlet for combed tops which are "contaminated" with kemp. Such a top can be made, for example, from a mixture of the groups of wools referred to above. The demand for these tops is probably related to their relatively lower price compared with other tops of the same mean fibre length and diameter which are not "contaminated", but also possibly to fashion demands. However, the degree of "contamination" should not be excessive otherwise the price and the demand would be adversely affected.

In the light of the above information the efficiency of the comb in removing kemp is of importance and some combing trials on a very kempy wool were therefore conducted at SAWTRI. Taking cognisance of previous work on mohair[1] and karakul wool[2], the Noble comb was selected as being best suited for kemp removal. The effects of certain changes in settings, pin densities and temperatures were studied.

## EXPERIMENTAL

The raw material used was a very kempy scoured inferior cross-bred mixture which was probably derived from Native bellies, locks and cross-breds together with white kempy outsorts from Coarse and Coloured sortings. Apart from its inferior character the wool was also inclined to be tender. The punch slivers made from this raw material contained 24% of medullated fibres by weight.

The term "medullated fibre" has been used in this study in preference to the word "kemp" since no distinction was made between a milky white fibre (kemp) and one which was not milky white but with a small medulla, the only criterion used being that a definite medulla was present.

Settings of the outside drawing-off roller (O.D.O.R.) and of the inside drawing-off roller (I.D.O.R.) refer to the distances measured from the flutes to the respective brass rims of the circles.

The temperatures of the large and small circles were maintained at 60°C and 20°C respectively except for one experiment in which these temperatures were reversed. The former choice of temperatures was purposely made in order to produce low holding power of the large circle[2].

Performance was compared keeping production constant for each set of variables.

Separate data for the combed slivers emerging from the large and small circles were obtained using special techniques[3].

**TABLE I**

**THE EFFECT OF CHANGES IN O.D.O.R. AND I.D.O.R. SETTINGS ON MEDULLATED FIBRE REMOVAL**

(Pin density of circles 42/46 p.p.i.)

| O.D.O.R. setting (mm)<br>I.D.O.R. setting (mm) | 1<br>2 | 1<br>8 | 6<br>8 |
|---|---|---|---|
| Medullated fibre in Top (%) | 23 | 22 | 20 |
| Medullated fibre in Noil (%) | 32 | 34 | 40 |
| Percentage noil | 14 | 17 | 20 |
| m.f.d. of wool fibres in Top ($\mu$m) | 21 | 20 | 21 |
| m.f.d. of wool fibres in Noil ($\mu$m) | 20 | 19 | 20 |
| m.f.d. of medullated fibres in Top ($\mu$m) | 40 | 42 | 43 |
| m.f.d. of medullated fibres in Noil ($\mu$m) | 55 | 58 | 56 |

## RESULTS AND DISCUSSION

The amount of medullated fibre in the top was found to be influenced by both the O.D.O.R. and the I.D.O.R. settings (Table I). An increase in either setting resulted in a reduction of the medullated fibre content of the top. An increase in both settings produced the best result, but the percentage noil removed was also highest. No significant change in the mean fibre diameters (m.f.d.) of the wool fibres or medullated fibres was evident in the top or noil for the changes of the above settings.

### TABLE II

### THE EFFECT OF A CHANGE IN LARGE CIRCLE PIN DENSITY ON MEDULLATED FIBRE REMOVAL

**(Settings: O.D.O.R. 10 mm & I.D.O.R. 8 mm)**

| Pin density of large circle (p.p.i.) | | 42 | 28 |
|---|---|---|---|
| Medullated fibre in Top (%) | | 22 | 22 |
| Medullated fibre in Noil (%) | | 33 | 33 |
| Percentage noil | | 21 | 21 |
| **Length and Diameter of Top:** | | | |
| Wool | m.f.l. (cm) | 5,6 | 6,2 |
| | m.f.d. ($\mu$m) | 21 | 21 |
| Medullated fibres | m.f.l. (cm) | 6,1 | 7,1 |
| | m.f.d. ($\mu$m) | 41 | 36 |
| **Length and Diameter of Noil:** | | | |
| Wool | m.f.l. (cm) | 1,4 | 1,8 |
| | m.f.d. ($\mu$m) | 20 | 20 |
| Medullated fibres | m.f.l. (cm) | 2,0 | 1,6 |
| | m.f.d. ($\mu$m) | 61 | 77 |

The results of a change in pin density of the large circle from 42 p.p.i. to 28 p.p.i. are given in Table II. It can be seen from this table that a reduction in pin density of the large circle produced no change in percentage noil or in the amount of medullated fibre in the top or noil. There was also no change in the mean fibre diameter of the *wool* fibres in the top or noil. However, the mean fibre diameter of the *medullated* fibres decreased in the top and increased in the noil and was accompanied by an increase and a decrease in mean fibre length respectively. A longer and finer top was produced when using a low pin density large circle than when using a high pin density large circle for the same amount of noil.

**TABLE III**

**THE EFFECT OF REVERSAL OF LARGE AND SMALL CIRCLE TEMPERATURE ON MEDULLATED FIBRE REMOVAL**

**(Pin density of circles 28/46. Settings: O.D.O.R. 7 mm I.D.O.R. 1,5 mm)**

| | | | |
|---|---|---|---|
| Temperature of large circle (°C) | | 60 | 20 |
| Temperature of small circle (°C) | | 20 | 60 |
| Holding power of large circle (%) | | 51 | 71 |
| Medullated fibres in Top A (%) | | 20 | 22 |
| Medullated fibres in Top B (%) | | 22 | 25 |
| Medullated fibres in Combined Top (%) | | 21 | 22 |
| Medullated fibres in Noil (%) | | 37 | 32 |
| Percentage noil | | 18 | 19 |
| **Length and Diameter of Top A:** | | | |
| Wool | m.f.l. (cm) | 6,2 | 5,5 |
| | m.f.d.(μm) | 21 | 22 |
| Medullated fibres | m.f.l. (cm) | 7,3 | 6,9 |
| | m.f.d.(μm) | 37 | 40 |
| **Length and Diameter of Top B:** | | | |
| Wool | m.f.l. (cm) | 4,3 | 3,4 |
| | m.f.d.(μm) | 20 | 20 |
| Medullated fibres | m.f.l. (cm) | 4,4 | 3,5 |
| | m.f.d.(μm) | 46 | 44 |
| **Length and Diameter of Combined Top:** | | | |
| Wool | m.f.l. (cm) | 5,3 | 5,1 |
| | m.f.d.(μm) | 21 | 22 |
| Medullated fibres | m.f.l. (cm) | 6,1 | 6,2 |
| | m.f.d.(μm) | 40 | 40 |
| **Length and Diameter of Noil:** | | | |
| Wool | m.f.l. (cm) | 1,5 | 1,7 |
| | m.f.d.(μm) | 19 | 19 |
| Medullated fibres | m.f.l. (cm) | 1,8 | 1,7 |
| | m.f.d.(μm) | 49 | 56 |

Reversing the temperatures of the large and small circles when using a large circle of low pin density, changed the holding power of the large circle and produced changes in the characteristics of the combed slivers and noil. These results are given in Table III. It is clear from this table that there was a higher percentage of medullated fibre in the combed sliver emerging from the small circle (Top B) than that emerging from the large circle (Top A) when using either of the temperature combinations. The mean fibre lengths of both wool and medullated fibres were significantly lower in Top B than in Top A. Whilst the wool fibres in Top B were finer than those in Top A, the medullated fibres in Top B were considerably coarser than those in Top A, particularly when the small circle was cold and the large circle hot. This latter temperature combination also resulted in higher mean fibre lengths for wool as well as medullated fibres in both Top A and Top B. When considering the characteristics of the combined top (Top A + Top B), however, there appears to be no advantage in reversing the temperature combinations unless it is intended to keep the components separate.

The degree of success in using the Noble comb for the purpose of medullated fibre removal can be broadly summed up by reference to Table IV. This table gives the average values for diameter and length of the top and noil obtained in the experiments described.

It can be seen from Table IV that the percentage of medullated fibres in the punch sliver was reduced from 24,0% to 21,7% by combing. Although this reduction is relatively small it will nevertheless be noted that the diameter of the medullated fibres in the top is nine microns *finer* and in the noil ten microns *coarser* than the diameter of the medullated fibres in the punch sliver. It is also clear from a comparison of the lengths of medullated fibres in the punch sliver, top and noil that the shorter coarser medullated fibres went into the noil and the longer finer medullated fibres went into the top. The quality of the punch sliver with respect to amount and type of medullated fibre was therefore much improved by combing.

**TABLE IV**

**CHARACTERISTICS OF KEMPY CROSSBRED IN PUNCH SLIVER, TOP AND NOIL**

| | Punch Sliver | Top | Noil |
|---|---|---|---|
| Percentage of Medullated fibres | 24,0 | 21,7 | 34,6 |
| **Wool** m.f.l. (cm) | 4,5 | 5,6 | 1,6 |
| m.f.d. (μm) | 20,8 | 20,9 | 19,6 |
| **Medullated fibres** m.f.l. (cm) | 4,3 | 6,3 | 1,8 |
| m.f.d. (μm) | 49,3 | 40,3 | 58,9 |

It is perhaps of interest to compare these results with the results on the Noble combing of BSFH mohair reported in a previous paper[1]. These results are given in Table V. It can be seen from Table V that in this case of combing mohair the diameter of the kemp fibres in the top is seven microns *coarser* and in the noil one micron *finer* than the diameter of the kemp fibres in the punch sliver. The trends for diameter given in Tables IV and V are therefore contradictory. The difference, however, is basically due to the difference in the characteristics of the two blends. The mohair blend, broadly speaking, contained *short fine* kemp and *long coarse* kemp whereas the wool blend contained *short, coarse* medullated fibres and *long fine* medullated fibres. In both cases therefore the selection would appear to be strongly length biased.

**TABLE V**

**CHARACTERISTICS OF BSFH MOHAIR IN PUNCH SLIVER, TOP AND NOIL**

| | Punch Sliver | Top | Noil |
|---|---|---|---|
| Percentage of kemp | 2,4 | 0,91 | 24,1 |
| Mohair m.f.l. (cm) | 10,7 | 11,4 | 1,8 |
| m.f.d. (μm) | 36,1 | 37,9 | 34,5 |
| Kemp m.f.l. (cm) | 2,4 | 3,5 | 2,2 |
| m.f.d. (μm) | 56,5 | 63,9 | 55,8 |

## CONCLUSIONS

The quality of a kempy punch sliver with respect to the amount and type of medullated fibre present can be improved by combing on the Nôble comb. The use of wide settings on both the outside and inside drawing-off rollers is recommended for reducing the amount of medullated fibre in the resultant top. The use of lower pin densities on the large circle is recommended for increasing the mean fibre length and decreasing the mean fibre diameter of the resultant top. If a higher efficiency is required in medullated fibre removal it may be worth while considering the use of unconventional techniques whereby the combed slivers from the large and small circles are kept separate. In this event the use of low small-circle temperatures and high large-circle temperatures would be helpful.

## ACKNOWLEDGEMENTS

The author wishes to thank Mrs. Barbara van der Riet and her group for undertaking the tedious measurement of lengths and diameters of the fibres.

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# A STUDY OF THE TWIST VARIATION OF SINGLE WOOL WORSTED HOSIERY YARNS

*by I. M. HUNTER*


## ABSTRACT

*The twist of a number of commercial wool worsted hosiery yarns was determined on an automatic twist tester and the correlations between variation in twist and yarn irregularity as determined on an Uster tester, and variation in yarn linear density over one metre lengths, respectively were investigated. The relationship between mean twist and yarn linear density was also derived from the data.*



## KEY WORDS

Twist, twist variation, automatic twist tester, hosiery yarns, yarn irregularity.


## INTRODUCTION

It is well known that twist runs into thin places and a very high correlation was previously[1] found between the standard deviation of twist determined over one inch segments and the yarn irregularity as determined on the Uster range of evenness testing equipment. The variation in twist so obtained could therefore be used as a measure of the short term variation of the yarn linear density, i.e. of the yarn irregularity. Today, however, increasing use is being made of automatic twist testers which operate over gauge lengths of the order of 50 cm. The question now arises: Is there a correlation between the variation in twist obtained when employing such a long gauge length and either the yarn linear density variation over a corresponding length or the yarn irregularity as measured on the Uster, i.e. is the variation in twist so obtained also a measure of the yarn irregularity?

In this study the correlations between the coefficient of variation (C.V.) of twist obtained on an automatic twist tester and the coefficient of variation of yarn linear density and between yarn irregularity and the standard deviation of twist were investigated for a range of single wool worsted hosiery yarns. The relationship between yarn twist and linear density (tex) was also investigated.

## EXPERIMENTAL

In this study 232 commercial wool worsted hosiery yarns comprising undyed as well as yarns dyed to different shades and ranging in count from 15,3 tex to 63 tex, were used. The yarn twist was measured on a Zweigle Automatic Twist Tester (Type D300) by means of the Double Untwist Twist Test Method[2]. One hundred tests were carried out on each yarn. Although a 50 cm gauge length is employed in this test, two very nearly consecutive 50 cm lengths are used in arriving at each twist value (then given as the twist in one metre of yarn). The effective test length was therefore assumed to be one metre and not 50 cm.

The yarn linear density was calculated from the weight of six 50 metre lengths of yarn.

Because of the amount of work involved only 59 of the 232 yarns were selected for determining the variation in yarn linear density over one metre lengths. In order to correspond as closely as possible to the twist test a fifty metre length of yarn was wound onto a drum, one metre in circumference, cut into one metre lengths, weighed and the coefficient of variation calculated in the normal manner.

Once again, because of the amount of work involved, the irregularity of only 66 of the yarns was determined on the Uster Evenness Testing equipment. The test procedure and settings used were as follows:

**Evenness Tester** (Model GGP – B30)
Speed : 100 m/min
Range of Scale : ± 100%
Test : Normal

**Integrator** (Model ITG – Q101)
Evaluating Time : 2½ minutes
Scale : ± 100%

In most cases eight 2½-minute tests were carried out on each yarn. The average of the coefficient of variation values was then calculated. All tests were carried out at 20°C and 65% R.H.

## RESULTS AND DISCUSSION

A regression analysis of Uster irregularity against standard deviation of twist was carried out on the results obtained on the 66 yarns on which irregularity tests had been done and the following regression equation was obtained:

Irregularity (%) = 0,16 (standard deviation of twist) + 13,1 ............ (1)
number of readings (n) = 66
Correlation coefficient = 0,50 (significant at the 0,1 *per cent* level)

It is therefore apparent that a low but significant correlation exists between Uster irregularity and standard deviation of twist. This is illustrated in Fig. 1 in which standard deviation of twist has been plotted against Uster irregularity. It is clear from Fig. 1 that standard deviation of twist is only a very rough measure of the yarn irregularity, the correlation found here between standard deviation of twist and yarn irregularity not being as good as that found previously[1] between standard deviation of twist (using a 1 inch gauge length) and yarn irregularity as measured on the Uster.

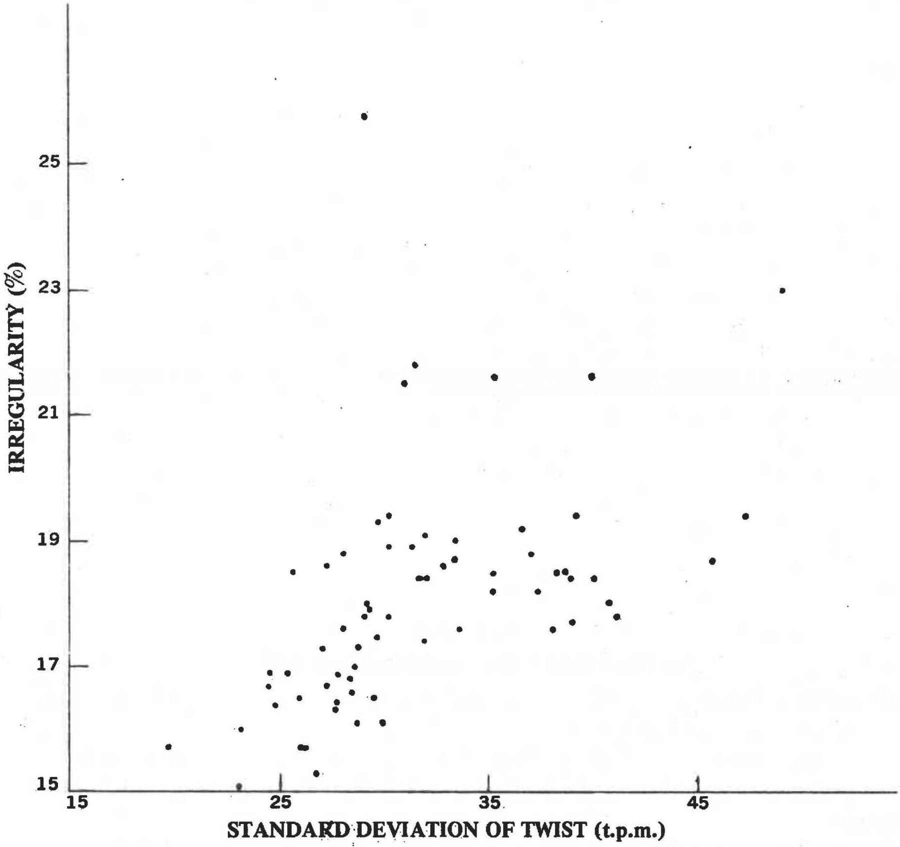


**FIGURE 1**

**Relationship between yarn irregularity and standard deviation of twist**

A straightforward regression analysis of coefficient of variation of twist against coefficient of variation of linear density (tex) as determined from the weights of one metre lengths of yarn gave the following equation:

C.V. of linear density (in %) = 3 (C.V. of twist) – 14 ..................(2)
n = 59

Correlation coefficient = 0,366 (significant at the 1 *per cent* level). There is therefore a low but significant correlation between the coefficient of variation of twist as obtained on the Zweigle Twist Tester and the coefficient of variation of linear density obtained from the weights of one metre lengths of yarn (i.e. the medium term variation in yarn linear density). The correlation is, however, too poor for the

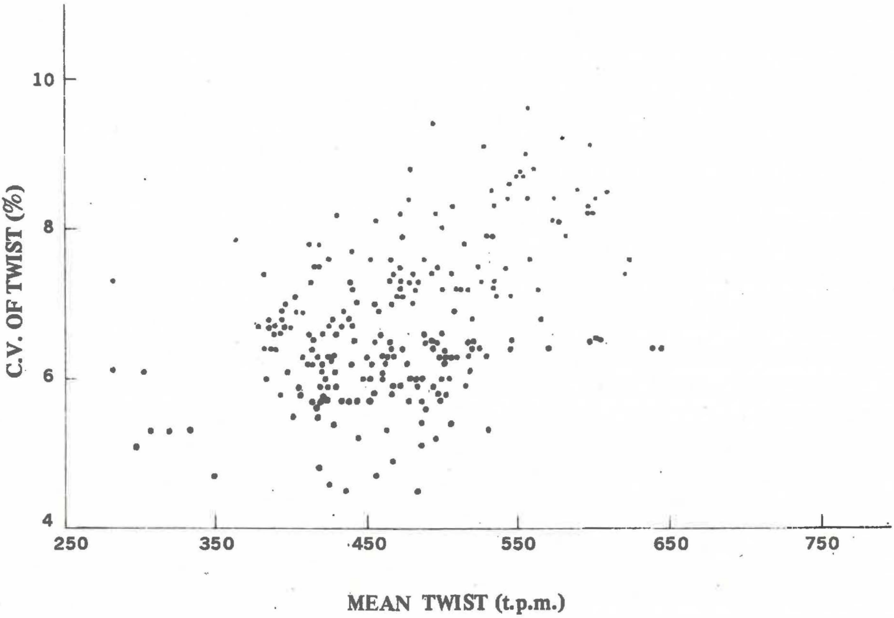


FIGURE 2

Coefficient of variation of twist versus mean twist

coefficient of variation of twist to be used in practice as a measure of the medium term variation in yarn linear density.

A regression analysis of coefficient of variation of twist against mean twist was carried out on the results of all 232 yarns and the following equation was obtained:

C.V. of twist (in %) = 0,0063 Twist (in t.p.m.) + 3,7 .................. (3)
n = 232

Correlation coefficient = 0,42 (significant at the 0,1 *per cent* level)

It is therefore apparent that the coefficient of variation of twist is dependent upon the mean twist; the higher the twist inserted in the yarn, the higher the coefficient of variation of twist, i.e. the greater the variation in twist. The correlation is, however, rather poor as is illustrated by Fig. 2 in which coefficient of variation of twist has been plotted against mean twist.

In Fig. 3 yarn twist in turns per metre (t.p.m.) has been plotted against yarn linear density (in tex) for all 232 yarns. It is evident from Fig. 3 that the majority of points lie within a reasonably narrow band (the spread for a particular linear density was approximately 100 t.p.m.). Most of the outlying points (i.e. those lying a considerable distance above the majority of points) were found to belong to yarns composed of very short fibres (mean fibre length of the order of 40 mm),

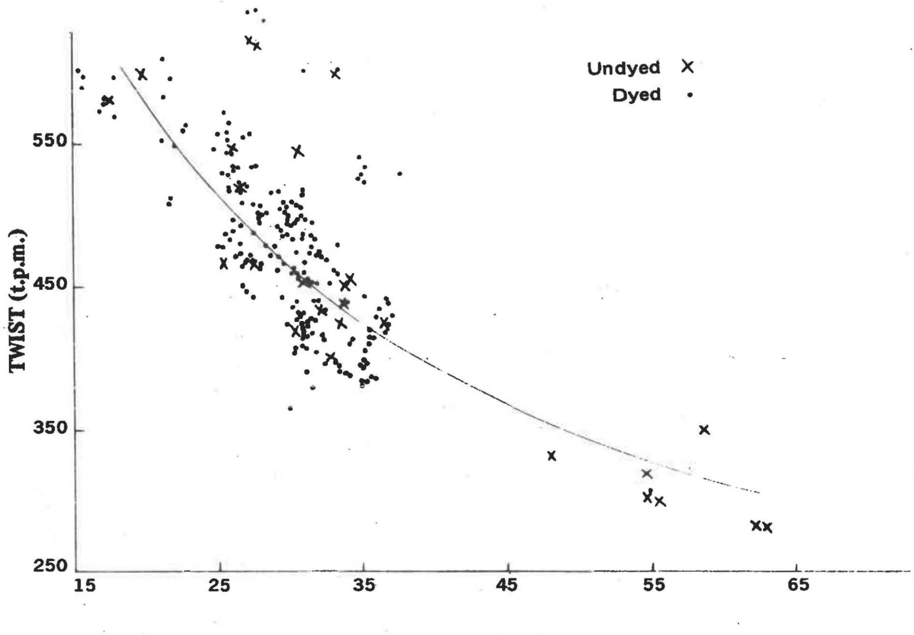


**FIGURE 3**

**Relationship between yarn twist and linear density**

the relatively high twist used in the case of these yarns being essential to obtain satisfactory yarn tensile properties and end breakage rate during spinning. It is clear therefore, that the twist-yarn linear density relationship will be highly dependent upon mean fibre length and to a lesser extent upon other raw material and processing characteristics.

Two regression analyses of log twist against log tex were carried out. The first analysis (equation (4)) was carried out on all of the 232 results while the 15 outlying points were excluded from the second analysis (equation (5)). The following regression equations were obtained:

$$\text{Twist (in t.p.m.)} = \frac{2\,844}{\text{tex}^{0,53}} \qquad \text{(4)}$$

Number of readings (n) = 232

Correlation coefficient = – 0,753

The index of tex does not differ significantly from 0,50.

## TABLE I

## COMPARISON OF TWIST AND TWIST FACTOR VALUES OBTAINED FROM EQUATIONS (4) and (6)

| Count | | EQUATION (4) | | | | EQUATION (6) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tex | Worsted | Twist (in t.p.m.) $= \frac{2\,844}{\text{tex}^{0,53}}$ | Equivalent twist in t.p.i. | Corresponding Twist Factors: t.p.m. x tex$^{1/2}$ | Corresponding Twist Factors: $\frac{\text{t.p.i.}}{(\text{Worsted count})^{1/2}}$ | Twist (in t.p.m.) $= \frac{2\,731}{\text{tex}^{1/2}} - 38,4$ | Equivalent twist in t.p.i. | Corresponding Twist Factors: t.p.m. x tex$^{1/2}$ | Corresponding Twist Factors: $\frac{\text{t.p.i.}}{(\text{Worsted count})^{1/2}}$ |
| 15 | 59,1 | 677 | 17,2 | 2 622 | 2,24 | 667 | 16,9 | 2 582 | 2,20 |
| 20 | 44,3 | 571 | 14,5 | 2 552 | 2,18 | 572 | 14,5 | 2 559 | 2,18 |
| 25 | 35,4 | 516 | 13,1 | 2 582 | 2,20 | 508 | 12,9 | 2 539 | 2,17 |
| 30 | 29,5 | 469 | 11,9 | 2 568 | 2,19 | 460 | 11,7 | 2 521 | 2,15 |
| 35 | 25,3 | 432 | 11,0 | 2 556 | 2,18 | 423 | 10,7 | 2 504 | 2,14 |
| 40 | 22,2 | 403 | 10,2 | 2 546 | 2,17 | 393 | 10,0 | 2 488 | 2,12 |
| 45 | 19,7 | 378 | 9,6 | 2 537 | 2,16 | 369 | 9,4 | 2 473 | 2,11 |
| 50 | 17,7 | 358 | 9,1 | 2 529 | 2,16 | 348 | 8,8 | 2 459 | 2,10 |
| 55 | 16,1 | 340 | 8,6 | 2 522 | 2,15 | 330 | 8,4 | 2 446 | 2,09 |
| 60 | 14,8 | 325 | 8,2 | 2 515 | 2,14 | 314 | 8,0 | 2 434 | 2,07 |
| 65 | 13,6 | 311 | 7,9 | 2 510 | 2,14 | 300 | 7,6 | 2 421 | 2,06 |

$$\text{Twist (in t.p.m.)} = \frac{3\,074}{\text{tex}^{0,56}} \qquad \text{.............................} (5)$$

n = 217

Correlation coefficient = – 0,850

The index of tex differs from 0,50 at the 2 *per cent* level

A curve corresponding to equation (5) has been fitted to the points plotted in Fig. 3.

A regression analysis of twist against $\text{tex}^{-1/2}$ yielded the following equation:

Twist (in t.p.m.) = 2 731 $\text{tex}^{-1/2}$ – 38,4 ........................ (6)

n = 217

Correlation coefficient = – 0,846

Within the range of tex investigated here this curve corresponded very closely (on the average to within 1 *per cent*) to that obtained from equation (5)

It may be pointed out, however, that only a few coarse yarns were tested and that the curves fitted to the points may therefore not be entirely accurate for yarns which are on the coarse side.

In Table I twist values calculated from equations (4) and (6) are given for yarn linear densities ranging from 15 to 65 tex (the values for equation (5) can be obtained from the curve drawn in Fig. 3). The corresponding twist factors in metric and Bradford worsted units have also been given for reference and comparison purposes. It is evident that the worsted twist factor

$$\frac{\text{t.p.i.}}{(\text{worsted count})^{1/2}}$$

generally increases slightly with decreasing tex, ranging on the average, from about 2,1 for a 65 tex (13,6's Wo) yarn to about 2,2 for a 15 tex (59's Wo) yarn. The corresponding metric twist factors (t.p.m. × $\text{tex}^{1/2}$) are approximately 2 466 and 2 602 respectively. However, in practice these twist factors would have to be adapted according to the fibre characteristics and spinning conditions.

## SUMMARY

The standard deviation of yarn twist as determined on an automatic twist tester was found to have a low but significant correlation with the yarn irregularity as determined on the Uster Evenness Testing equipment and it is therefore a rough measure of the yarn irregularity.

A low but significant correlation was also found between coefficient of variation of twist and coefficient of variation of yarn linear density calculated from the weights of one metre-lengths of yarn. The correlation was, however, too poor to be of any practical use.

Empirical relationships between yarn twist and linear density were also derived from the results obtained on a large number of commercial wool worsted hosiery yarns.

## ACKNOWLEDGEMENTS

The author is indebted to Mrs. F. J. de Villiers and Mr. A. J. Gerber for technical assistance and Mrs. I. Botha for carrying out the statistical analyses. The assistance of Dr. R. I. Slinger in the planning of the statistical analyses is also gratefully acknowledged.

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# NEW DEVELOPMENTS IN DYEING AND FINISHING OF KERATIN FIBRES

*by D. P. VELDSMAN*

*Director, S.A. Wool Textile Research Institute, Port Elizabeth.*
*(Presented at Chemical Institute Convention, Grahamstown, February, 1971)*

In the Textile Industry the processes of dyeing and finishing have become of increasing importance. This state of affairs can be ascribed to several factors, viz.–

In this age of easy-care the textile consumer no longer tolerates tasks such as hand washing or ironing. An end-commodity should therefore be able to withstand a normal machine washing and after tumble-drying, or line-drying, it should be ready for wear. This demand has placed a heavy responsibility on the shoulders of the dyeing and finishing industries since easy-care treatments such as permanent press, shrink-resist treatments for wool and the application of dyestuffs which can withstand severe washing conditions, now require the closest attention of finishers and dyers.

Nowadays the colour, style, character and finish of a textile end-commodity have also become of tremendous importance. The fibre from which the end-commodity is made, has become of lesser importance. If an end-commodity possesses the aforementioned properties, the consumer would most likely decide to buy it, should the price be within reach.

The dyeing and finishing sectors of the textile industry are highly machine intensive and in view of the current price of fully or partly automatised dyeing and finishing machines, there is a continuous battle to keep processing costs down.

Both these processes incorporate a number of wet processes which produce large quantities of heavily polluted effluents. Whereas in earlier days these effluents could be released into rivers, public streams and sewers without complying with stringent specifications, this is no longer the case and a solution to this vexing problem will have to be sought.

A heavy responsibility is consequently placed on the shoulders of the Dyeing and Finishing industries, which so far has been ably coped with, both by Research Organisations and by textile processing firms. The object of this paper is to review some of the most important advances made over the past 5 years in order to satisfy the desires and meet the demands of the modern consumer while retaining the economic viability of the two processes.

## DYEING

One of the major objectives was to find dyestuffs which are bright and which have a high resistance to fading when exposed to light and to bleeding when the end-commodity is laundered. With synthetics this is not such a formidable problem but in the case of wool, dyestuff manufacturers and research organisations were faced with tremendous problems. The use of reactive dyes on wool came as a solution and today there is a wide range of reactive dyestuffs available for application to keratinous, as well as cellulosic fibres. Table I lists the most important commercial types of dyestuff groups available.

Since the reactive dyestuffs form covalent bonds with wool or cellulose, the fastness to washing is also good. Furthermore, in most cases the fastness to light and level of brightness are satisfactory. However, the level application of these dyestuffs to wool posed some problems. The use of textile auxiliaries to facilitate level dyeing of reactive dyestuffs became of major importance and in this respect the Ciba Co. (Basle) made an important contribution with the introduction of their Lanasol dyestuff range and associated auxiliaries (Albegal B and C). Albegal B is specifically advantageous in the level application of reactive dyes and Albegal C serves a dual function, i.e. it suppresses excessive foam formation and acts as a de-aerater during yarn package dyeing.

Problems associated with the supply of treated water, suitable for dyeing and sufficiently cheap, are of a national character in view of our restricted water resources. The proper treatment of dyehouse effluent at an economical level invited intensive research to establish effluent treatment techniques which are economically feasible.

The South African Wool Textile Research Institute approaches these problems from a different angle by using organic solvents instead of water as the processing medium. Striking success has already been achieved and intensive research is still proceeding. By using solvents problems associated both with the supply of water and effluent treatment are eliminated as the solvent is recovered by distillation. Furthermore, the thermo-economics of solvents are very attractive as the heat of evaporation and the specific heat of perchlorethylene are respectively about 1/10 and 1/5 that of water. Therefore, the drying and heating-up processes are much more economical for solvents when compared with water.

In the dyeing of wool, the South African Wool Textile Research Institute used conventional wool dyestuffs and found that the majority were suitable for the dyeing of wool in a perchlorethylene "charged system". In our case the "charge" of water was initially high – 50 *per cent* on the weight of the goods and approx. 5 *per cent* on the volume of the perchlor. In addition, suitable emulsifying/wetting agents had to be used. Lately, however, the percentage water in the charge was reduced considerably by using more suitable auxiliaries for dissolution of the dyestuffs.

## BLEACHING

The yellowing of wool mainly through the ultra violet rays in sunlight is a well known problem. Thusfar, however, there has been no bleaching process available by which permanent whiteness can be imparted to wool.

Aqueous hydrogen peroxide is still used extensively for wool bleaching in spite of the fact that the whitening effect is not permanent and that the rate of

## TABLE I

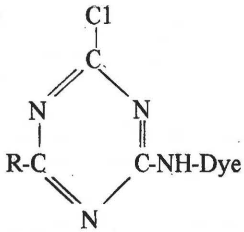
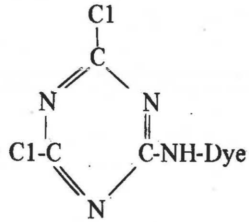
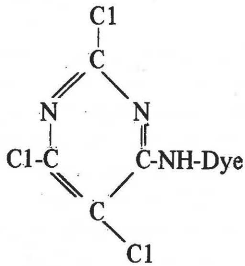
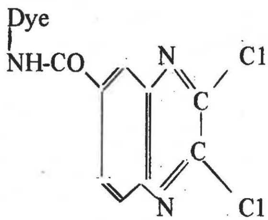
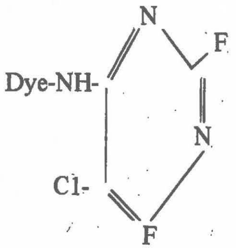
| | TYPE | NAME | MANUFAC-TURER |
|---|---|---|---|
|  | Monochloro-triazinyl | Procion H<br>Cibacron<br>Cibacrolan | I.C.I.<br>Ciba<br>Ciba |
|  | Dichloro-triazinyl | Procion M | I.C.I. |
|  | Trichloro-pyrimidyl | Drimarene<br>Reactone | Sandoz<br>Geigy |
|  | Dichloro-quinoxalino | Levafix E | Bayer |
| Dye-NH-CO-CH=$CH_2$ | Acrylamido | Procilan | I.C.I. |
| Dye-NH-CO-C(Br)=$CH_2$ | Bromo-acryl-amido | Lanasol | Ciba |
| Dye-$SO_2$-CH=$CH_2$ | Vinyl sulphonyl | Remazolan | Hoechst |

**TABLE I (contd.)**

| | TYPE | NAME | MANUFAC-TURER |
|---|---|---|---|
|  | Chloro-difluoro pyrimidyl | Verofix<br>Reactolan<br>Drimarene | Bayer<br>Geigy<br>Sandoz |
| Dye-NH-CO-$CH_2$-Cl | Chloro-acetyl | Cibalan Brilliant | Ciba |
| D-NH-CO-$CH_2$-$CH_2$-O-$SO_3$H | Sulphatoethyl carbonamide | Primazin | BASF |
| D-$CH_2$-NH-CO·CCl=$CH_2$ | – | Lanasyn Brilliant | Sandoz |
| D-$CH_2$-NH-CO·$CH_2$·$CH_2$<br>$HO_3$S-O-$CH_2$-$CH_2$-$SO_2$ | – | Lanafix | Sumitomo |

yellowing is much faster after bleaching. Recently, the South African Wool Textile Research Institute applied the principle of solvent-based bleaching of wool by dispersing the $H_2O_2$ in perchlorethylene. Excellent results were obtained – only 10 *per cent* of the conventional amounts of peroxide was required for the same bleaching effect and the bleaching time was reduced to 25 *per cent* of the normal. The solvent bleaching was no more damaging than aqueous bleaching for the same degree of whiteness and in the case of the solvent process, no stabilising agents were required as is the case with the aqueous process.

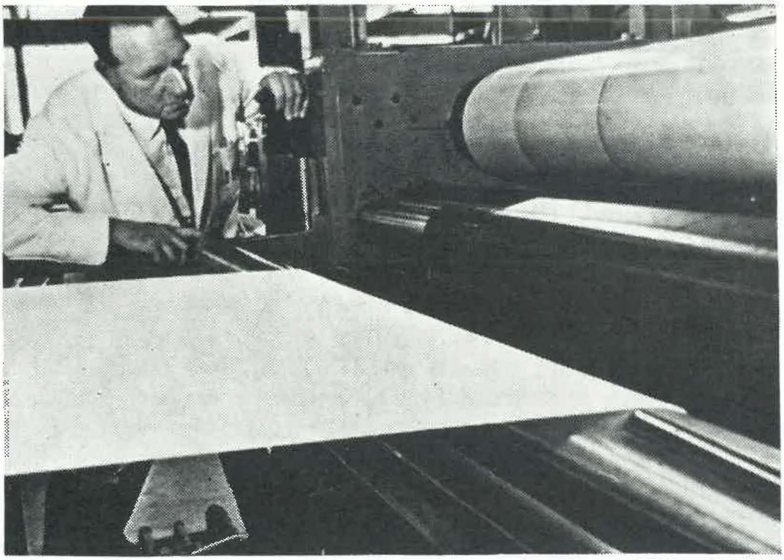
These developments led us to believe that many dyeing and finishing processes for wool, and perhaps for other fibres as well, could be integrated or synchronised. A typical example is quoted below.

## SHRINKPROOFING OF WOOL

There are mainly two techniques for the shrinkproofing of wool, viz. chemically oxidative treatments and resin treatments. In the latter case the shrinkproofing effect is achieved by surface masking the protruding scales on the fibres thus reducing the uni-directional movement of fibres, or by spot welding the fibres in order to restrict their movement in the fabric.

Over the past few years certain resins have been developed which are soluble in perchlorethylene and which are able to render wool shrink-resistant. A typical example is Synthappret LKF (Bayer), a polyurethane resin which can be applied to wool in a dry-cleaning machine. Subsequent drying and ageing for 7 days effect complete curing (polymerisation) of the resin on the wool. The South African Wool Textile Research Institute found that the process of curing could be expedited considerably by vacuum steaming of the wool (0,35 $kg/cm^2$ steam pressure for 2 min) very soon after resin application.

An interesting aspect of this processing sequence is that wool knitwear is not only shrinkproofed but the potential relaxation shrinkage is also inhibited to a very large extent. By shrinkproofing wool with a resin in perchlorethylene, followed by steaming, dyeing in solvent medium could be carried out immediately afterwards.



**I.W.S. Pad-batch Dyeing Technique**
**(Photo by Courtesy of the I.W.S., England)**

## CONTINUOUS PROCESSING

One of the main objectives of modern dyeing and finishing techniques is to implement continuous methods. This is of paramount importance in the case of fabrics of cellulosics and synthetics where considerable yardage of a certain shade or type is involved.

In the case of dyeing, a semi-continuous process, the so-called pad/batch method developed by I.W.S. has recently been developed for wool pieces. Here the dyestuff, in this case a reactive type of dyestuff, is dissolved in a 35 *per cent* urea solution containing a wetting agent and a thickener and padded onto the wool (see Fig. 1). The wool piece is then batched on a perforated roller which is slowly but continuously rotated in air for anything from 12 to 48 hours, depending on the reactivity of the dyestuff. This period permits fixation of the dyestuff through covalent linkage. After batching, the piece is rinsed by circulating water through the wound beam in a beam dyeing machine.

Continuous dyeing of carpets also proved a viable process by using the same type of padding system and solutions as mentioned above but, instead of batching, the carpet is passed through a steamer for rapid fixation of the dyestuff.

As regards *continuous finishing* there are various processing stages which could vastly improve production rates. Continuous open width scouring is a classical example. Here again the use of organic solvents has come to the fore and the latest techniques employ the use of a series of jet sprays followed by squeezing. In another case the cloth is first impregnated with the scouring liquor and then passed through a series of boxes containing steel balls. Mechanical vibration of the boxes at 50 cycles/sec allows the steel balls to beat the cloth, thereby facilitating the consolidation of the cloth.

During the final dry finishing processes, relaxation shrinkage could be overcome by passing the cloth in a tensionless state over a series of revolving steel bars while steam is blown from underneath onto the cloth. In the United States of America this continuous steaming process is known as sponging.

Although a continuous finishing range has much to be commended, in the wool textile industry long runs of one particular cloth type are exceptional and continual changes in cloth type and concommitant finishing procedures make this type of processing less attractive. However, a change to semi-continuous processing of wool fabrics would be of economic advantage in view of reductions in labour and processing costs.

## THE USE OF PROPRIETARY NAMES

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

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