RET P3148O REC: 158405 BUL 65

SAWTRI BULLETIN

WU41F1112

SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH INSTITUTE
OF THE CSIR

P.O. BOX 1124
PORT ELIZABETH

VOL. 19 SEPTEMBER 1985 NO. 3

SAWTRI BULLETIN

Vol 19 SEPTEMBER 1985 No. 3

CONTENTS

Page

INSTITUTE NEWS 1

SAWTRI PUBLICATIONS 7

TECHNICAL PAPER:

A Comparison of the Diameter and Hairiness of Friction-Spun Yarns With Those of Ring- and Rotor-spun yarns

by A. Barella, A.M[a]Manich, A. Segura, L. Castro and L. Hunter

SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH
INSTITUTE OF THE CSIR

Telex: 24-3203
Telephone: 532-131

P.O. Box 1124 Port
Elizabeth 6000

SA ISSN 0036-1003

NFKTA

SAWMTA

SACTMA

EARLY PROCESSORS

Chief Director visits Portugal

Dr D W F Turpie addressed delegates to the annual meeting of the International Mohair Association by invitation during his visit to Estoril, Portugal, at the end of June. Dr Turpie used this opportunity to announce and release a special publication entitled: ''Some of SAWTRI's Important Research Findings on Mohair.''

Industrial Visit

Mr K W Sanderson, Head of the Short Staple Processing Department, visited cotton gins in Louis Trichardt and Marble Hall, accompanied by staff of the Cotton Board, with the aim of initiating trials sponsored by the Board.

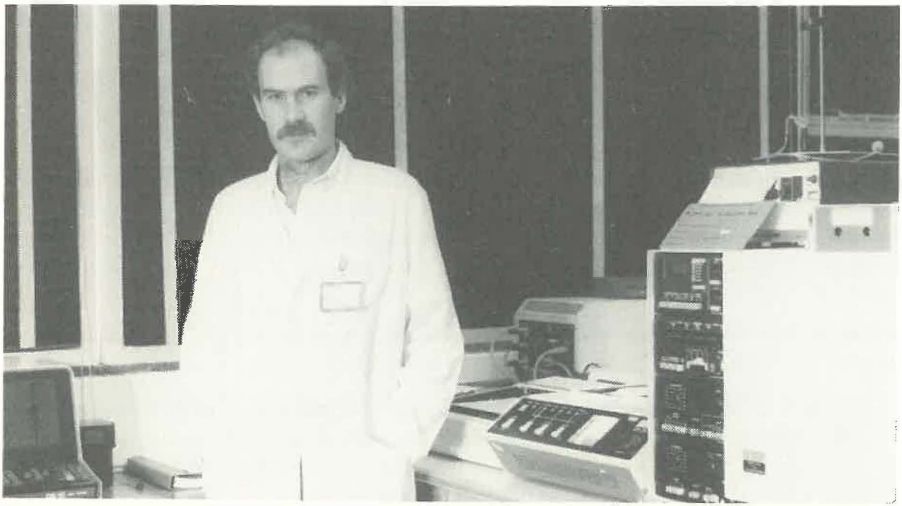
Mr Sanderson also supervised the ginning of spindle-picked and stripper-picked seed cotton at each of the two gins at Marble Hall, with samples of the resultant lint already being processed and spun at SAWTRI.

His itinerary also included a visit to the Head Office of the J L Clark Cotton Company (Pty) Ltd in Johannesburg for discussions with staff concerning SAWTRI's services to this Company.

Ph.D. Awarded

Dr J P van der Merwe, Head of the Woollen Department at SAWTRI, was recently awarded a Ph.D. degree by the Council for National Academic Awards which was conferred at the Scottish College of Textiles in Galashiels, Scotland, where the research work was carried out. The topic of Dr Van der Merwe's thesis was ''The Effect of Fibre Physical Properties on Woollen Spun and Plain Knitted Fabric Properties''. His promoters for this study were Dr J G Martindale, a retired ex-principal of the Scottish College of Textiles, and Dr H M Elder of the University of Strathclyde, Glasgow.

Dr J P van der Merwe, Head of the Woollen Department at SAWTRI, who has recently been awarded a Ph.D. degree



Mr Neil Trollip, a Researcher from the Department of Textile Chemistry, who has recently left for West Germany as guest researcher.

Visit to West Germany as Guest Researcher

Mr Neil Trollip, a Researcher in the Department of Textile Chemistry at SAW-TRI, who has recently completed an M.Sc. degree at the University of Port Eliza-beth, will spend a year as a guest researcher at the Deutsches Wollforschungsinsti-tut based in Aachen, West Germany. During this time he will have the opportunity of studying aspects of the mordant bleaching of karakul under the guidance of renowned West German textile research workers.

Research scientists at SAWTRI present papers at International Conferences in Japan

Eight members of SAWTRI's research staff represented the Institute at three major international textile conferences, all held in Japan, during which papers were presented reflecting the most recent research work undertaken at SA WTRI.

The 7th Quinquennial International Wool Textile Research Conference was held in Tokyo from 28th August until 3rd September, and SAWTRI was represented by Dr D W F Turpie, Chief Director, Dr L Hunter, Director, Mr E Gee, Head: Statistics, Mr G A Robinson, Group Leader: Fabric and Garment Manufacture, Mr M A Strydom, Head: Long Staple Processing, Dr N J J van Rensburg, Group Leader: Wet Processing and Textile Chemistry, Dr F A Barkhuysen, Head: Dyeing and Dr A P B Maasdorp, Head: Chemistry.

The last-mentioned three scientists also presented papers at ISF-85, an Inter-national Symposium on Fibre Science and Technology in Hakone during 20-24th August, while Dr L Hunter presented a paper at the 3rd Japan-Australia Joint

Symposium on ''Objective Measurement Applications to Product Design and Pro-cess Control'' which was held on September 5-7 in Kyoto.

A further report regarding these conferences and the papers presented by SAWTRI researchers will appear in the next edition of the Bulletin.

SAWTRI featured in Panorama

A full-length article featuring the research activities at SAWTRI, has appeared in the August edition of the South African Panorama, a prestigious journal distributed by the Department of Foreign Affairs. This information will undoubtedly be of interest to the general public who would gain insight into the work done at the Institute.

IN MEMORIAM

Mr A L W Jonas, member of the Machine Innovation and Development Department, passed away unexpectedly on the 22nd August at the age of 62. Len, as he was affectionately known by all, joined SAWTRI in 1970, and during his long and fruitful association with the Institute, he made a valuable contribution towards the success of several developmental projects undertaken by his department. Len was a popular and well-known member of staff and will be sadly missed by all.

STAFF NEWS

A number of staff members have retired recently. Mr Edgar Pretorius, Chief Technician in the Scouring Department took early retirement due to ill health after having been at SAWTRI for 14 years. Mr Milton Lugawe, a general assistant in the Dyeing and Finishing Department, having been at SAWTRI since 1967, Mr D A Dobson, a Technical Manager in the Knitting Department, having been associated with the Institute since 1974 and Mr E Barchietto, a Technical Manager from Dyeing and Finishing who joined SAWTRI in June 1980, have all left the Institute on retirement in recent months and the SAWTRI Executive extend a word of appreciation and gratitude towards these men who have served SAWTRI so well in their various capacities.

Mr Murdo McKenzie, a B.Sc. undergraduate student from the Scottish College of Textiles, recently returned to Scotland to finish his fourth and final year after having completed his 'Industrial Placement' year under the guidance of Mr Alan Robinson, Group Leader of Fabric and Garment Manufacture. Mr Hendrik van Aardt, a B.Sc. graduate and researcher in the Long Staple Processing Department, has rejoined SAWTRI after having completed two years national service.

After having won their category of the Red Cross Industrial First Aid Competition held last year, two members of the SAWTRI first aid team, Mr W. Moss and Mr P Horn, successfully completed a third and further advanced course, namely 'Advanced Emergency Care'.

SAWTRI PUBLICATIONS

Since the previous edition of the Bulletin, the following papers were published by SAWTRI:

Technical Reports

No. 566 Bathie, L.A. and Cizek, J., The Spinning of Double Wrapped Corespun Cotton/Polyester Yarns on a Modified Repco Self-twist Spinner. (June 1985)

No. 567 Strydom, M.A., The Contamination of Wool by High Density Polythylene (HDPE) Woolpack Material. (June 1985)

No. 568 Thierron, W., Studies on the Dref III Spinning System, Part IV: The Spinning of Cotton and Polyester/Cotton Stretch Yarns. (June 1985)

No. 569 Van der Merwe, J.P., The Processing of Karakul Blends on the Woollen System, Part I: Hosiery Yarns. (August 1985)

No. 570 Sanderson, K.W., The Ginning of South African Cottons, Part I: Effects on Fibre Properties. (Sept. 1985)

No. 571 Galuszynski, S., A Comparison of Forces Opposing Needle Penetration Obtained with Medium Ball and Slim Set Needle Points. (Sept. 1985)

SAWTRI SPECIAL PUBLICATIONS

WOL. 70 Sanderson, K.W., A Review of the Effects of Ginning Practices on Cotton Fibre and Yarn Properties and Processing Performance. (Aug. 1985)

WOL. 71 McMahon, J.F. and Van der Walt, G.H., A Review of Recent Developments in Warp Sizing. (Aug. 1985)

Papers by SAWTRI Authors Appearing in other Journals

Barella, A., Manich, A., Castro, L. and Hunter, L., Application du pilosimètre "Digital ITQT" á la mesure de l' irrégularité de la pilosité des fils. Bull. Scient. JTF, **14** (54), 1985.

Hunter, L., Veränderungen in Dimensions-und anderen Eigenschaften von gestrickten Baumwollunterhemden, die auf Trageverschleiss und Wäsche zurückzuführen sind. Wirkerei-und Strickerei-Technik **35,** 741 (1985).

Barella, A., Manich, A.M., Segura, A. and Hunter, L., Algunas precisiones sobre el diàmetro de los hilos de mohair. Invest e Inform Textil y de Tensloact. Vol. XXVIII No. 1/2, 21 (1985).

A COMPARISON OF THE DIAMETER AND HAIRINESS OF FRICTION-SPUN YARNS WITH THOSE OF RING- AND ROTOR-SPUN YARNS

by

A. BARELLA, A. M^{a}MANICH and A. SEGURA
Institute of Chemical and Textile Technology — CSIC —
Barcelona, Spain,

L. CASTRO
Association of Cotton Textile Research
Barcelona, Spain

and

L. HUNTER
South African Wool and Textile Research Institute,
Port Elizabeth, South Africa

ABSTRACT

The diameter and hairiness parameters (determined by means of the I.T.Q.T. Digital hairiness meter) of 40 and 60 tex polyester/cotton blend yarns (70/30 and 50/50) spun to different twist levels, on three different spinning systems (ring, rotor and Dref III friction), have been studied. The effect of yarn twist and linear density on yarn diameter and hairiness are discussed as a function of the spinning system used. Generally, the diameter and hairiness characteristics of the friction-spun yarns were found to lie between those of the rotor and ring yarns.

INTRODUCTION

As a continuation of the collaborative studies between I.T.Q.T. and SAWTRI, on the diameter and hairiness of yarns, an investigation has been carried out on the diameter and hairiness (measured with the I.T.Q.T. Digital hairiness meter[1]), of certain of the yarns studied previously by Thierron and Hunter[2]. They made a comparative study of certain physical properties of 40 and 60 tex polyester/cotton blend yarns spun at three twist levels on ring, rotor and friction (Dref III) spinning systems, each at three different twist levels. Included in the yarn properties origin-

ally investigated was hairiness as determined by the "Shirley hairiness meter". Since this instrument gives only a partial view of yarn hairiness, and since yarn diameter had not been covered it was decided to extend the work to yarn diameter and hairiness as measured on the I.T.Q.T. Digital hairiness meter, which provides a more complete picture of yarn hairiness.

EXPERIMENTAL

Details relating to the production of the yarns have been given elsewhere[2] and will be summarised only very briefly. An Acala AOX 1517/70 cotton was blended with Trevira 120 polyester (38 mm, 1,5 dtex semi-dull) at two different levels, namely 70/30 polyester/cotton and 50/50 polyester/cotton. Each material was pro-cessed into lap through a blowroom having three cleaning points (Porcupine, two-bladed and Kirschner beaters). The laps were then processed on a Platt card.

On the rotor system (Schubert and Salzer machine), the yarns were spun using wire covered opening rollers. In addition, however, limited trials were carried out with pinned opening rollers.

Each card sliver was subjected to two drawframe passages at a speed of 122m/min, with 6 doublings at each passage. Two different linear densities were produced at the second passage, namely 3,0 ktex for Dref III friction spinning and for rotor spinning and 4,5 ktex for ring spinning. In preparation for ring spinning, the 4,5 ktex drawframe sliver was processed into a 690 tex roving.

On the Dref III system there was always a ratio of 70/30 of core to sheath. The fibres used in the sheath were always 100% cotton whereas the core sliver com-prised 100% polyester for the 70/30 polyester/cotton blend and 70/30 polyester/cot-ton for the 50/50 blend. Approximately 2 kg of yarn were spun in each case.

Relevant processing details and yarn results are given in Table I. A spindle speed of between 8 000 and 12 000 rev/min, was used during ring spinning, depending upon yarn linear density and twist, while for rotor spinning an opening roller speed of 6 000 rev/min and a rotor speed of 45 000 rev/min were used. For the Dref III, the yarn production rate was maintained at 250 m/min and the speed of the carding roller at 12 000 rev/min (for further details, see Table I of reference 2).

The yarns were rewound onto cones and some were waxed. For the purposes of the present study, it was decided to ignore the effect of waxing, in spite of its possible effect on yarn hairiness. All the rotor yarns spun with pinned opening rollers were waxed.

The testing of the yarns by means of the I.T.Q.T. Digital hairiness meter was carried out under the standard conditions established for this instrument, which has a programmed 10 000 readings, the yarn speed being 10 m/min with 15 readings per yarn. The yarns were tested in an air-conditioned laboratory (65% RH ± 2% and 20°C ± 2°C) after a minimum conditioning period of 48 hours.

TABLE I

SOME SPINNING AND YARN DETAILS AND YARN DIAMETER AND HAIRINESS RESULTS

Yarn No.	Tex	Blend (Polyester Cotton)	RING		ROTOR		DREF III	RESULTS OBTAINED			Notes
			Yarn Production Speed (m/min)	Twist Factor*	Yarn Production Speed (m/min)	Twist Factor*	Spinning Drum Speed (Rev/min)	Yarn Diameter (mm)	Yarn $\bar{V}$	Hairiness $\bar{L}$	
1	40	70/30	21,5	28,7	—	—		0,350	1,036	0,125	—
2	40	70/30	20,9	33,5	—	—		0,346	1,070	0,152	—
3	40	70/30	19,8	38,3	—	—		0,330	1,033	0,129	—
4	60	70/30	20,3	38,3	—	—		0,374	1,059	0,169	—
5	40	50/50	21,5	28,7	—	—		0,356	1,041	0,122	—
6	40	50/50	20,9	33,5	—	—		0,346	1,085	0,186	—
7	40	50/50	19,8	38,3	—	—	—	0,339	1,170	0,242	—
8	60	50/50	20,3	38,3	—	—	—	0,382	1,092	0,214	—
9	40	70/30	—	—	86,5	33,4	—	0,339	1,004	0,083	Wire
10	40	70/30	—	—	72,0	38,2	—	0,331	0,992	0,082	Covered
11	40	70/30	—	—	64,0	45,3	—	0,348	1,002	0,064	Opening
12	60	70/30	—	—	106,0	33,4	—	0,368	1,016	0,086	Roller
13	60	70/30	—	—	92,0	38,2	—	0,369	1,010	0,090	—
14	60	70/30	—	—	76,5	45,3	—	0,370	1,021	0,108	—
15	40	50/50	—	—	86,5	33,4	—	0,336	0,977	0,068	—
16	40	50/50	—	—	72,0	38,2	—	0,332	0,950	0,059	—
17	40	50/50	—	—	64,0	45,3	—	0,336	0,939	0,049	—
18	60	50/50	—	—	106,0	33,4	—	0,366	0,961	0,042	—
19	60	50/50	—	—	92,0	38,2	—	0,370	0,997	0,066	—
20	60	50/50	—	—	76,5	45,3	—	0,362	0,998	0,089	—
21	40	70/30	—	—	—	—	4000	0,331	0,921	0,082	—
22	40	70/30	—	—	—	—	5000	0,328	0,887	0,072	—
23	40	70/30	—	—	—	—	6000	0,329	0,906	0,074	—
24	60	70/30	—	—	—	—	6000	0,362	0,987	0,097	—
25	40	50/50	—	—	—	—	4000	0,342	0,957	0,082	—
26	40	50/50	—	—	—	—	5000	0,332	0,930	0,084	—
27	40	50/50	—	—	—	—	6000	0,334	0,962	0,100	—
28	60	50/50	—	—	—	—	6000	0,381	1,074	0,165	—
29	40	70/30	—	—	72,0	38,2	—	0,336	0,917	0,048	Pinned
30	60	70/30	—	—	92,0	38,2	—	0,392	1,005	0,074	Opening
31	40	50/50	—	—	72,0	38,2	—	0,349	0,948	0,045	Roller
32	60	50/50	—	—	92,0	38,2	—	0,374	0,988	0,061	—

* Turns/cm$\times\sqrt{\text{tex}}$

RESULTS AND DISCUSSION

Figs 1 and 2 show the effect of yarn twist on yarn diameter for the 70/30 polyester/cotton and 50/50 polyester/cotton yarns, respectively, while Figs 3 and 4 illustrate the effect of yarn linear density on yarn diameter. In the case of the Dref III yarns, the spinning drum speed was used as a measure of the yarn twist.

Figs 1 and 2 show that twist level had little effect on the diameter of the rotor and Dref III yarns while, as found before, an increase in twist caused a decrease in the diameter of the ring yarns. In previous studies[34] it was also found that twist had little effect on the diameter of rotor yarns. For the 40 tex 70/30 polyester/cotton

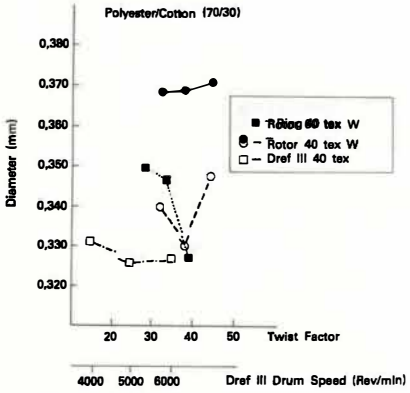


Fig. 1: Effect of Yarn Twist on Yarn Diameter (W = Wire Covered Opening Rollers)

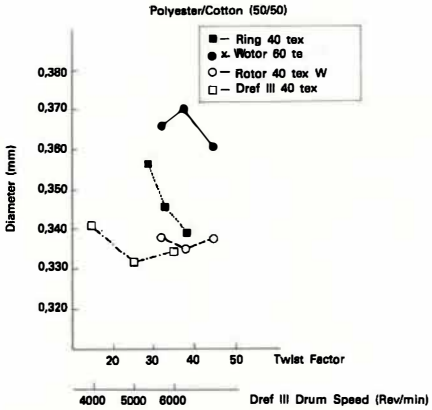


Fig. 2: Effect of Twist on Yarn Diameter (W = Wire Covered Opening Rollers)

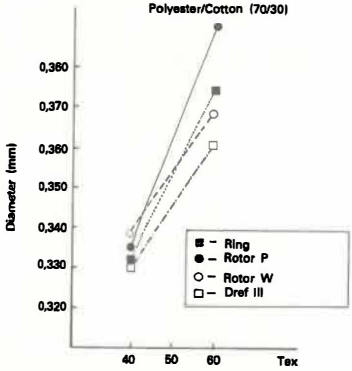


Fig. 3: Effect on Yarn Linear Density and Spinning System on Yarn Diameter (P = pinned opening rollers, W = wire covered opening rollers)

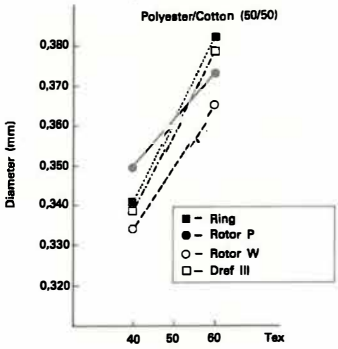


Fig. 4: Effect of Yarn Linear Density and Spinning System on Yarn Diameter (P = pinned opening rollers, W = wire covered opening rollers)

yarns, the average diameter of the ring yarns tended to be the highest followed by that of the rotor yarns, with that of the Dref 111 yarns the lowest. For the other blend (50/50) the diameter of the ring yarns was again the highest but now the diameter of the Dref III and rotor yarns were very similar. By increasing the proportion of cotton in the blend from 30% (Fig 1) to 50% (Fig 2), the diameter of the rotor yarns decreased slightly while that of the ring and Dref III yarns increased slightly.

According to Figs 3 and 4, yarn diameter increased with yarn linear density, as expected. The pinned opening roller tended to produce yarns with a larger diameter than the wire covered rollers.

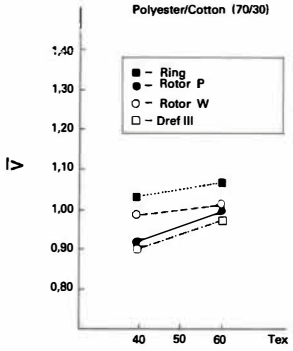


Fig. 5: Effect of Yarn Linear Density and Spinning System on the Average Hairiness Index ($\bar{V}$)
(P = pinned opening rollers, W = wire covered opening rollers)

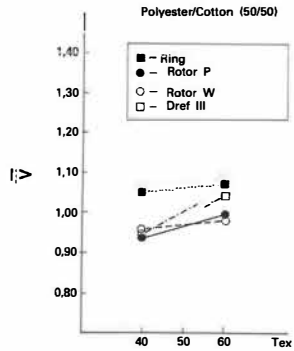


Fig. 6: Effect of Yarn Linear Density and Spinning System on the Average Hairiness Index ($\bar{V}$)
(P = pinned opening rollers, W = wire covered opening rollers)

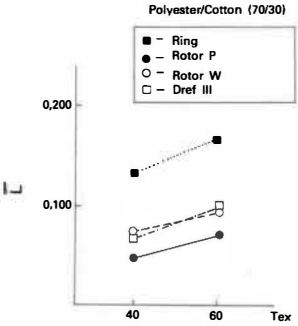


Fig. 7: Effect of Yarn Linear Density and Spinning System on the Average Hair Length Index ($\bar{L}$)
(P = pinned opening rollers, W = wire covered opening rollers)

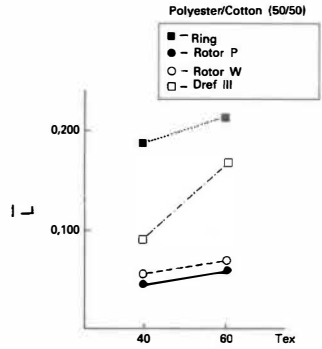


Fig. 8: Effect of Yarn Linear Density and Spinning System on the Average Hair Length Index ($\bar{L}$)
(P = pinned opening rollers, W = wire covered opening rollers)

Hairiness

In order to simplify the results and the interpretation thereof, the hairiness results obtained on the yarns differing in twist levels were averaged and have been plotted against yarn linear density in Figs 5 to 8. From Figs 5 to 8 it can be seen that both the mean hairiness index ($\overline{V}$) and the mean length hairiness index (L) of the ring yarns were higher than those of the rotor and Dref III yarns, both parameters increasing as yarn linear density increased. In most cases, the two hairiness indices were the lowest for the rotor yarns, with the pinned opening roller generally pro-ducing rotor yarns with the lowest hairiness, this possibly being due to the fact that these yarns had been waxed. The hairiness of the ring and Dref III yarns tended to be higher for the blend (50/50) with the higher cotton content.

According to Table II, the maximum hairiness indices (V max and L max) were highest for the ring yarns, and lowest for the rotor yarns (pinned opening roller again producing the least hairy yarns) which is in line with the trends observed for the average hairiness indices ($\overline{V}$) and ($\overline{L}$).

According to the hairiness results obtained on the same yarns by Thierron and Hunter[9], who used a Shirley Hairiness meter, but ignoring the very high result they obtained for the 40 tex rotor yarn produced using pinned opening rollers, the hairiness of Dref III yarns was the highest by far, there being little difference between the hairiness values obtained on the rotor and ring yarns. Clearly, there-fore, the two different instruments (I.T.Q.T. and Shirley) and associated systems for measuring yarn hairiness tended to rank the yarns differently. Considering the differences in the measuring techniques employed by the two instruments, it would
appear as if the Dref III yarns have more long hairs (3mm and longer) protruding from their surface than the ring yarns, these being counted by the Shirley Hairiness meter, but fewer of the shorter hairs which have a greater influence on the I.T.Q.T. Digital hairiness results.

SUMMARY AND CONCLUSIONS

The diameter and hairiness of 70/30 polyester/cotton and 50/50 polyester/cotton yarns, of different linear densities (40 and 60 tex) and twist levels, and spun on ring, rotor (wire and pinned opening rollers) and friction (Dref III) systems have

TABLE II

MEAN VALUES FOR Lmax AND Vmax

YARN	L max	V max	NO. OF YARNS
RING	3,99	6,15	8
ROTOR (WIRE)	3,44	4,85	12
ROTOR (PINS)	2,54	3,73	4
DREF III	3,95	5,63	8

been measured by means of the I.T.Q.T. Digital Hairiness Meter. It was found that an increase in yarn twist had little effect on the diameter of the Dref III and rotor yarns while it caused a decrease in that of the ring yarns. The diameter of the ring yarns tended to be slightly higher than that of the Dref III yarns. The rotor yarns with the higher proportion of cotton (50%) had a slightly lower diameter than those with the lower proportion (30%) of cotton while the reverse tended to be true for the ring and Dref III yarns.

Ignoring the effect of twist level on yarn hairiness, it was found that the hairiness of the ring yarns was the highest and that of the rotor yarns the lowest, with the pinned opening rollers producing yarns with a lower hairiness (possibly because the yarns had been waxed) than those produced with the wire covered opening rollers. The hairiness of the Dref III and ring yarns tended to increase as the proportion of cotton in the blend increased from 30% to 50%. According to previous work on the same yarns but in which the Shriley Hairiness Meter was used, the Dref III yarns were more hairy than the ring yarns. This contradictory finding suggests that the Dref III yarns have more long hairs (longer than 3 mm) but fewer shorter hairs than the ring yarns.

ACKNOWLEDGEMENTS

The authors thank Mrs D. Rose Mateu of I.T.Q.T. for technical assistance and the Department of Short Staple Processing at SAWTRI, particularly Mr W. Thierron, for the production of the yarns.

REFERENCES

1. A. Barella, V. Martin, A.M. Manich and J.P. Vigo, *J. Text. Inst., 71* (6), 277-283 (1980).
2. W. Thierron and L. Hunter, *SAWTRI Techn. Rep.* No. 530, 1983 and *Melliand Textilber., 65,* 228 (1984).
3. A. Barella, A.M. Manich, L. Castro and L. Hunter, *Text. Res. J., 54, 840* (1984).
4. A. Barella. A.M. Manich, A. Segura, L. Castro and L. Hunter, *SAWTRI Techn. Rep.* No. 541, 1983.

Published by
The South African Wool and Textile Research Institute
P.O. Box 1124, Port Elizabeth, South Africa,
and printed in the Republic of South Africa
by Nasionale Koerante Beperk, P.O. Box 525, Port Elizabeth. Copyright reserved