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Rotor Spinning of Cotton, Cotton/ Polyester and Polyester

Part I: The Influence of Doffing Tube Surface Character and Position on Certain Yarn Properties

by

J.P. van der Merwe and D.P. Veldsman

SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH
INSTITUTE OF THE CSIR

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ROTOR SPINNING OF COTTON, COTTON/POLYESTER AND POLYESTER

PART I: THE INFLUENCE OF DOFFING TUBE SURFACE CHARACTER AND POSITION ON CERTAIN YARN PROPERTIES

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ABSTRACT

In this article the authors pay particular attention to the effect of introducing grooves (or flutes) in the doffing tube navel and to the positioning of the doffing tube in respect of the rotor base using a Schubert and Salzer RU-11 rotor machine.

It has been found that by increasing the number of grooves (or flutes) resultant yarn properties deteriorated. On the other hand by bringing the doffing tube 2 mm closer to the rotor base some improvement in yarn properties was accomplished.

The findings in this report may not be applicable to all types of rotor machines.

INTRODUCTION

Rotor spinning of short stapled fibres is going from strength to strength on a worldwide basis. Yet there are many unresolved obscurities associated with the zone inside the rotor groove where yarn formation takes place. This article is an attempt to elucidate some aspects in this area.

Lunenschloss and his co-workers have made a considerable contribution towards our knowledge and understanding of the factors which affect yarn formation inside the rotor. In one of their papers[1] particular attention was paid to the influence of the so-called "length of the binding zone" on twist propagation. Twist propagation could be increased by increasing the number of flutes (or grooves) in the doffing tube navel at relatively lower rotor speeds. In subsequent papers[2,3] they elaborated on this concept of "binding zone length".

Research at the Textile Research Center in Lubbock (Texas) paid considerable attention to *surface characteristics* of the yarn[4] trumpet of the Elitex BD 200-M. By changing the surface of the trumpet through the application of a metal oxide, yarn strength was increased by 20%. Unfortunately the durability of this finish left much to be desired.

London *et al*[5] found by using a smooth doffing tube navel or one having small flutes, as against a highly fluted navel, that the twist levels in the yarn surfaces were different. Increased twist in the yarn surface was found to lead to improved strength and lower pilling, yet lower bulk or cover properties.

Hairiness was found to increase when a highly fluted navel was used. Furthermore, the fluted navel gave less twist in the surface fibres, and a more disturbed fibre arrangement.

Kirschner[6] claims that a stronger yarn could be spun if the amount of false twist inserted by the doffing tube could be increased. This could be accomplished by inserting flutes or grooves in the navel of the doffing tube.

Simpson and Louis[7] found that an increase in rotor speeds (from 45 000 r/min to 60 000 r/min) decreased strength, elongation and uniformity. A similar trend was observed with an increase in rotor navel groove coarseness.

Artz[8] and co-workers also paid attention to the concept of "length of twist propagation" in the rotor groove. The higher the rotor speed the higher this length became. Similarly, the introduction of grooves will increase this length — the greater the number of grooves, the longer the length. However, the greater the number of flutes or grooves, the larger the yarn damage.

Wolf[9] refers to work done by Lunenschloss in which the latter found that with a round rotor groove it was more difficult to control twist propagation; a wedge-shaped groove was by far the best. He also refers to the concept of *wrapper fibres* (i.e. fibres on the yarn surface not tied in completely during rotor spinning). The "length of tying in" (cf. "length of twist propagation") affects the number of wrapper fibres. Increasing the tying zone length also deteriorates yarn properties.

In another article[10] it was clearly shown that the twisting force was increased considerably by having more grooves or flutes in the doffing tube navel. The use of strongly fluted tubes is, however, to be avoided. Only at very low low twist levels and when spinning coarse yarns could the use of highly fluted navels be advised.

Nield and Ali[11] have also shown that increase friction between the fibres and the doffing tube leads to more deformation of the yarn and a consequent deterioration in yarn strength.

EXPERIMENTAL

Raw Materials

The cotton used throughout the experiment was a Rhodesian Albar 72B of which the fibre characteristics are given in Table I. The polyester used was a ®Trevira type 120 having a staple length of 40 mm .

Processing

Three lots were prepared for eventual spinning trials viz a 100% cotton, a 50/50-cotton/polyester (Co/PE) blend and a 100% polyester (PE).

TALE I

FIBRE CHARACTERISTICS OF ALBAR 72B

2,5% Span length (mm)	27,23
50% Span length (mm)	13,03
Uniformity ratio	48
Maturity ratio	0,88
Fineness (mtex)	167
Micronaire	3,95
3,2 mm Gauge tenacity (cN/tex)	23,26
Bundle extension (%)	7,0
Visible trash (%)	2,11
Invisible trash (%)	0,69

All three lots were processed through a blow room line containing three cleaning points (a porcupine beater, a two-bladed beater and a Kirschner beater). In the case of the 50/50 cotton/polyester blend the cotton and polyester components were layer-blended before passing through the blowroom line. The three lots were then carded using stationary flats, at a production rate of approximately 7 kg/hr . During the above processes, machine settings were not changed, and all three lots were processed utilizing settings normally applied for the processing of pure cotton.

The different lots were then subjected to *two* drawframe passages with six doublings each. In this case, ratch-settings were used to suit the fibre length of the cotton and polyester, respectively. A delivery speed of 120 m/min was maintained.

In order to keep the draft on the Rotor spinning machine constant for the different yarns, slivers of different densities were produced. (see Table II).

TABLE II

DETAILS OF DRAWFRAME SLIVER INTENDED FOR ROTOR SPINNING

Rotor yarn linear density (tex)	Drawframe sliver linear density (ktex)	Draft
35	3,10	86
50	4,30	86

Rotor spinning

Yarns of linear density 35 tex and 50 tex were spun from the three respective blends on an Ingolstadt RU-11 Rotor Spinner equipped with 55 mm diameter rotors, at a rotor speed of 40 000 r/min and an opening roller speed of 7 000 r/min . For spinning the polyester yarns an opening roller covered with metallic wire and designed *specifically for synthetic fibres* was used. The same opening rollers were used for the spinning of the 50/50-cotton/polyester blend while opening rollers covered with metallic wire, designed for the *spinning of cotton*, were used during the spinning of the all-cotton yarns. All yarns were spun at tex twist multipliers ranging from 19,2 to 67 (English cotton twist factors 2 to 7). In every case 2 500 metres of yarn were spun.

For the various yarn lots at the different twist levels, smooth, 4-grooved and 8-grooved doffing tube navels were used respectively. The same yarn lots were also duplicated after the distance between the rotor and doffing tube navel was *decreased* by 2 mm by inserting a suitable spacer of 2 mm thickness underneath the navel.

Ring yarns

For purposes of comparison ring yarns were also spun from the three fibre combinations, with similar twist multipliers and linear densities as those used above.

In all three cases a 4,3 ktex draw-frame sliver was used and processed into 440 tex rovings on a Rieter M 1/1 speedframe at a delivery speed of 23 m/min. (For details see Table III).

TABLE III

RING YARN PROCESSING DETAILS

Fibre	Yarn linear density (tex)	Sliver linear density (ktex)	Roving linear density (tex)	Roving (twist) (turns/m)
All-cotton	35 50	4,3	440	51
50/50-Co/PE	35 50	4,3	440	36,2
All-PE	35 50	4,3	440	36,2

The rovings were spun on a Platt M1 ring spinning frame, equipped with 50 mm rings and a Cassablanca KX 3,5 drafting system, into the required yarns using a spindle speed of 9 000 r/min.

Testing:

Yarn irregularity was determined on the Uster range of evenness testing apparatus. Single yarn tenacity and extension at break were determined on an Uster automatic breaking strength tester. Skein breaking strength (CSP) was determined on a Heal hank strength tester. A Shirley Yarn Hairiness Tester was used to determine the hairiness of the yarns.

RESULTS AND DISCUSSION

Initially it was observed that a doffing tube navel with 8 grooves produced a much weaker, more irregular and more hairy yarn than either the smooth or the 4-grooved navel. This observation was made during the spinning of the all cotton, the 50/50 cotton/polyester and the all polyester lots. In most cases it was found impossible to piece the yarn with an 8-grooved navel and in the few cases where a yarn could be spun, the endbreakage rate was exceptionally high. It was, therefore, decided to discontinue the use of 8-grooved navels. Furthermore, although the effect of inserting a *2 mm spacer* underneath the navel was reported on, distances varying between 1,3 and 3,2 mm were also investigated. In view of the complexity of the results, however, only the effect of the 2 mm spacer was singled out for reporting.

Yarn properties investigated were single yarn tenacity, hank strength, hairiness, irregularity and the number of neps per 1 000 m of yarn. The influence of the surface of the doffing tube navels (smooth or 4-grooved) and the position or distance of the doffing tube navel from the base of the rotor upon the abovementioned yarn properties are discussed below under the individual headings.

Influence on yarn tenacity

In all cases the ring-spun yarns were stronger than any of the rotor-spun yarns. For the all-cotton yarns the rotor-spun yarns were approximately 25% weaker than the ring-spun yarns, for the 50/50 cotton/polyester blend approximately 35% and for the 100% polyester approximately 15%. [See Figs 1(a) and (b), 2(a) and (b) and 3(a) and (b)].

It was also observed that when spinning the 50 tex all-cotton rotor yarns with a *smooth doffing* tube navel, or a similar navel where the distance between the doffing tube navel and the base of the rotor had been decreased by 2 mm,

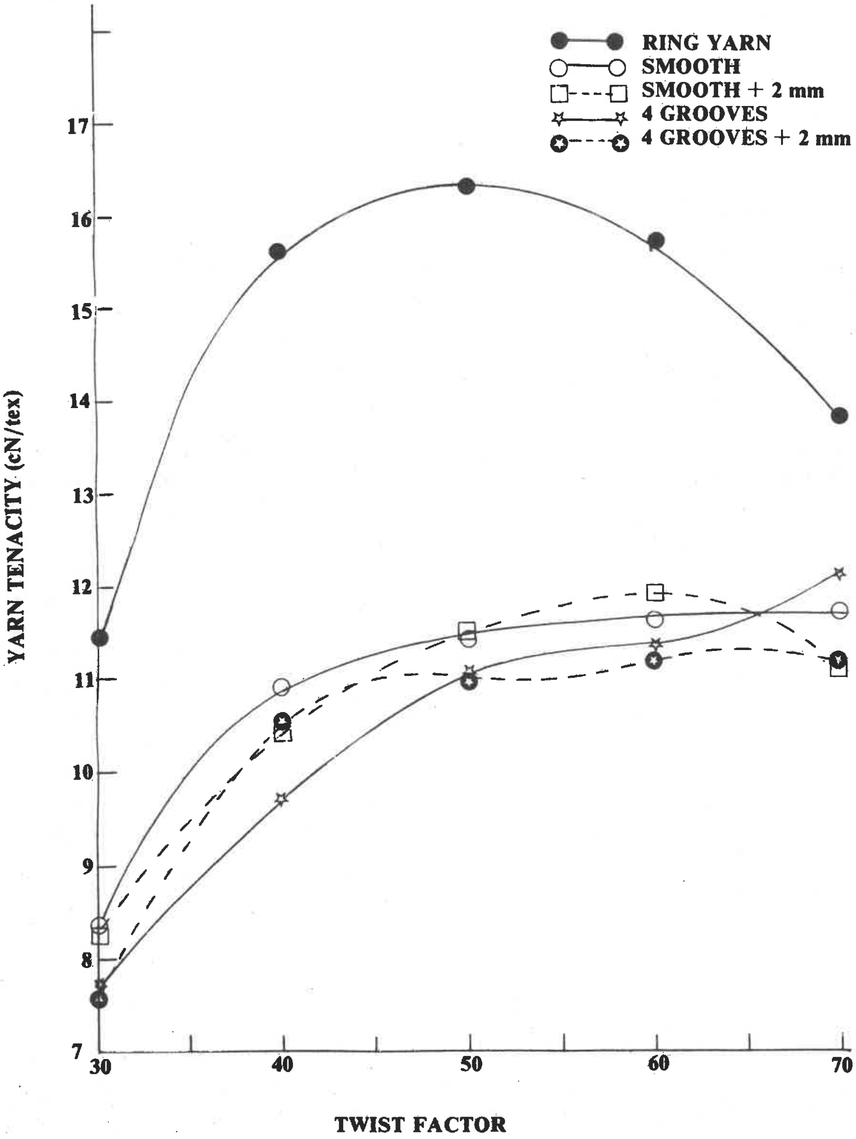

Fig 1(a) The effect of doffing tube surface and position on the yarn tenacity of a 35 tex all cotton yarn

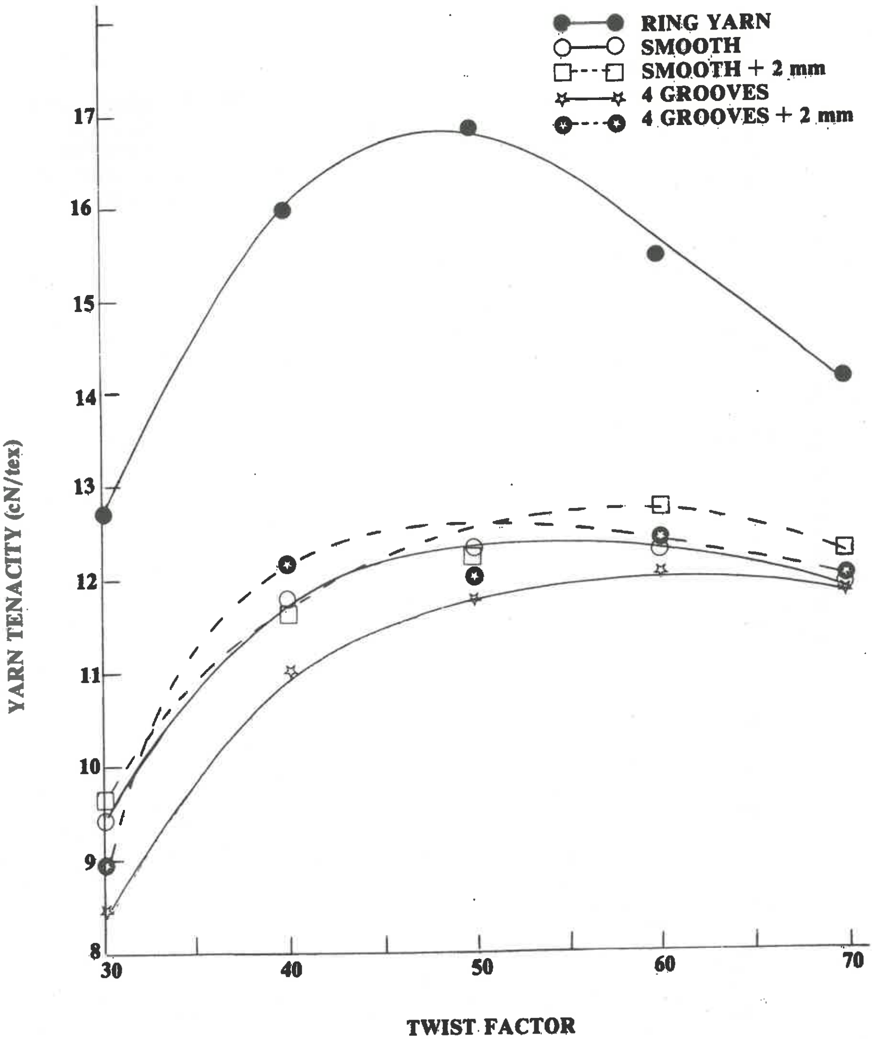

Fig 1(b) The effect of doffing tube surface and position on yarn tenacity of a 50 tex all cotton yarn

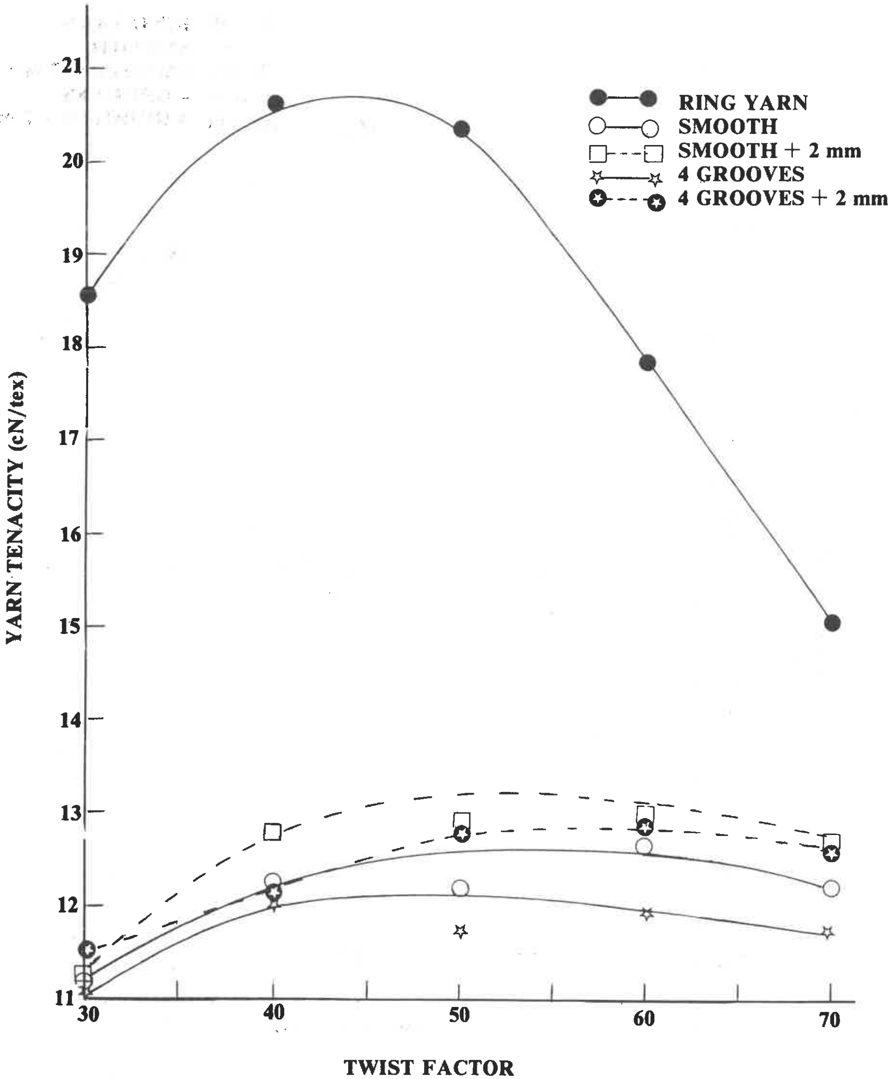

Fig. 2(a) *The effect of doffing tube surface and position on the yarn tenacity of a 35 tex 50/50 cotton/PE blend yarn*

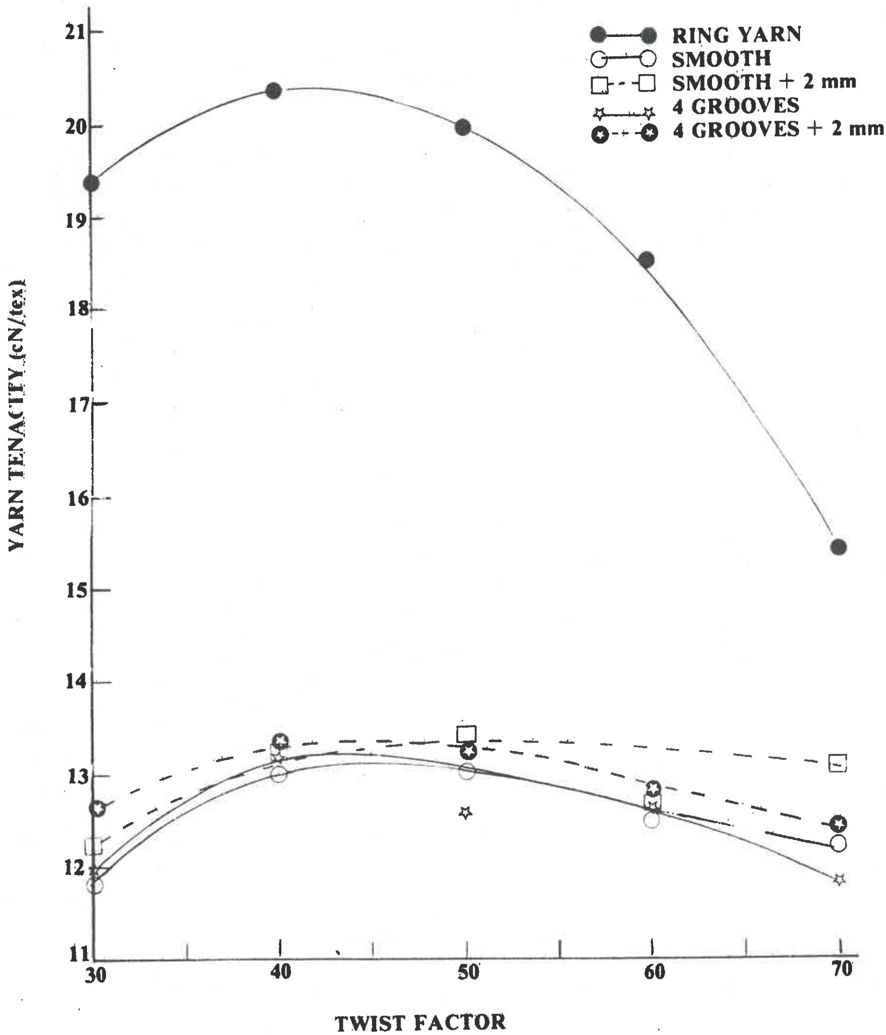

Fig 2(b) The effect of doffing tube surface and position on the yarn tenacity of a 50 tex 50/50 cotton/PE yarn

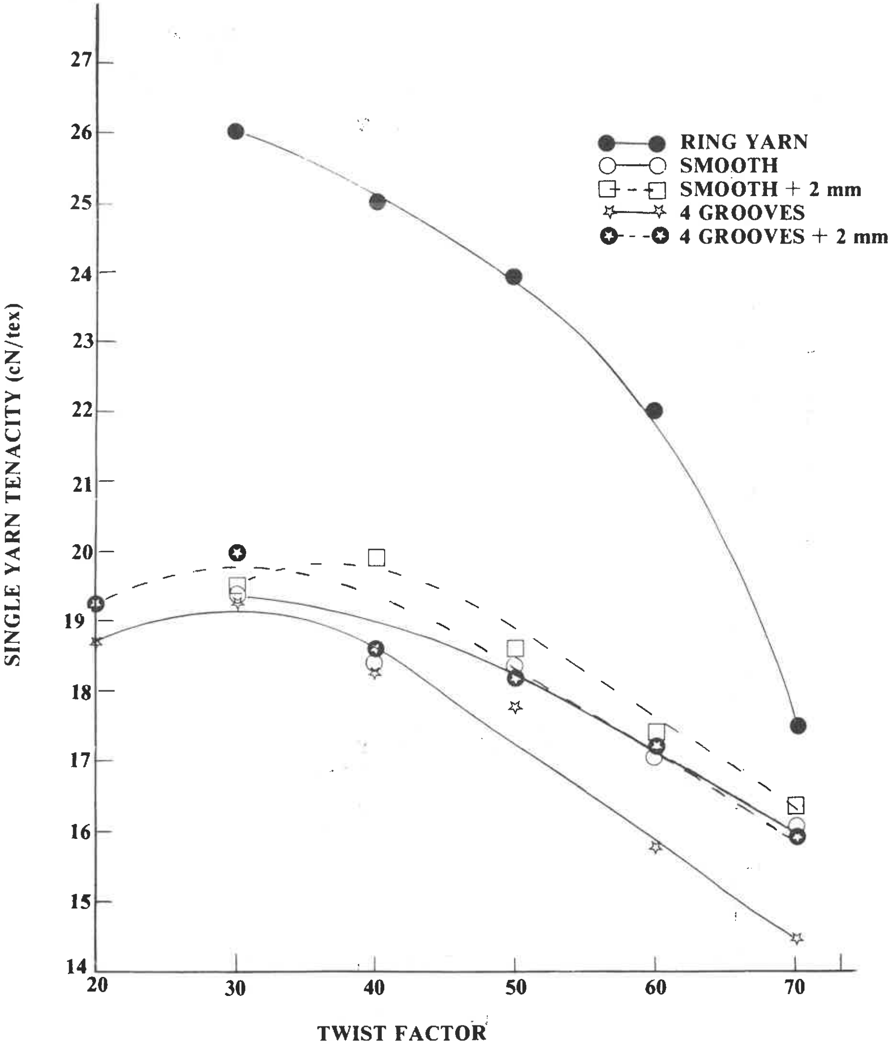

Fig 3(a) The effect of doffing tube surface and position on the yarn tenacity of a 35 tex PE yarn

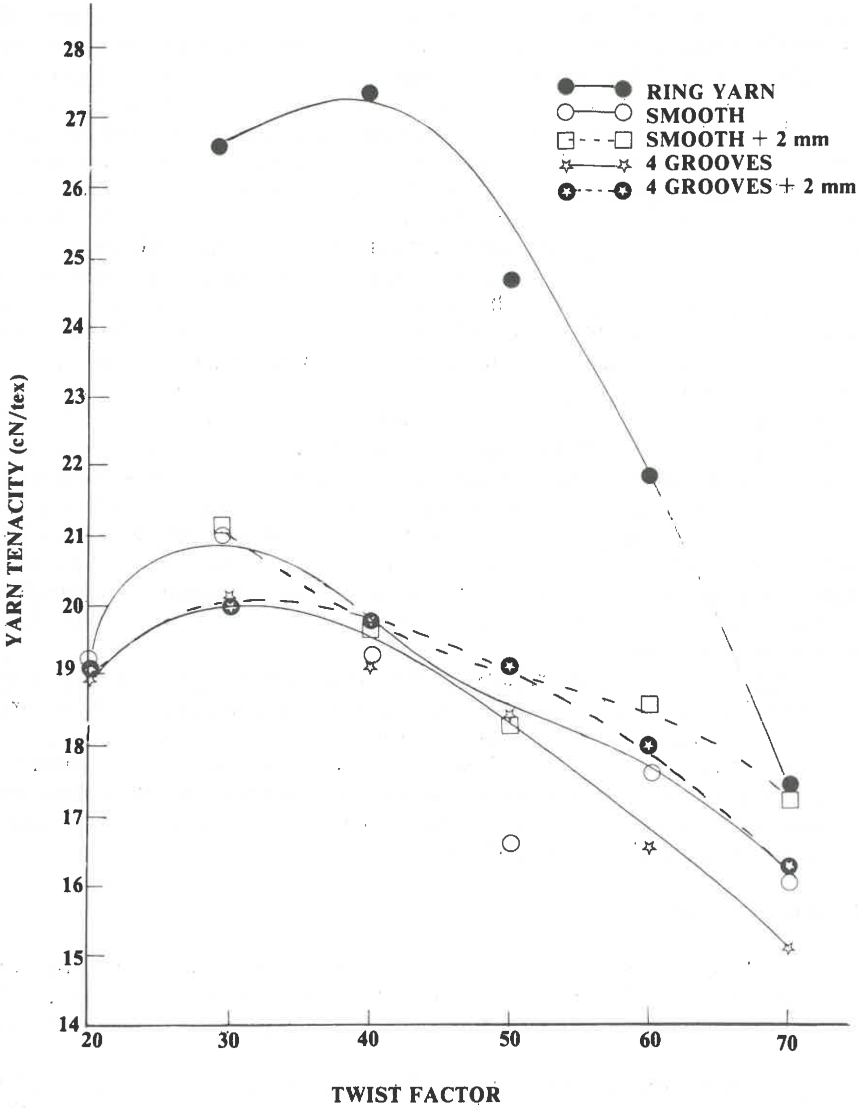

Fig 3(b) The effect of doffing tube surface and position on the yarn tenacity of a 50 tex PE yarn these yarns tended to be slightly stronger than those spun under the same conditions using a *4-grooved navel*. Similarly, when the 4-grooved navel was brought closer by 2 mm, a slightly stronger yarn was produced. [See Fig 1(b)]. In the case of a 35 tex yarn, the 2 mm spacer did not have a consistent effect.

The results also show that optimum yarn strength can be obtained for the *all-cotton* rotor-spun yarns at approximately the same twist levels as those for ring-spun yarns. Maximum yarn strength is obtained at a tex twist factor of 50 for rotor yarns which is approximately equal to that for the ring-spun yarns for the cotton under investigation and the particular spinning conditions.

For the 50/50-cotton/polyester yarns, yarn tenacity was only slightly increased (approximately 2%) when either the smooth or 4-grooved navel was brought closer by 2 mm for both the 35 and 50 tex yarns. [See Figs 2(a) and 2(b)]. The most significant increase in tenacity was obtained for the 35 tex yarn at a twist factor of 40 to 50 for the rotor-spun yarn using a smooth navel and narrowing the distance by 2 mm . Once again, the 35 tex rotor-spun yarn with a smooth navel tended to be stronger than the one spun with a 4-grooved navel. [See Fig 2(a)]. Differences in tensile strength of the 50 tex yarn spun with a smooth and 4-grooved navel were found to be slight [see Fig 2(b)]. The region of optimum twist for maximum yarn strength was found to lie between a twist factor of 40 and 50 for the rotor-spun yarns [see Figs 2(a) and 2(b)]. This is only slightly higher than the optimum twist required for maximum strength when spinning *ring yarns*, which for this investigation was found to lie at a twist factor of approximately 40.

Yarn tensile strength results for the 35 tex 100% *polyester* showed that stronger rotor-spun yarns (approximately 4%) are obtained when both the yarns from smooth and 4-grooved navels with a narrowing by 2 mm were compared with those spun with smooth and 4-grooved navels in their normal positions.

Optimum yarn tenacity was obtained at a twist factor of 30 to 40 for both 35 and 50 tex yarns [see Figs 3(a) and 3(b)]. At the optimum twist factor, however, the spacer had only a small effect.

Influence on CSP

In general strength results obtained from yarn tensile strength were confirmed by the CSP results. CSP values for ring-spun yarn were also found to be higher than those of rotor-spun yarn. [See Figs 4(a) and (b), 5(a) and (b) and 6(a) and (b)].

Strength values obtained for a 35 tex all-cotton yarn showed [See Fig 4(a)] that there was only a small difference when smooth and 4-grooved doffing tube navels were used. CSP, however, increased by 4% when a smooth navel was used and the distance between the navel and the face of the rotor was decreased by 2 mm . Maximum CSP was obtained at a twist factor of 50 while maximum yarn strength for the 35 tex ring-spun yarn was obtained at a twist factor of approximately 40 [see Fig 4(a)].

The results on a 50 tex yarn showed that hank strength was increased by about 5% when the distance between both the smooth and 4-grooved navels and the rotor was reduced by 2 mm. Maximum yarn strength was obtained at a twist factor of 40 when spinning with a 4-grooved navel but at a twist factor of 50 when the smooth navel was used while maximum yarn strength for the ring spun yarn was obtained at a twist factor of 40 [see Fig 4(b)].

No significant difference was found in CSP when spinning with either the smooth or 4-grooved navel in their normal positions [see Fig 4(b)]. When a 35 tex 50/50-cotton/polyester yarn was spun on the rotor spinning system, it was found that yarn hank strength was increased by approximately 2% by narrowing the distance between the rotor and either the smooth or the 4-grooved navels by 2 mm. Maximum strength for the smooth and 4-grooved navel was, however, at twist factor 40 and 50 for the two navels respectively, while that for the ring spun yarn was found to be at a twist factor of 40.

An increase in CSP of 6% was found for the 50 tex 50/50 cotton/polyester blend rotor yarn when the distance of the smooth navel was narrowed by 2 mm as compared to the smooth navel in the normal position. Maximum yarn strength was obtained at a twist factor of 50. An increase in yarn strength of 5% was obtained at a twist factor of 40 when the distance of the 4-grooved navel was narrowed by 2 mm as compared to the yarn strength obtained with the 4-grooved navel in the normal position. Yarn strength of the smooth navel when the distance was reduced by 2 mm is, however, 3% higher than that obtained with the 4-grooved navel when the distance was reduced by 2 mm. [See Fig 5(b)].

No significant difference in CSP was obtained when spinning a 35 tex 100% polyester yarn on the rotor spinning machine utilizing either the smooth or 4-grooved navel. An increase of 10% in yarn breaking strength, however, was obtained when spinning was carried out with the 4-grooved navel at a twist factor of 40 when the distance was reduced by 2 mm (see Fig 6(a)]. Hank strength was increased by 2% when reducing the distance of the smooth navel by 2 mm.

The rotor yarn spun with the 4-grooved navel and a reduction of the distance by 2 mm was found to be about 8% stronger than the yarn spun with the smooth navel with a reduction of 2 mm (see Fig 6(b)].

When a 50 tex all-polyester rotor yarn was spun, it was found that a 4-grooved navel produced a yarn 4% stronger than the yarn produced with a smooth navel. Reducing the distance for both the smooth and 4-grooved navels by 2 mm produced yarns 2% stronger than the yarn produced with a 4-grooved navel in the normal position. Maximum CSP in all cases was obtained at a twist factor of 30 to 40. [See Fig 6(b)].

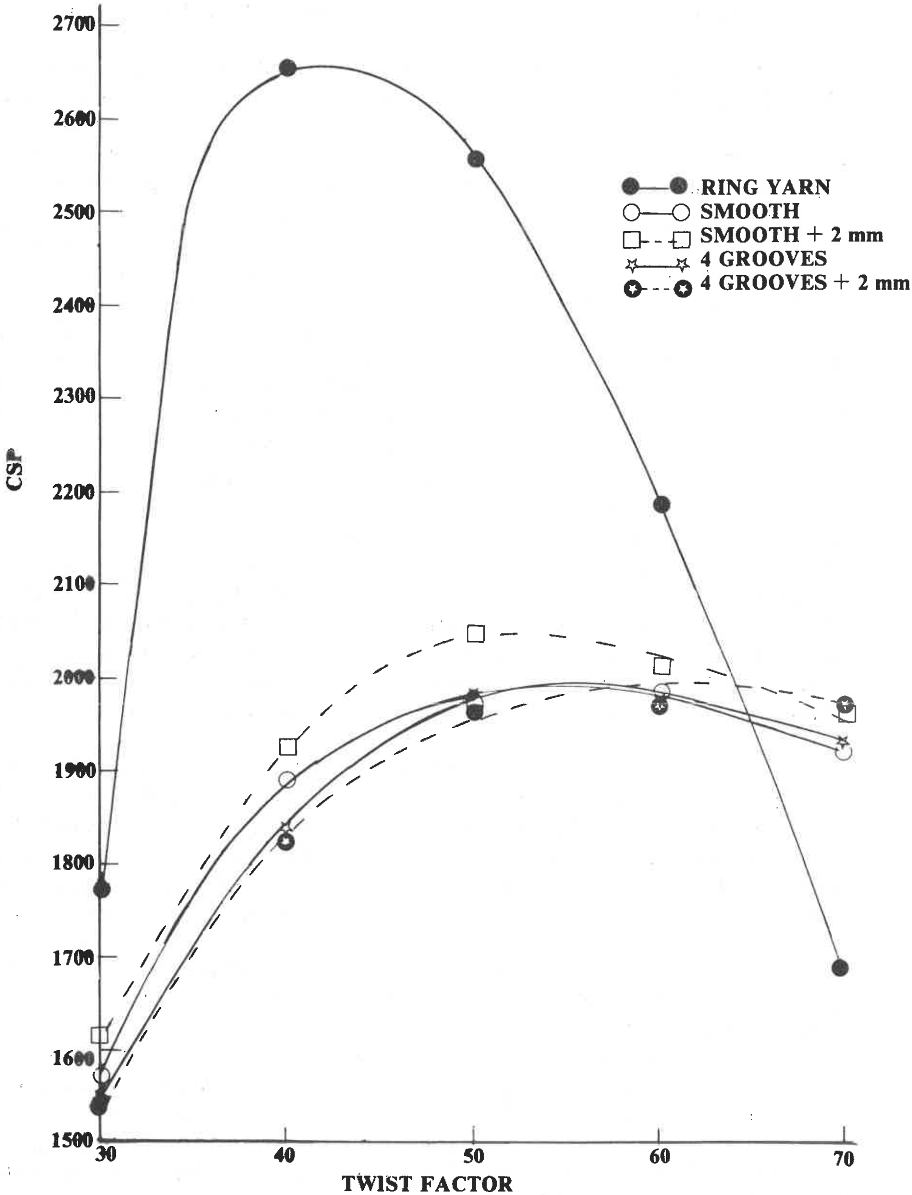

Fig 4(a) The effect of doffing tube surface and position on the CSP of a 35 tex all cotton yarn

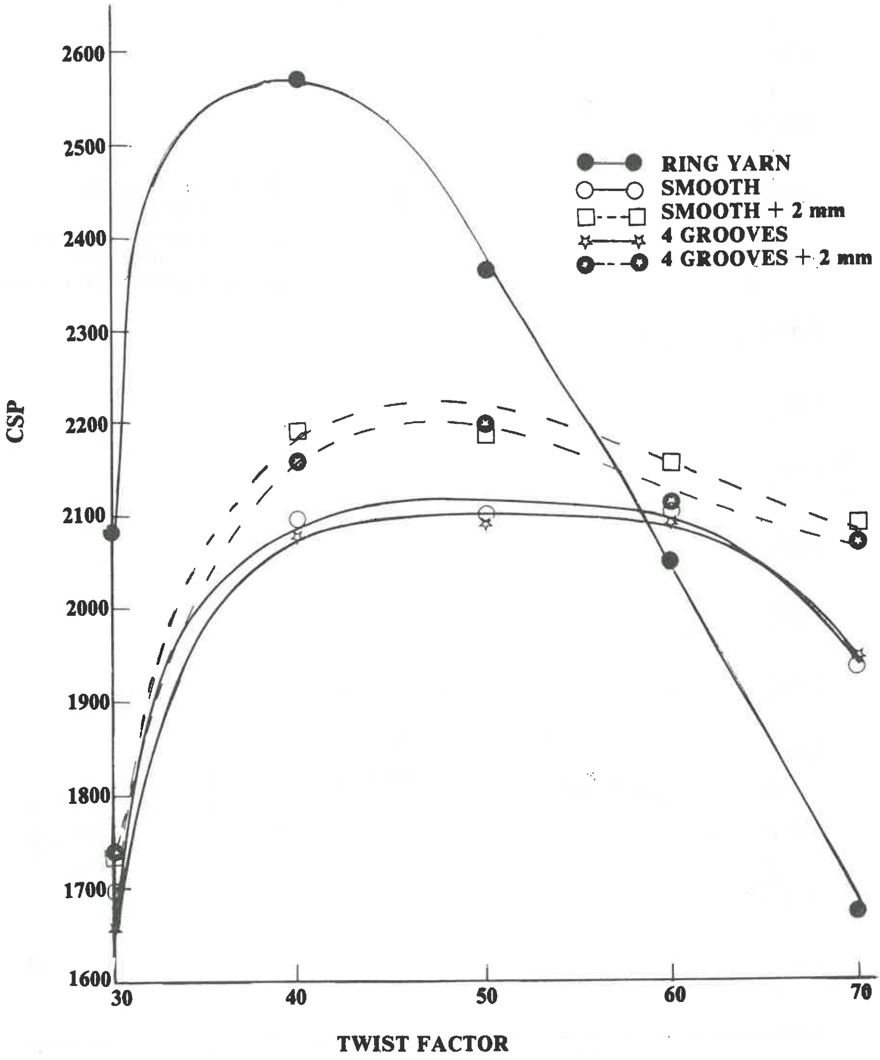

Fig 4(b) The effect of doffing tube surface and position on the CSP of a 50 tex all cotton yarn

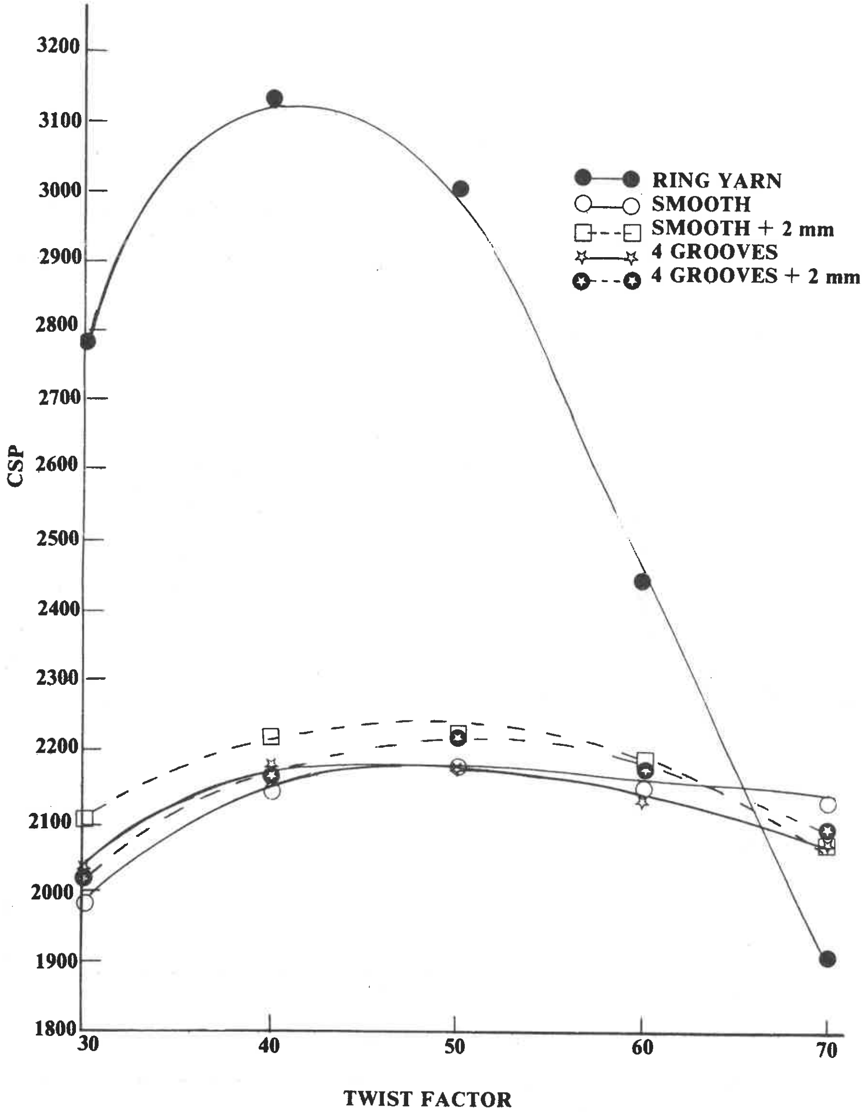

Fig 5(a) The effect of doffing tube surface and position on the CSP of a 35 tex 50/50 cotton/polyester blend yarn

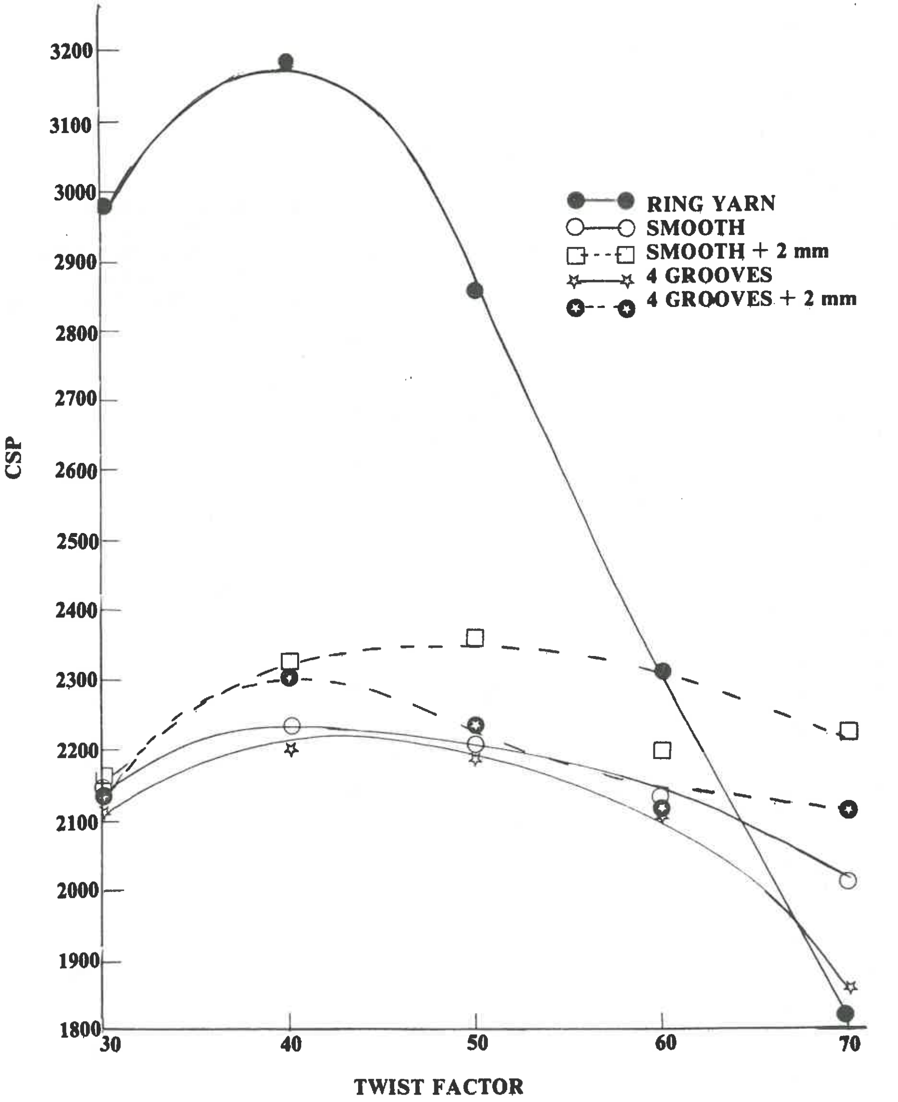

Fig 5(b) The effect of doffing tube surface and position on the CSP of a 50 tex 50/50 cotton/PE blend yarn

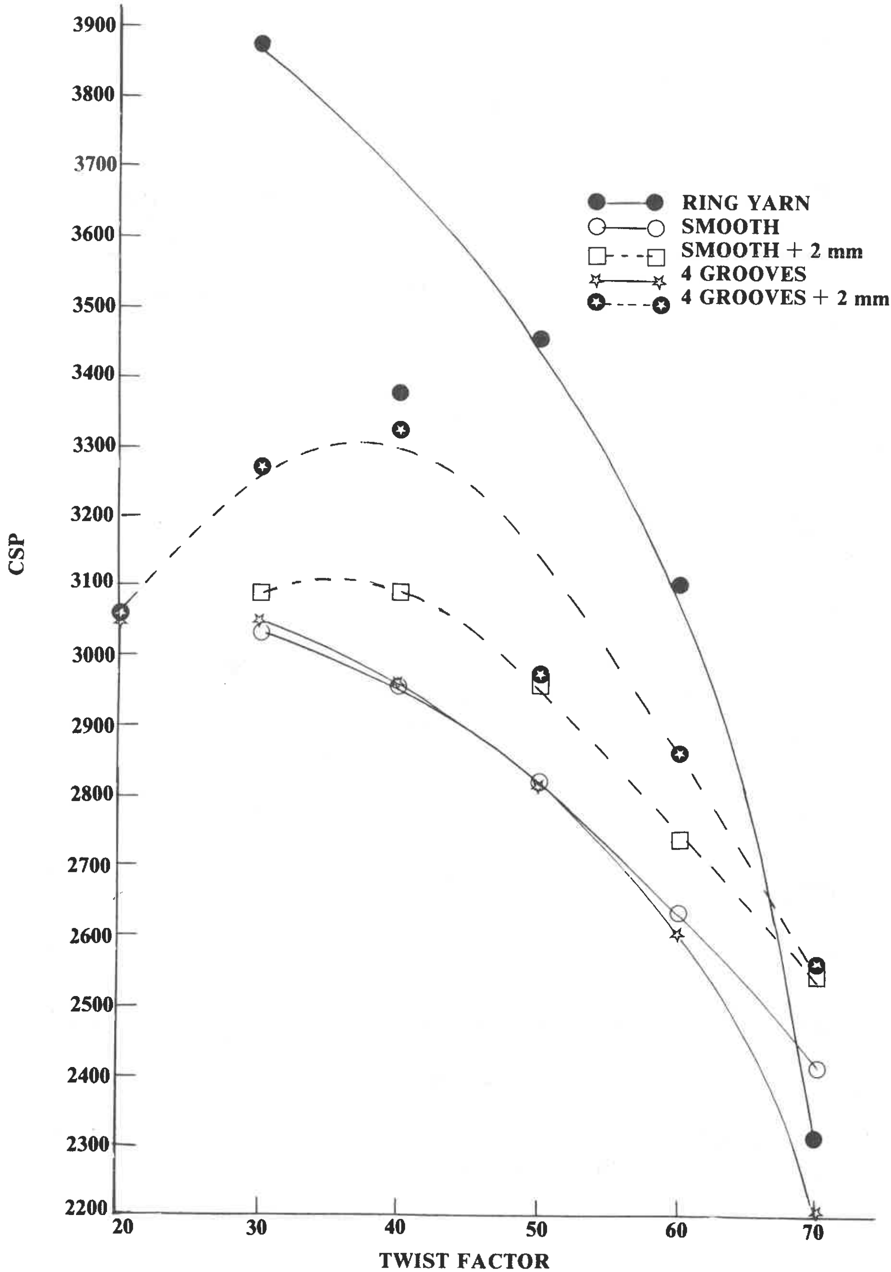

Fig 6(a) The effect of doffing tube surface and position on the CSP of a 35 tex all PE yarn

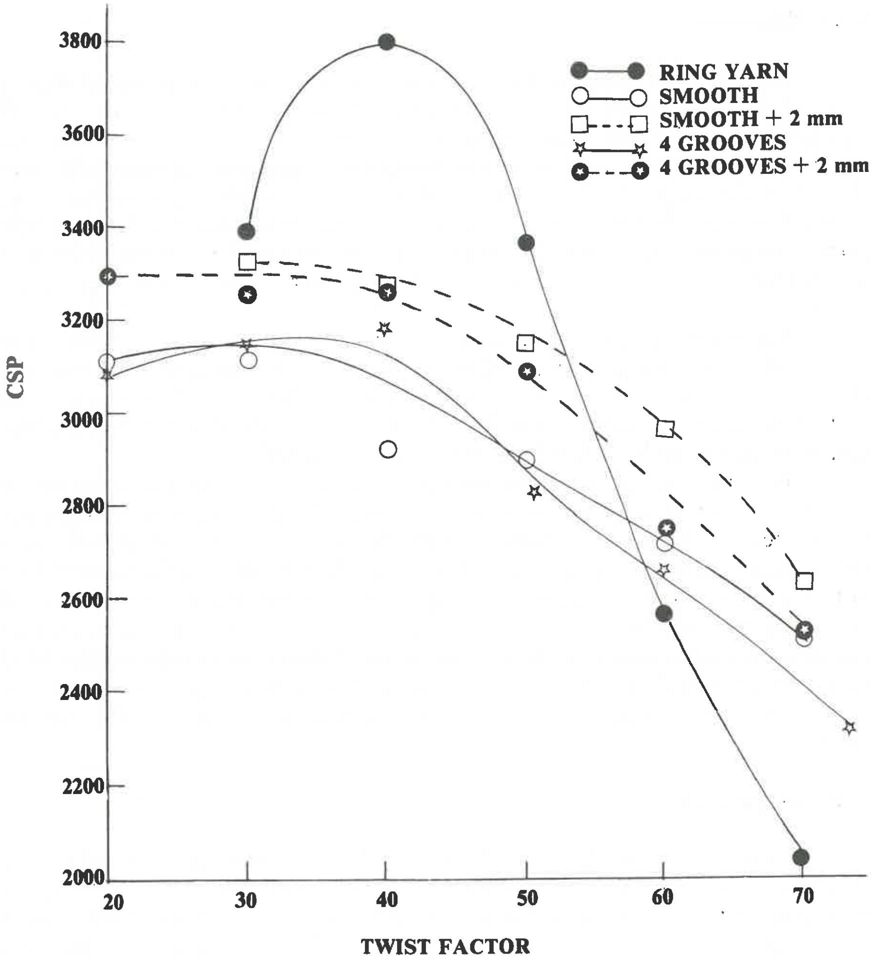

Fig 6(b) The effect of doffing tube surface and position on the CSP of a 50 tex all PE yarn

Yarn Hairiness

The lowest number of hairs per metre was obtained when spinning rotor yarns with a smooth navel and a reduction in the distance by 2 mm . [See Fig 7(a) and 7(b)]. The hairiness of the rotor yarns was found to be higher than those of the ring-spun yarns when the former were spun with a 4-grooved navel. Hairiness was, however, improved when the distance of the 4-grooved navel was reduced by 2 mm but hairiness was still worse than that obtained for ring-spun yarns except beyond a twist factor of 55 where the hairiness of the rotor yarns was found to be better than that of the ring-spun yarns (see Figs 7(a) and 7(b)].

Hairiness values obtained from 50/50-cotton/polyester blend yarns showed that the lowest number of hairs per metre was obtained for ring-spun yarns at low twist values. Above a twist factor of 50 hairiness values for the rotor yarns spun with a smooth and a smooth navel whose distance was reduced by 2 mm were found to be lower [See Figs 8(a) and 8(b)].

Hairiness values obtained for the yarns spun from all-polyester showed that the number of hairs per metre was the lowest for the ring-spun yarns at twist factors below 50. Hairiness values for the rotor yarns spun with smooth navel and a reduction of 2 mm and 4-grooved navels with a reduced distance of 2 mm were found to be lower than that of ring-spun yarns beyond a twist factor of 50. [See Figs 9(a) and 9(b)]. Hairiness values for the rotor yarns spun with a 4-grooved navel was found to be the worst of all the yarns except for the 50 tex yarn where the hairiness values for the yarn spun with a 4-grooved navel and a reduction of 2 mm was only worse below a twist factor of 40. [See Figs 9(a) and 9(b)].

Yarn Irregularity

Values obtained for irregularity for the *all-cotton* yarns show that the rotor yarns were more even than the ring-spun yarns. The irregularity results tended to increase with an increase in twist for both ring-spun and rotor yarns. The values showed no significant difference for the rotor yarns when spun with different doffing tube navels or when the distance between the latter and the rotor was reduced by 2 mm [see Tables IV(a) and (b)].

The number of neps per 1 000 metres increased with an increase in twist for both ring-spun and rotor yarns with the ring-spun yarns having a comparatively *higher* number of neps. The number of neps per 1 000 m decreased when the distance between either the smooth or the 4-grooved navel and the rotor was reduced by 2 mm. Differences in the number of neps were small for th. smooth and 4-grooved navels except at a twist factor of 7 where the neppiness of the yarns spun with a 4-grooved navel increased when compared

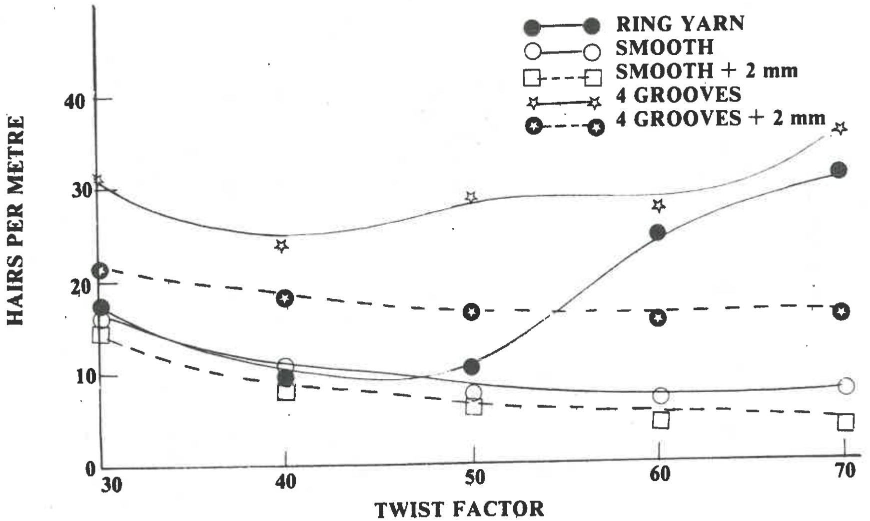

Fig. 7(a) The effect of doffing tube surface and position on the hairiness of a 35 tex all cotton yarn

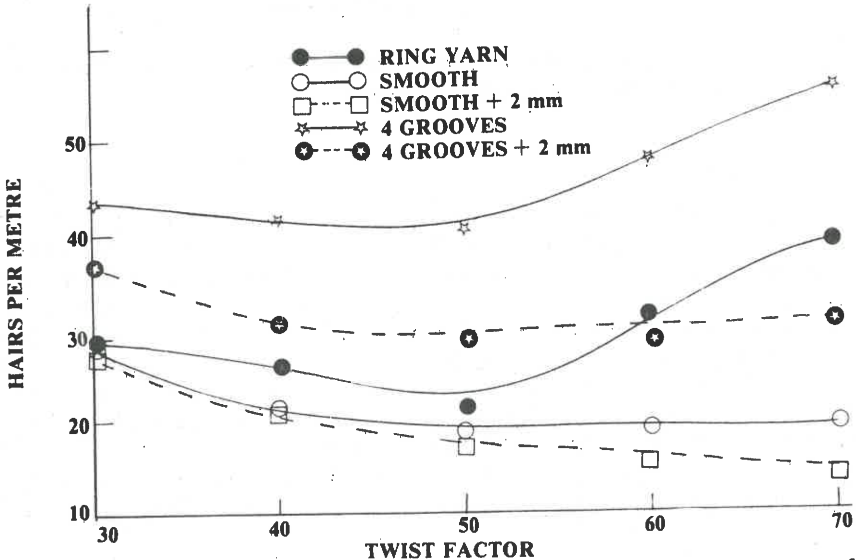

Fig 7(b) The effect of doffing tube surface and position on the hairiness of a 50 tex all cotton yarn

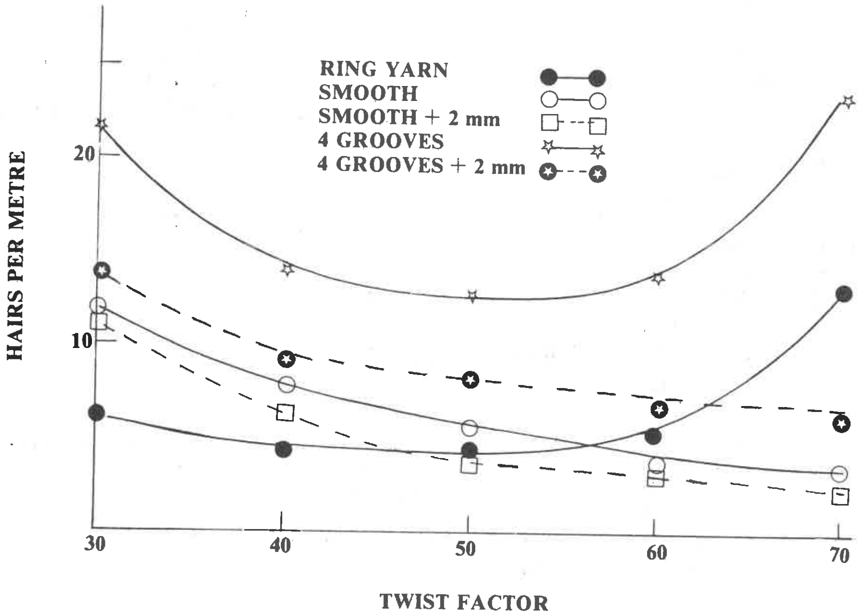

Fig 8(a) The effect of doffing tube surface and position on the hairiness of a 35 tex 50/50 Co/PE-blend yarn

with the yarns spun with the smooth navels.

Results obtained for the 50/50 cotton/polyester blend yarns show that ring-spun yarns were slightly more even than the rotor-spun yarns. [See Tables V(a) and (b)]. Irregularity increased with an increase in twist for the 50 tex ring- and rotor-spun yarns. No significant differences in yarn irregularity was obtained by utilizing different navels or by changing the distance by 2 mm .

The ring-spun 50/50-cotton/polyester yarns showed higher values for the number of neps per 1 000 m as compared to the rotor-spun yarns. The number of neps per 10 000 m also increased with an increase in twist for the ring-spun yarns. The nep count varied somewhat for the rotor-spun yarns, appearing to increase with twist at first after which it decreased again. [See Tables V(a) and (b)].

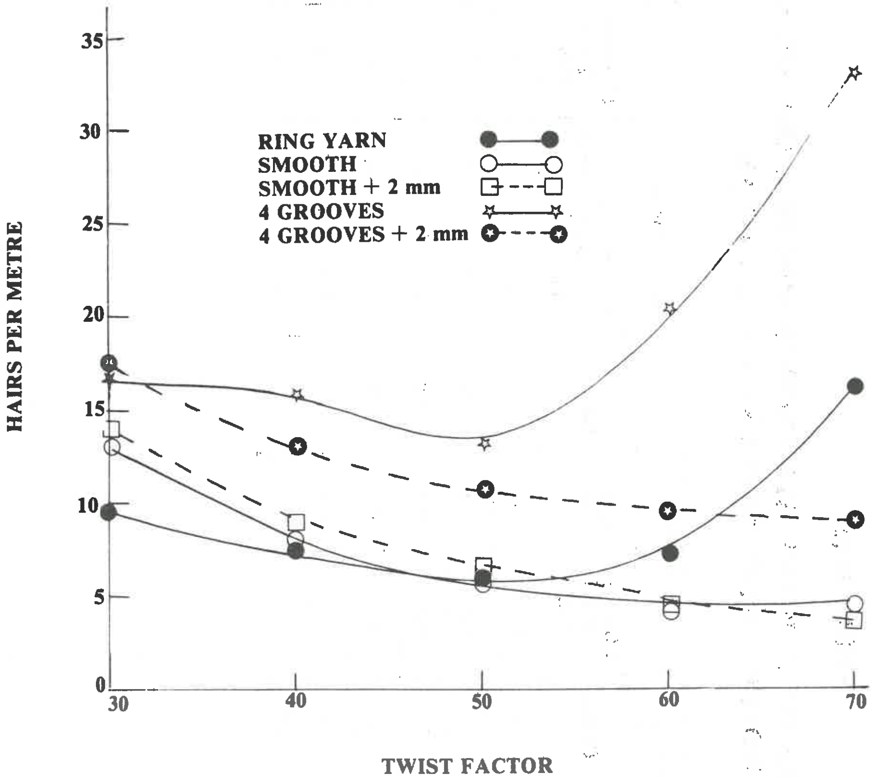

Fig 8(b) The effect of doffing tube surface and position on the hairiness of a 50 tex 50/50 cotton/ PE blend yarn

TABLE IV(a)

YARN EVENNESS PROPERTIES OF A 35 TEX ALL COTTON ROTOR YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)					NEPS PER 1 000 m				
	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
30	14,9	13,6	13,6	13,4	13,4	240	52	56	84	18
40	14,8	14,2	13,8	13,8	13,9	264	172	114	116	92
50	14,7	14,5	14,2	14,3	13,9	284	220	156	202	132
60	15,1	14,5	14,6	14,1	14,3	306	244	220	202	160
70	14,7	14,1	14,8	15,2	15,0	438	154	190	506	224
Av.	14,8	14,2	14,2	14,2	14,1	306	168	147	222	125

TABLE IV(b)

YARN EVENNESS PROPERTIES OF A 50 TEX ALL COTTON ROTOR YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)					NEPS PER 1 000 m				
	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
30	13,2	12,6	13,1	12,8	12,3	—	110	24	38	26
40	14,8	13,2	13,1	13,3	13,1	202	113	92	172	60
50	15,1	14,1	13,3	14,1	13,5	242	176	108	148	84
60	14,8	13,8	13,8	14,2	13,8	330	140	114	232	108
70	15,9	13,9	13,9	14,6	14,3	508	120	118	685	100
Av.	14,8	13,5	13,4	13,8	13,4	321	132	91	255	76

TABLE V(a)

YARN EVENNESS PROPERTIES OF A 35 TEX 50/50 CO/PE BLEND ROTARY YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)					NEPS PER 1 000 m				
	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
30	13,2	13,6	13,8	13,6	14,3	212	140	124	126	326
40	12,8	14,0	13,8	14,2	14,3	194	138	150	190	334
50	13,1	14,3	14,0	13,0	14,8	180	144	168	124	428
60	13,5	13,5	13,5	13,5	15,0	246	164	104	172	184
70	12,7	14,0	14,0	14,4	14,3	282	156	128	296	180
Av.	13,1	13,9	13,8	13,7	14,5	223	148	135	182	290

TABLE V(b)

YARN EVENNESS PROPERTIES OF A 50 TEX 50/50 CO/PE BLEND ROTOR YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)					NEPS PER 1 000 m				
	Ring yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift	Ring yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
30	11,6	12,8	12,8	12,6	13,0	—	90	84	84	128
40	13,0	13,1	13,0	13,2	13,1	150	72	80	88	72
50	12,6	12,8	13,1	13,3	13,1	148	148	72	58	92
60	13,0	13,3	13,3	13,9	13,3	214	78	166	112	72
70	14,2	13,3	12,8	13,3	13,3	626	66	56	592	60
Av.	12,9	13,1	13,0	13,2	13,2	285	91	92	187	85

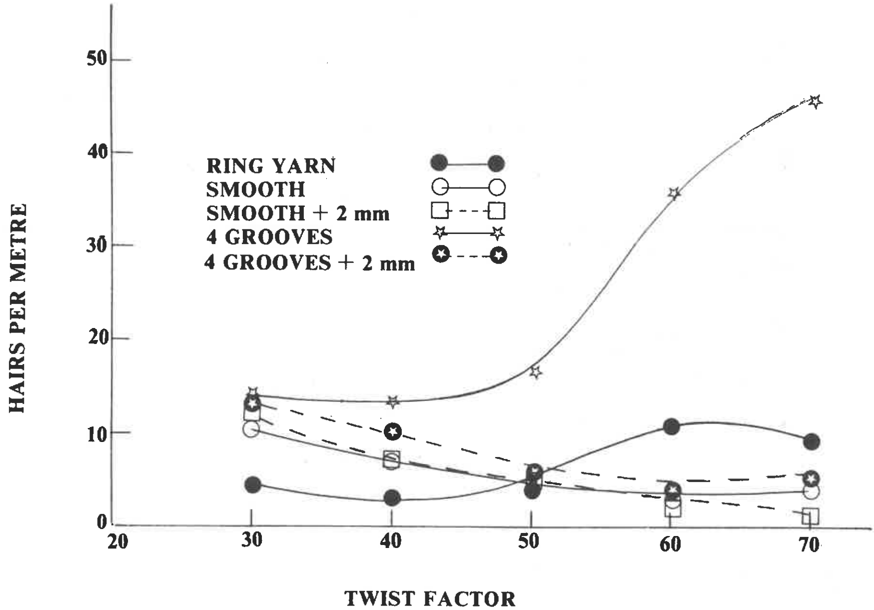

Fig 9(a) The effect of doffing tube surface and position on the hairiness of a 35 tex all PE yarn

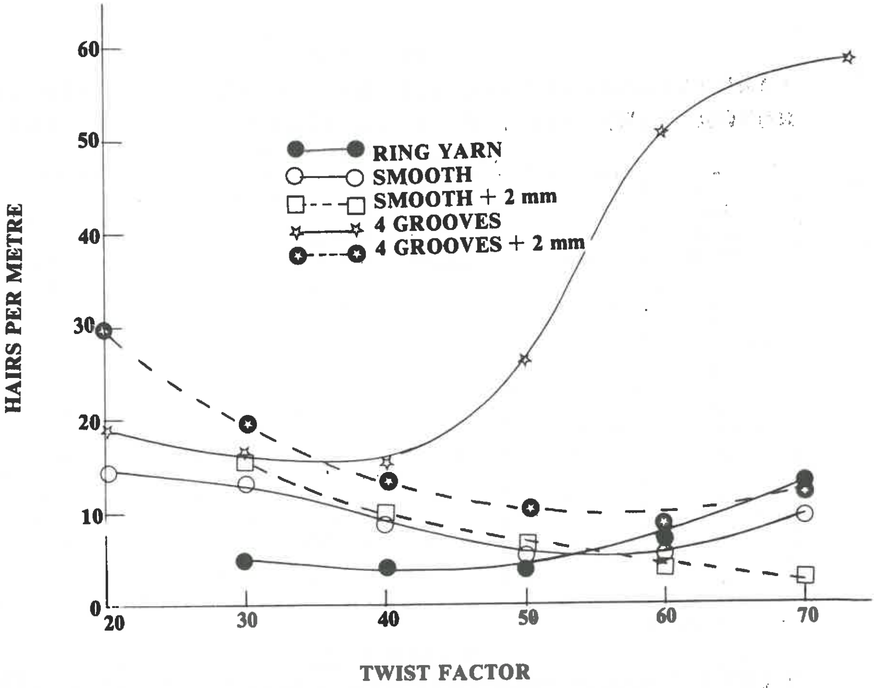

Fig 9(b) The effect of doffing tube surface and position on the hairiness of a 50 tex all PE yarn

The evenness of the all-polyester *ring* yarns was generally better than that of the rotor-spun yarns particularly at low twist factors [see Tables VI(a) and VI(b)]. Twist factor did not appear to have a consistent effect on yarn irregularity. The rotor yarns spun with a smooth or smooth navel and a reduction in the distance of 2 mm, however, produced a slightly more even yarn than those spun with a 4-grooved or 4-grooved navel and a reduction of 2 mm.

It should be stressed that the findings in this report pertain to the Schubert and Salzer machine in particular where the angle of yarn travel to the doffing tube is approximately 60°.

TABLE VI(a)
YARN EVENNESS PROPERTIES OF A 35 TEX ALL POLYESTER ROTOR YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)				
	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
20	—	*	*	13,0	13,1
30	11,8	12,5	12,2	13,1	12,9
40	11,2	12,4	12,4	12,7	12,8
50	11,7	12,2	12,2	12,6	12,3
60	12,6	12,4	11,5	13,0	12,8
70	12,2	11,9	13,0	13,0	11,9
Av.	11,9	12,3	12,3	12,9	12,6

(* - Would not spin)

TABLE VI(b)
YARN EVENNESS PROPERTIES OF A 50 TEX ALL POLYESTER ROTOR YARN SPUN WITH DIFFERENT DOFFING TUBE NAVELS AND POSITIONS

Tex Twist Factor	IRREGULARITY (CV %)				
	Ring Yarn	Smooth	Smooth + 2 mm Lift	4 Grooves	4 Grooves + 2 mm Lift
20	—	12,2	*	13,0	12,8
30	11,8	11,8	12,0	11,6	12,2
40	11,0	11,8	11,7	11,4	11,6
50	10,6	11,3	11,3	11,6	11,2
60	11,5	10,8	10,9	11,1	11,4
70	15,2	10,7	10,9	11,6	11,3
Av.	12,0	11,4	11,4	11,7	11,8

SUMMARY

The authors compiled some data on two aspects concerning the doffing tube navel, viz (a) a comparison of the effect of the smoothness (or roughness) of the doffing tube navel surface on yarn properties and (b) the effect of the position of this tube in respect of the rotor base. In this study all-cotton, 50/50-cotton/polyester and all-polyester yarns were used.

The results showed conclusively that there was no point in trying to "roughen" the navel surface (by insertion of grooves or flutes). Although, theoretically, the presence of grooves should facilitate twist propagation, yarn properties also deteriorated simultaneously.

Another interesting observation was that by reducing the distance between the doffing tube and the rotor base by 2 mm, improved yarn properties were obtained.

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ERRATUM

Tech. Report No. 389

p. 20: 2nd paragraph, 4th line

---- yarns spun with a smooth and a 4-grooved navel ----

p. 20: Last paragraph, 2nd last line:

for "a twist factor of 7" please read "a twist factor of 70".