A STUDY OF VARIOUS PARAMETERS AFFECTING THE ROTOR SPINNING OF WOOL

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ABSTRACT

A study was made of the effects of various machine parameters as well as lubrication on the spinnability of all-wool and a 75/25-wool/cotton blend on the Schubert and Salzer RU-11 rotor spinning machine.

All-wool sliver (2,5 ktex) prepared on the worsted system, *was spun to 60 tex at opening roller speeds of 5 000 r/min and 35 000 r/min rotor speeds.* Pinned opening rollers *were found to be the best whereas type of lubricant made no real difference when* spinnability *was considered. When* yarn properties *were considered, it was once again established that pinned opening rollers with speeds less than 7 000 r/min should be used.* Smooth nozzles *also appeared to be better. Two lubricants were found to improve yarn properties.*

When a 75/25-wool/cotton *sliver was spun on the* cotton system *to 60 and 45 tex yarn linear densities, at rotor speeds of 35 000 r/min and at different opening roller speed (between 4 000 and 7 000 r/min), it was found that an opening roller speed less than 7 000 r/min was preferable. For the 55 and 65 mm rotors, diameter was of no consequence.*

INTRODUCTION

In a preliminary investigation[1] some data were published on the spinning of lambswool. Parameters such as opening roller speed, rotor speed and effect of certain lubricants were studied in relation to yarn properties. It has been found that 60 tex yarns could be spun at opening roller speeds of 6 000 rev/min and rotor speeds of 35 000 rev/min. Lubricants had a detrimental affect on yarn properties. A further in-depth study was, however, required to obtain a clearer understanding of the possibilities of wool and wool blends in rotor spinning.

Recently, Landwehrkamp[2] produced an interesting review of a number of parameters which were found to play a decisive rôle in the performance of wool during rotor spinning. His observations could be summarised as follows: the wool to be spun must have an even staple diagram with a residual wool grease content of 0,5–0,7%. Together with a suitable lubricant the total fatty matter should not exceed 1%. *Fibre crimp* proved to be disadvantageous and processes which are inclined to remove crimp are beneficial. The roving mass should not be too heavy and the opening roller and rotor speeds should be relatively low. The appropriate diameter of a V-grooved rotor should be used.

In the present study the authors considered various machine parameters and the possible use of various types of lubricants to effect improved spinnability. Also, since the processing of all wool via the *blowroom* proved to be a formidable task, the possibility of using a blend of 75% wool/25% cotton was considered.

EXPERIMENTAL

1. Processing of all-wool

A wool top having properties as shown in Table I was used throughout those experiments confined to *all-wool* rotor spinning.

Three 5-kg lots of this wool were treated with the following lubricants:

(a) Control (i.e. no lubricant added)
(b) 2,0% ® Nopco Worsted oil 12/25 (25% solids)
(c) 0,5% ® Nopcostat 725X (100% solids)

These lubricants were applied during the first and second gilling operations. The slivers were then passed through a Schlumberger autoleveller gill box and then finally drawn by three gilling operations to a sliver mass of 2,5 ktex.

The above experiment was repeated by first *backwashing* 25 kg of top, dividing this lot into five 5 kg sub-lots and then adding lubricants (b) to (e) as indicated below. The residual grease of the backwashed tops was 0,11%. The fatty matter contents are given in Table II.

All the slivers were left in the spinning room for a period of about 6 weeks. During this period the ambient conditions were 22°C and 55% RH. The eight lots were then spun to 60 tex using 963 turns/m (tex twist factor = 74) on the Schubert & Salzer RU-11 with rotor diameters of either 55 mm or 65 mm using various types of clothing on the opening rollers which were run at 5 000 r/min. Rotor speeds were kept at 35 000 r/min. The navel (steel) on the doffing tube was also changed from either smooth to 4-grooved. The various parameters used are depicted in Table III. Approximately 2 000 metres of yarn were spun from each lot.

It should be noted that each lot was subjected to the parameters listed in Table III. During the spinning operation the number of ends down for each particular lot was recorded. These results are given in Table IV. The effect on yarn properties are given in Tables VI and VII.

TABLE I

PROPERTIES OF COMBED TOP

Mean fibre length (mm)	45,9
CV %	58,1
% Fibres shorter than 25 mm	19,3
Mean fibre diameter (μm)	21,1
Residual wool grease (%)	0,76
Single fibre crimps/cm	3,93

TABLE II

FATTY MATTER CONTENT OF VARIOUS TOP LOTS

Sample		Total fatty matter (%)
control: not backwashed	I(a)	0,44
worsted oil 12/25	I(b)	0,72
Nopcostat 725X	I(c)	0,81
control: backwashed	II(a)	0,11
worsted oil 12/25	II(b)	0,35
Nopcostat 725X	II(c)	0,49
Nopcostat 762	II(d)	0,34
Nopcotex EP8	II(e)	0,68

TABLE III

PARAMETERS VARIED ON ROTOR SPINNING MACHINE

Clothing on Opening Roller	Type of steel Nozzle	Rotor Diameter (mm)
Cotton*	Smooth	55
Cotton*	Smooth	65
Cotton*	4 Grooves	55
Cotton*	4 Grooves	65
Synthetic**	Smooth	55
Synthetic**	Smooth	65
Synthetic**	4 Grooves	55
Synthetic**	4 Grooves	65
Pins	Smooth	55
Pins	Smooth	65
Pins	4 Grooves	55
Pins	4 Grooves	65

*metallic wire with positive angle

**metallic wire with negative angle

TABLE IV

ENDS DOWN FOR NO BACKWASHING BEFORE SPINNING AND BACKWASHING BEFORE SPINNING

Rotor diameter (mm)	Type of opening roller	Type of nozzle	No Backwashing before Spinning			Backwashing before Spinning				
			Ends down*/2 000 metres of yarn			Ends down*/2 000 metres of yarn				
			No lubricant (a)	Lubricant (b)	Lubricant (c)	No lubricant	Lubricant (b)	Lubricant (c)	Lubricant (d)	Lubricant (e)
55	Cotton	Smooth	15	17	20	6	7	3	1	11
65	Cotton	Smooth	1	7	7	1	1	0	1	1
55	Cotton	4-grooves	6	8	4	0	0	0	0	1
65	Cotton	4-grooves	3	7	7	1	0	0	0	1
55	Synthetic	Smooth	6	9	10	3	1	4	1	4
65	Synthetic	Smooth	3	8	5	0	2	0	2	1
55	Synthetic	4-groove	0	6	4	1	1	0	1	1
65	Synthetic	4-groove	2	6	6	1	0	0	2	2
55	Pins	Smooth	0	2	2	0	0	0	0	1
65	Pins	Smooth	0	5	1	2	1	0	2	1
55	Pins	4-groove	0	1	1	0	0	0	0	0
65	Pins	4-groove	1	1	0	0	0	0	1	0

*Multiply by 1090 to get ends down per 1 000 rotor-hours

2. **Processing of 75% Lambswool/25% Cotton (Acala SJI):**

The properties of the lambswool and cotton are given in Table V.

In the blowroom three cleaning points, viz. Porcupine opener, two-bladed beater and a Kirschner beater were used. The resultant laps were passed through a single card using normal settings and speeds at a production rate of approximately 7,5 kg/hr. The material was processed through two passages of the drawframe whereafter rotor spinning of a 60 tex yarn (964 turns/m)* was carried out on the RU-11 at a rotor speed of 35 000 r/min. The same varying conditions as used for all-wool in regard to rotor diameter, opening roller type, etc., were applied. Various opening roller speeds i.e. 5 000, 6 000 and 7 000 r/min respectively, were used.

It was also decided to try to spin yarns at a *lower* linear density and twist from this blend and, on further investigation, it was found that a 45 tex yarn (749 turns/m), was the lowest that could be spun at opening roller speeds of 4 000, 5 000, 6 000 and 7 000 r/min. respectively.

Theoretically, a *control* lot comprising 100% lambswool (*without* lubricant) was also required to be processed on the cotton system. However, this proved to be difficult when processed through the blowroom since licking around the calender rollers was excessive. Perhaps the presence of some lubricant would have improved the situation.

TABLE V

FIBRE PROPERTIES FOR WOOL AND COTTON

Lambswool		Cotton	
Mean diameter (μm)	20,4	2,5% Spun length (mm)	29,50
% CV	20,4	Uniformity ratio	46,0
WIRA Mean single fibre length (mm)	34,7	0-gauge	47,2 gf/tex
		3,2-gauge	29,0 gf/tex
% CV	42,0	Maturity ratio	0,85
		Fineness (mtex)	177
		Micronaire	4,1

No lubricant was added. This lot was processed via the *Cotton system.*

*A lower twist could have possibly been used.

TABLE VI

YARN PROPERTIES – NOT BACKWASHED BEFORE SPINNING
(Opening roller speed 5 000 r/min)

Rotor Diameter (mm)	Type of Opening Roller	Type of Nozzle	Lubricant	Tenacity cN/tex (CV %)	% Extn.	Irregul. (CV %)	Thin Places per 1000 m	Thick Places per 1000 m	Neps per 1000 m
65	Cotton	Smooth	Nil (control)	4,0 (12,34)	15,2	19,2	130	348	766
55	Synthetic	4-groove	–	4,0 (11,0)	17,0	19,2	132	398	744
65	Synthetic	4-groove	–	4,0 (10,8)	16,0	19,5	226	426	940
55	Pins	Smooth	–	4,1 (12,9)	18,6	18,3	158	144	298
65	Pins	Smooth	–	4,0 (10,1)	14,4	18,3	120	188	470
55	Pins	4-groove	–	4,0 (11,1)	16,4	19,0	122	206	554
65	Pins	4-groove	–	4,0 (12,1)	15,6	18,9	146	236	518
55	Pins	Smooth	Lubric. (b)	4,3 (11,9)	16,6	18,7	132	264	666
55	Pins	4-groove	Lubric. (b)	3,7 (15,3)	14,4	19,2	98	256	632
65	Pins	4-groove	Lubric. (b)	3,9 (11,1)	13,0	18,7	98	228	638
55	Pins	Smooth	Lubric. (c)	4,3 (15,0)	15,4	18,4	100	180	508
65	Pins	Smooth	Lubric. (c)	3,8 (9,8)	13,0	18,5	100	150	540
55	Pins	4-groove	Lubric. (c)	4,2 (10,9)	16,6	18,8	90	178	540
65	Pins	4-groove	Lubric. (c)	4,0 (11,8)	14,2	18,1	94	192	536

TABLE VII

YARN PROPERTIES – BACKWASHED BEFORE SPINNING
(Opening roller speed 5 000 r/min)

Rotor Diameter (mm)	Type of Opening Roller	Type of Nozzle	Lubricant	Tenacity cN/tex (CV %)	% Extn.	Irregul. (CV %)	Thin Places per 1000 m	Thick Places per 1000 m	Neps per 1000 m
65	Cotton	Smooth	Control (0.11% grease)	3,9 (13,1)	15,0	18,4	100	250	510
55	Cotton	4-groove	–	3,8 (12,2)	15,6	18,0	74	174	578
65	Cotton	4-groove	–	3,8 (14,0)	14,0	18,6	134	226	684
65	Synthetic	Smooth	–	3,9 (13,4)	15,0	19,6	170	372	610
55	Synthetic	4-groove	–	4,1 (12,8)	16,6	18,6	136	242	422
65	Synthetic	4-groove	–	3,9 (13,7)	14,6	19,0	156	354	786
55	Pins	Smooth	–	4,0 (12,4)	17,0	17,9	64	124	340
65	Pins	Smooth		4,1 (12,7)	15,4	17,7	56	176	340
55	Pins	4-groove		4,0 (12,5)	17,8	18,1	58	148	276
65	Pins	4-groove		3,9 (11,5)	15,0	18,2	104	162	442
65	Cotton	Smooth	Lubric. (b)	4,3 (14,9)	17,0	18,8	96	300	784
55	Cotton	4-groove	Lubric. (b)	4,2 (13,4)	19,0	18,3	82	314	818
65	Cotton	4-groove	Lubric. (b)	4,2 (13,8)	19,0	18,5	100	256	818
55	Synthetic	Smooth	Lubric. (b)	4,2 (12,6)	19,6	19,4	86	374	922
65	Synthetic	Smooth	Lubric. (b)	4,5 (12,9)	18,0	19,6	158	338	654
55	Synthetic	4-groove	Lubric. (b)	4,3 (10,5)	19,8	19,2	130	358	770
65	Synthetic	4-groove	Lubric. (b)	4,1 (14,3)	14,8	19,5	162	418	964
55	Pins	Smooth	Lubric. (b)	4,3 (11,7)	19,0	18,3	80	136	516
65	Pins	Smooth	Lubric. (b)	4,3 (12,5)	17,4	18,3	98	198	394
55	Pins	4-groove	Lubric. (b)	4,3 (13,8)	19,6	19,1	96	27	680
65	Pins	4-groove	Lubric. (b)	4,2 (11,2)	19,0	18,5	92	204	532
65	Cotton	Smooth	Lubric. (c)	4,3 (9,6)	17,2	18,8	98	280	626
55	Cotton	4-groove	Lubric. (c)	4,3 (9,7)	18,2	18,3	68	212	594
65	Synthetic	Smooth	Lubric. (c)	4,3 (11,0)	17,2	19,8	166	204	612
55	Synthetic	4-groove	Lubric. (c)	4,3 (13,1)	18,8	18,6	96	208	714
65	Synthetic	4-groove	Lubric. (c)	4,3 (12,0)	18,6	19,1	170	222	786
55	Pins	Smooth	Lubric. (c)	4,5 (10,2)	20,6	18,8	116	130	400
65	Pins	Smooth	Lubric. (c)	4,3 (13,5)	18,2	18,4	78	142	472
55	Pins	4-groove	Lubric. (c)	4,4 (12,5)	19,0	18,5	70	140	522
65	Pins	4-groove	Lubric. (c)	4,4 (13,0)	18,0	18,3	124	180	466
55	Cotton	Smooth	Lubric. (d)	4,0 (10,4)	16,8	19,2	176	366	880
65	Cotton	Smooth	Lubric. (d)	4,2 (12,7)	15,6	18,9	130	330	766
55	Cotton	4-groove	Lubric. (d)	4,5 (11,6)	16,8	18,4	74	260	664
65	Cotton	4-groove	Lubric. (d)	4,0 (13,2)	15,6	18,7	140	246	742
55	Synthetic	Smooth	Lubric. (d)	4,2 (12,7)	17,6	19,5	140	392	792
65	Synthetic	Smooth	Lubric. (d)	4,3 (14,6)	14,8	19,2	164	384	700
55	Synthetic	4-groove	Lubric. (d)	4,3 (12,2)	18,6	18,9	144	388	734
65	Synthetic	4-groove	Lubric. (d)	4,3 (15,2)	15,0	19,6	256	426	986
55	Pins	Smooth	Lubric. (d)	4,3 (11,1)	18,0	18,6	76	168	450
65	Pins	Smooth	Lubric. (d)	4,4 (12,3)	17,0	18,6	140	268	502
55	Pins	4-groove	Lubric. (d)	4,4 (10,2)	20,4	18,6	90	182	502
65	Pins	4-groove	Lubric. (d)	4,2 (9,7)	16,0	17,8	64	192	536
65	Cotton	Smooth	Lubric. (e)	4,1 (11,7)	16,2	19,1	106	294	836
55	Cotton	4-groove	Lubric. (e)	4,1 (11,8)	18,6	18,9	110	316	828
65	Cotton	4-groove	Lubric. (e)	4,1 (10,9)	17,8	18,7	102	248	802
65	Synthetic	Smooth	Lubric. (e)	4,1 (11,9)	18,2	19,3	158	310	696
55	Synthetic	4-groove	Lubric. (e)	4,2 (10,5)	18,0	18,9	106	336	746
65	Synthetic	4-groove	Lubric. (e)	4,1 (13,3)	16,6	19,5	118	380	864
55	Pins	Smooth	Lubric. (e)	4,3 (11,9)	18,6	18,5	82	86	406
65	Pins	Smooth	Lubric. (e)	4,4 (16,9)	18,8	19,0	76	178	430
55	Pins	4-groove	Lubric. (e)	4,2 (11,6)	18,4	18,4	104	124	366
65	Pins	4-groove	Lubric. (e)	4,4 (10,6)	18,4	18,4	102	178	508

RESULTS AND DISCUSSION

1. **All-wool:**

A statistical analysis (details omitted) of the effect of all the parameters on *spinnability* showed the following:

A. **No backwashing before spinning:**

The overall best spinnability was obtained by using pinned rollers and 4-grooved nozzles. Rotor diameter (55 or 65 mm) was not found to be important. Spinnability was better *without* any lubricant.

B. **Backwashing before spinning:**

The statistical analysis once again showed that the lowest ends down were obtained by using pinned rollers and 4-grooved nozzles. In this case the use of a 55 mm-diameter rotor was also beneficial, although not critical. Type of lubricant had no significant effect.

As far as *yarn properties* are concerned, statistical analysis of Tables VI and VII showed the following:

No significant differences could be observed from the results in Tables VI and VII. There were definite trends, however, which could be summarised as follows:

Opening roller speeds less than 7 000 r/min should be chosen. Hence although there was little to choose between 5 000 and 6 000 r/min, the lowest is to be preferred from an economical point of view (power consumption). Lubricant (c) tended to give better overall yarn properties, followed by lubricant (e).

For rotor diameters of 55 and 66 mm, the yarn properties did not favour one above the other. In general, *pinned* opening rollers with smooth nozzles tended to effect better yarn properties.

II. **Processing of 75/25-Wool/Cotton blend**

The results on the 60 tex yarns using various machine parameters and opening roller speeds of 5 000, 6 000 and 7 000 r/min respectively, are given in Table VIII whereas Table IX depicts similar information for a 45 tex yarn.

From Tables VIII and IX (i.e. for 60 and 45 tex yarns, respectively), it was clear that 7 000 r/min for the opening roller speed was too high; there was, however, little to choose between 5 000 and 6 000 r/min. Pinned rollers with 4-grooved nozzles or synthetic rollers with smooth-groove nozzles gave somewhat better overall yarn properties. Rotor diameter was of no consequence when 55 mm or 65 mm diameters were considered.

SUMMARY AND CONCLUSIONS

In this report the authors considered the effect of a number of machine parameters on the spinnability of wool and 75/25-wool/cotton on the Schubert and Salzer RU-11 rotor machine. The all-wool slivers were prepared on the *worsted system* whereas the 75/25-blend slivers was processed via the *cotton system.*

TABLE VIII

YARN PROPERTIES OF 75/25-LAMBSWOOL COTTON SPUN TO 60 TEX WITHOUT LUBRICANT AT VARIOUS OPENING ROLLER SPEEDS

Rotor Diameter (mm)	Type of Opening Roller	Type of Nozzle	Opening Roller Speed (r/min)	Breaking Strength cN (CV %)	% Extn.	Irregul. (CV %)	Thin Places per 1000 m	Thick Places per 1000 m	Neps per 1000 m
55	Cotton	Smooth	5000	4,4 (9,0)	8,4	16,0	8	16	118
65	Cotton	Smooth	5000	4,5 (10,4)	7,6	16,2	24	22	176
55	Cotton	4-groove	5000	4,9 (8,2)	8,0	18,7	18	24	380
65	Cotton	4-groove	5000	4,8 (9,2)	7,6	16,1	8	24	226
55	Synthetic	Smooth	5000	4,9 (9,2)	8,8	18,4	10	20	102
65	Synthetic	Smooth	5000	4,8 (8,8)	7,4	15,9	10	38	186
55	Synthetic	4-groove	5000	4,7 (11,0)	8,4	15,9	8	20	140
65	Synthetic	4-groove	5000	5,7 (9,4)	7,2	15,9	2	14	360
55	Pins	Smooth	5000	4,9 (10,0)	10,0	16,0	16	28	126
65	Pins	Smooth	5000	4,7 (9,9)	7,8	16,1	10	20	186
55	Pins	4-groove	5000	4,5 (8,3)	8,2	16,3	16	16	152
65	Pins	4-groove	5000	4,9 (6,9)	7,4	15,6	8	34	252
55	Cotton	Smooth	6000	4,3 (10,2)	8,4	17,4	48	66	204
65	Cotton	Smooth	6000	4,5 (11,6)	7,4	17,2	14	28	180
55	Cotton	4-groove	6000	4,9 (7,9)	8,4	16,7	6	16	320
65	Cotton	4-groove	6000	4,9 (9,2)	7,6	16,1	18	28	306
55	Synthetic	Smooth	6000	4,8 (7,9)	8,6	15,8	18	14	88
65	Synthetic	Smooth	6000	4,8 (11,0)	7,8	15,8	8	18	192
55	Synthetic	4-groove	6000	4,8 (8,8)	8,4	15,5	8	12	116
65	Synthetic	4-groove	6000	4,7 (8,9)	6,8	16,2	14	30	514
55	Pins	Smooth	6000	4,7 (7,6)	8,0	15,9	6	16	90
65	Pins	Smooth	6000	4,8 (9,4)	7,4	16,1	14	24	204
55	Pins	4-groove	6000	4,7 (8,5)	8,0	16,0	14	24	146
65	Pins	4-groove	6000	4,9 (9,9)	6,8	16,0	6	38	300
55	Cotton	Smooth	7000	4,4 (10,4)	7,2	17,5	32	34	144
65	Cotton	Smooth	7000	4,6 (9,4)	7,2	17,4	14	28	180
55	Cotton	4-groove	7000	4,9 (6,6)	7,6	16,6	12	22	320
65	Cotton	4-groove	7000	4,8 (9,3)	7,2	16,4	18	24	268
55	Synthetic	Smooth	7000	5,0 (10,5)	8,4	16,4	10	30	138
65	Synthetic	Smooth	7000	4,9 (11,4)	7,4	16,1	2	24	160
55	Synthetic	4-groove	7000	4,6 (8,9)	8,2	16,6	12	38	178
65	Synthetic	4-groove	7000	4,5 (10,8)	7,0	16,6	8	20	446

TABLE IX

YARN FROM 75/25-LAMBSWOOL/COTTON SPUN TO 45 TEX WITHOUT LUBRICANT AT VARIOUS OPENING ROLLER SPEEDS

Rotor Diameter (mm)	Type of Opening Roller	Type of Nozzle	Opening Roller Speed (r/min)	Breaking Strength cN (CV %)	% Extn.	Irregul. (CV %)	Thin Places per 1000 m	Thick Places per 1000 m	Neps per 1000 m
65	Cotton	Smooth	4000	3,5 (10,1)	7,4	16,7	44	32	168
55	Cotton	4-groove	4000	3,2 (8,9)	7,8	16,8	42	26	206
65	Cotton	4-groove	4000	3,4 (9,4)	7,2	16,5	32	28	160
55	Synthetic	Smooth	4000	3,3 (12,0)	7,8	17,7	46	56	180
65	Synthetic	Smooth	4000	3,6 (9,9)	7,6	16,0	28	40	166
55	Synthetic	4-groove	4000	3,5 (8,2)	8,2	16,3	34	44	136
65	Synthetic	4-groove	4000	3,6 (11,0)	7,0	17,2	38	20	238
55	Pins	Smooth	4000	3,5 (16,3)	7,4	16,6	34	30	168
55	Pins	4-groove	4000	3,5 (11,2)	7,6	16,3	52	38	192
65	Pins	4-groove	4000	3,7 (9,0)	6,8	16,5	16	46	188
65	Cotton	Smooth	5000	3,5 (10,2)	7,4	16,6	44	30	152
55	Cotton	4-groove	5000	3,3 (10,5)	7,6	16,9	42	32	196
65	Cotton	4-groove	5000	3,6 (10,2)	7,2	16,2	34	16	164
55	Synthetic	Smooth	5000	3,4 (11,0)	8,0	17,1	48	26	164
65	Synthetic	Smooth	5000	3,7 (9,3)	7,2	16,4	22	34	154
55	Synthetic	4-groove	5000	3,5 (8,9)	8,0	16,1	20	22	164
65	Synthetic	4-groove	5000	3,5 (9,9)	6,8	16,4	44	22	252
55	Pins	Smooth	5000	3,5 (7,8)	7,8	16,7	42	20	116
55	Pins	4-groove	5000	3,4 (8,5)	7,6	16,5	34	24	168
65	Pins	4-groove	5000	3,6 (8,9)	7,2	16,3	44	18	128
65	Cotton	Smooth	6000	3,5 (10,7)	7,4	16,7	30	32	160
55	Cotton	4-groove	6000	3,5 (11,0)	7,8	16,2	16	10	146
65	Cotton	4-groove	6000	3,5 (12,3)	7,2	16,0	24	22	168
55	Synthetic	Smooth	6000	3,5 (11,4)	7,8	16,3	32	24	138
65	Synthetic	Smooth	6000	3,6 (10,4)	6,8	16,3	18	26	118
55	Synthetic	4-groove	6000	3,4 (9,2)	7,8	16,1	26	20	134
65	Synthetic	4-groove	6000	3,5 (9,1)	6,8	16,7	38	24	226
55	Pins	Smooth	6000	3,3 (11,6)	7,6	16,3	30	22	116
65	Pins	Smooth	6000	3,2 (9,9)	7,0	17,5	38	36	162
55	Pins	4-groove	6000	3,3 (13,6)	7,4	16,0	26	14	132
65	Pins	4-groove	6000	3,3 (10,9)	6,6	16,2	12	22	152
65	Cotton	Smooth	7000	3,4 (10,2)	7,4	17,9	98	32	188
55	Cotton	4-groove	7000	3,1 (10,2)	8,0	17,0	42	24	226
65	Cotton	4-groove	7000	3,4 (12,8)	7,2	16,3	26	38	168
55	Synthetic	Smooth	7000	3,2 (10,5)	7,4	17,2	26	24	110
65	Synthetic	Smooth	7000	3,5 (9,7)	7,8	16,4	28	24	144
55	Synthetic	4-groove	7000	3,1 (11,9)	8,0	20,0	84	66	174
65	Synthetic	4-groove	7000	3,4 (10,4)	7,0	17,3	36	32	282

In the case of the all-wool, the *spinnability* of 60 tex yarns at opening roller speeds of 5 000 r/min and rotor speeds of 35 000 r/min was found to be improved by using pinned opening rollers and 4-grooved navels on the doffing tube. Of the two rotor diameters, viz. 55 mm and 65 mm, there was little to choose and type of lubricant had no significant effect. As far as *yarn properties* were concerned, pinned opening roller speeds lower than 7 000 r/min were preferable. Of the lubricants investigated, two were found to improve yarn properties. Smooth nozzles tended to effect better overall yarn properties.

For the *75/25-blend*, various opening roller speeds, viz. 4 000, 5 000, 6 000 and 7 000 r/min were tried. Once again it was proved that speeds less than 7 000 r/min should be used. Pinned opening rollers with 4-grooved nozzles or synthetic rollers with smooth nozzles gave somewhat better overall yarn properties. Rotor diameter was of no consequence when the 55 and 65 mm rotors were considered.

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PROPRIETARY NAMES

The trade names of the lubricants used in this publication are the property of Messrs Nopco Chemical Co., U.S.A.

The use of proprietary names in this report in no way implies that there are not other products of equal or greater merit.

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