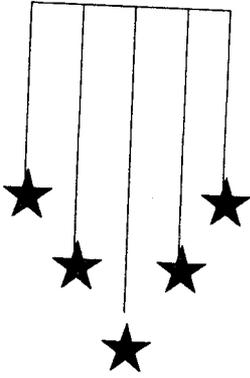
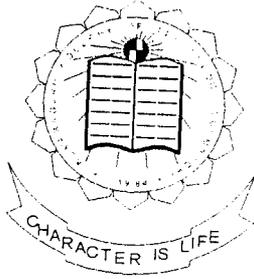


A study on compact spinning



2000 - 2001

Project Work

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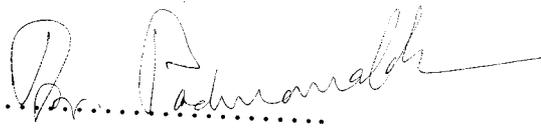
Faculty Guide

Place :

Date :

Submitted for the university Viva-Voce examination held on

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Internal Examiner


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External Examiner

Dedicated

To

Our

Beloved

Parents

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT:

We wish to thank Dr. K.K. padmanabhan , principal , Kumaraguru college of technology , for the encouragement given to us in doing this project work.

We are immensely thankful and highly indebted to prof A.R. padmanabhan , HOD , Department of textile technology , Kumaraguru college of technology , for his timely and valuable advices in executing this project work successfully .

We are thankful to Mr. S. Ganesan , Assistant professor , Kumaraguru college of technology , for his highly valuable guidance , through which we have learnt much , during the entire execution of this project work. We are also highly obliged to all the staff members of textile technology department for their timely assistance in completing this project work.

We are grateful to M/s K.V.S. textiles and M/s Thirumalai venkateshwara mills for supply of raw materials for carrying out this project work successfully.

We are very much thankful to M/s ATL Textiles , Tirupur for giving valuable details for this project work.

We are thankful to SITRA for testing the yarn samples in time.

SYNOPSIS

SYNOPSIS:

All the leading machine builders of the world agree that the 2 best yarn manufacturing methods at present, namely ring spinning and rotor spinning have attained optimum limits of their economic production and qualitative appeal, while not offering sufficient opportunity for creativity in design of specific yarn characteristics. Hence a new type of yarn is going to establish itself in addition to the conventional ring and rotor yarns in the textile industry in future. The compact yarn is a variation on conventional ring spun yarn and claims to produce distinctive, high quality yarns.

In this work the authors have made attempts to make compact yarn by simple modification of the existing ring spinning frame so as to reduce the cost of conversion.

By comparing normal yarn with the compact yarn produced through the above modification for two counts 20s and 40s (100% cotton) under spindle speed of 11,500 and at same level of twist.

The following are the conclusion on the yarn characteristics which are expected to change, viz, single yarn strength, hairiness, evenness and lea strength test were studied.

- 17 % reduction in the hairiness of the yarn, the reduction being more pronounced in long length hairs.
- 2 % increase in yarn strength. Further the end breaks are greatly reduced.
- Better yarn evenness is obtained.
- Twist can be reduced by 10% while maintaining the same strength.
- Improved appearance and luster of the yarn.

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1. INTRODUCTION:

The new spinning process developed so far mainly concentrated on getting higher production / spinning unit. This is especially true with rotor and air-jet spinning which are the only new spinning systems having achieved some break through to date. However ring spinning has always been and still is producing a world class yarn which is accepted as the undisputed quality benchmark.

The outcome of higher production performance of rotor and air jet spinning systems is inferior quality in some aspect or other. Moreover no new spinning process displays flexibility compared to ring spinning in its scope of application.

If ring spun yarn is examined under microscope it is easy to see that the integration of many fibres is poor. i.e. uncontrolled to yarn main structure . In other words if all fibres are integrated into yarn i.e. compacted into yarn structure, both strength and elongation could be further enhanced.

This is how the concept of compact spinning was born.

LITERATURE REVIEW

2.LITERATURE REVIEW:

Compact spinning is a new spinning process. Here the troublesome spinning triangle is reduced either by using perforated aprons or by use of perforated drums.

The four leading manufacturers of compact spinning are

- Suessen Elite system
- Rieter comfor spin
- Zinser air comtex
- MAL system

2.1 Objectives of compact spinning:

1. To reduce the hairiness.
2. To increase the single yarn strength
3. To reduce the twist which results in high production.
4. To improve the evenness
5. To reduce the end breaks

Suessen Elite spinning process:

In the suessen Elite spinning as shown in fig5 (see at the end of the section), compacting is achieved by introduction of a new condensing zone according to suessen Elite spinning catalogue ¹. A tubular profile subjected to negative pressure is closely embraced by a lattice apron. Delivery top roller fitted with rubber cots presses the lattice apron against the hollow profile and drives the apron at the same time

forming the delivery nipping line the tubular profile has a small slot in the direction of fibre flow, which commences at the immediate vicinity of the front roller nipping line. This creates an air current through the lattice apron via the slot towards the inside of the profile tube. The air current seizes the fibres after they leave the front roller nipping line and condense the fibre strand, which is conveyed by the lattice over a curved path and transported to the delivery nipping line.

As the slot, being under negative pressure, reaches right up to delivery nipping line, the fibre assembly remains totally closed. The spinning triangle and the serious disadvantages, in respect to yarn structure, strength and hairiness of the finished yarn disappear. The diameter of the delivery top roller is slightly bigger than the front top roller, hence a tension in the longitudinal direction during the condensing process.

The consequence of this tension is that curved fibre will be straightened and thus support the condensing effect of negative pressure acting on the fibre band in the slot area of the profile tube. when processing very short fibres like carded cotton, the suction slot is arranged at an angle to the direction of fibre flow ensuring that the fibre ends, during their transport from the front roller to the delivery nipping line are well bound into the strand of fibres.

Three measures described above – condensing right upto the delivery clamping line, light tensioning of the fibre band during condensing, and rotation of fibre band around its axis during condensing, result in the fibre band reaching the delivery clamping line ideally

straightened, with individual parallel and optimally condensed fibres. This creates a cross sectional force during the fibre transport, which in turn causes the fibre assembly to rotate around its own axis so that the fibre ends are closely embedded into the yarn assembly.

The delivery top roller is connected to front top roller via a gear. This ensures that both rollers are synchronized. The tension essential for perfecting condensing of the fibre assembly, is guaranteed by a small difference in the diameters of front top roller and delivery top roller.

The effect of air current is all the more regular and the spinning results all the better, because of the smaller and closely spaced perforation of the lattice apron. In this respect it is interesting to note that a lattice apron has more than 3000 pores / sq.cm , compared with approximately 80 openings in a perforated drum.

Most important for satisfactory and uniform spinning results over the complete length of the machine is an identical level of suction from the spinning position, as well as the possibility to adjust the suction level in accordance with yarn counts and draw material. This can easily and reliably be achieved, if separate and adjustable suction sources are available for spinning section.

Rieter comfor spin:

In rieter system according to RIETER ⁶ spinning triangle associated with conventional ring spinning system is eliminated by suction and compaction on a perforated steel drum as shown in fig 3(see at the end of the section). Here an intermediate zone otherwise known as

compacting zone is inserted between drafting area and yarn formation. Process is characterized by the introduction of a 4th nip point downstream of the exit from the conventional 3/3 drafting system used in cotton ring frames. This intermediate zone on front bottom delivery roller, which takes the form of the perforated drum between the first and front top rollers, is designed to act as an aerodynamic condenser .

A fixed suction system generating a vacuum is fitted inside this perforated drum. This results in a current of air flowing from outside to the inside of the drum. The fibres from the delivery nip line of the drafting system are thus held firmly on the surface of the perforated drum and move with the circumferential speed of the drum .A subsequent second top roller also presses on the drum.

The nip between this second top roller and drum clamps the spinning triangle, i.e. yarn formation occurs immediately after this second nip. Twist is actually inserted in the same way as in the conventional ring spinning .The web of fibres condensed in the intermediate zone between the two top rollers on the perforated drum. There is a non-rotating insert inside the drum with a specially shaped diagonal slot to allow the passage of air. The angle of slot and the air flowing in the combined effect that the fibres being carried on the circumference of the drum are moved sideways.

The fibre structure in the condensing zone is thus condensed extremely efficiently and the same time very gently in this way to width ,which is only a fraction of width of the fibre sliver emerging from the drafting system . The fibre sliver emerging from drafting system has virtually no strength, since number of fibres in the cross section is

small and no twist has yet been inserted. It is therefore extremely important to guide these fibres carefully through the entire length of condensing zone. In the comfort spin process this task is handed ideally, in contrast to the other methods, since the fibres are held and guided on the perforated drum by aerodynamic forces immediately after leaving delivery nip line of the drafting system.

This fibre guidance is maintained as far as the spinning triangle. Despite optimum guidance however, the fibres must be shifted laterally in relation to the direction of motion in the condensing zone in order to achieve the required condensing effect.

For this reason the condensing surface must feature a very high quality surface finish with a low coefficient of friction between the fibres and the condensing surface. This requirement is also ideally satisfied in comfort spin process by metal surface to perforated drum. The aerodynamic condensing of the fibres results in narrower spinning zone, with individual fibres more effectively bound into the yarn assembly

Zinser air comtex :

In zinser according to Lakshmi vekatesh ⁷ roving emerging from the conventional 3/3 roller drafting is taken from nip line of the drafting system by an airflow and condensed under suction on a perforate surface as shown in the fig 7 (see at the end of the section).The compacted roving thus undergoes a substantial reduction in width prior to twist insertion and thereby spinning triangle is totally eliminated.

Zinser air comtex 700 machine is applicable to staple fibres upto 40mm long cotton, manmade fibres or blends and can produce

count range Nm 20 – 200. machines can be built with spindle speeds upto 25000 rpm.

MAL system :

In this MAL process according to Mr.chellamani, drafted roving coming from the front roller of the drafting system passes through another zone, which has a top roller and a bottom roller with guide aprons as shown in the fig 7 (see at the end of the section). The guide apron has a series of holes through which has air current is applied on the drafted material. This air current compacts the drafted strand and thereby eliminated the spinning triangle.

SALIENT FEATYRES:

Suessen Elite system ¹ :

- ❖ Suessen elite system is based on existing FIOMAX ring spinning machine.
- ❖ The twist to strength ratio is said to be substantially better, allowing lower twist levels . Hence softer yarns can be produced.
- ❖ They can be used for all commonly used raw materials, including blends across the entire spinning count ranges.

Rieter comfor spin ⁶ :

- ❖ Production of less hairy yarn
- ❖ Yarn profile is excellent
- ❖ Completely new characteristics of comfor yarn which are said to have softer and silkier yarn.
- ❖ This is an additional option alongside an existing ring and rotor spinning technique.

- ❖ The yarns are setting standards in downstream processing and wearing comforts, describing them as the yarns of the future.

Zinser air comtex³ :

- ❖ It is capable of producing long staple yarns

The yarns produced are less hairy and the yarn profile is excellent.

- ❖ The main targets are higher raw material yield and substantial reduction of the hairiness. The optimized yarn character can be clearly seen in the end products.

- ❖ Higher yarn yield can be achieved from the given raw material.

MAL system² :

- ❖ Best suited to the high volume production of medium counts yarns from carded cotton

- ❖ Yarn profile is very neat and uniform.

- ❖ Ends down is very neat and uniform.

- ❖ Operating cost is lower.

2.2 Principle of yarn formation:

In ring spinning yarn formation generally occurs immediately at the delivery nip line of the drafting system as shown in fig 1 according to stalder. The delivered end of the system with subsequent yarn formation is shown in the fig. The fibres are fed to the drafting system with a width 'F' before the delivery line. This width 'F' depends on various factors, such as yarn count, roving twist and the level of draft in the drafting system. Higher the draft, the wider stream of fibres emerging from the drafting system.

The fibres supplied by the drafting system are collected by the spinning triangle and then integrated into yarn structure. For a specific yarn given count and the elongation values, width 'f' of the spinning triangle depends mainly on the spinning tension 'P'. It is deduced from the experiments that width 'f' varies inverse proportion to spinning tension 'p' i.e. higher the tension 'P' smaller will be the width of the spinning triangle. These relationship explain the fact that in ring spinning, width 'F' of the fibres fed in always greater under practical conditions than width 'f' of the spinning triangle.

$$D = F - f \text{ and } D > 0$$

D i.e. the difference between the F and f, is therefore greater than zero. The spinning triangle is therefore unable to capture all the fibres fed in. In simple terms, many peripheral fibres are either lost or left uncontrolled in some way or other to the already twisted yarns. Ring spun yarns feature small quantum of fibres which make little contribution to the strength and which are also have an adverse influence o yarn uniformity.

If the spinning triangle is eliminated i.e. $D = 0$ or the spinning triangle length is reduced i.e. D is nearly equal to zero, the yarn is expected to posses high strength and uniformity. This is possible only when fibres delivered from the drafting system is compacted.

The fibre structure which is fed to the spinning triangle is so narrow that the spinning triangle becomes so small as virtually to disappear. In the process, of course, all the fibres from the remaining spinning triangle are collected and fully integrated in the yarn. The result is a perfect yarn structure. The yarn thus formed is termed as compact yarn.



2.3 Properties of compact spun yarns:

The improvement in yarn quality achieved with the compact spun yarns is impressive.

- When compared with the conventional yarns, compact spun yarns display significantly better strength and elongation values. This leap in quality is so great that even with reduced twist, the compact yarn still display better values than normally twisted , conventional yarns.
- The lower hairiness of compact spun yarns is very pronounced. The difference in hairiness of compact spun yarns is especially dramatic in categories of 3mm and over. This fact largely explains the considerable advantages of compact spun yarns in downstream processing.
- End products made from compact spun yarns look more attractive, have an improved luster and are pleasanter to touch.
- They show improved wearing properties. Piling is considerably reduced and the wear resistance of compact spun product is much higher.
- Compared to the ring spun yarns, compact yarns are therefore able to retain their original, attractive appearance for much longer.
- In spinning, carded feed materials by the compact spinning process, a higher strength was obtained than with the combing process. In other words ,yarns of equivalent strength can be spun with a saving of around 14 – 16 % in the fibre weight.
- The compact spinning meets all the requirements such as patentability, better raw material utilization, increased productivity and improved product quality.

2.4 Advantages and benefits ⁵ :

1. 15 – 20% reduction in hairiness of yarn, the reduction being more pronounced in long length hairs.
2. 10 – 15% improvement in yarn tenacity. Further, the strength of the weakest element is considerably improved leading to fewer end breaks in the subsequent stages.
3. Twist can be reduced by 10% while maintaining the same yarn strength.
4. Significantly, better abrasion resistance because of absence of long protruding hairs. As a result end breaks and droppings in the loom shed and linting in knitting are reduced.
5. Better yarn evenness and diameter.
6. Size % can be reduced by 30 – 50%
7. Singeing can be omitted.
8. Lower twist can be employed in doubling
9. Improved appearance and lustre on the fabric with a softer handle, reduced pilling and better dye uptake.
10. it can be universally used for all raw materials and blends as well as for the complete count range without restriction.
11. it is possible to replace the classical 2 ply yarn by a single compact yarn or conventional combed yarns by carded compact spun yarns.
12. Increased production and reduced energy consumption.
13. Entangling of warp threads on weaving frames are reduced to 30%
14. Knitting yarns need no waxing to get the same running properties as the waxed conventional yarns.

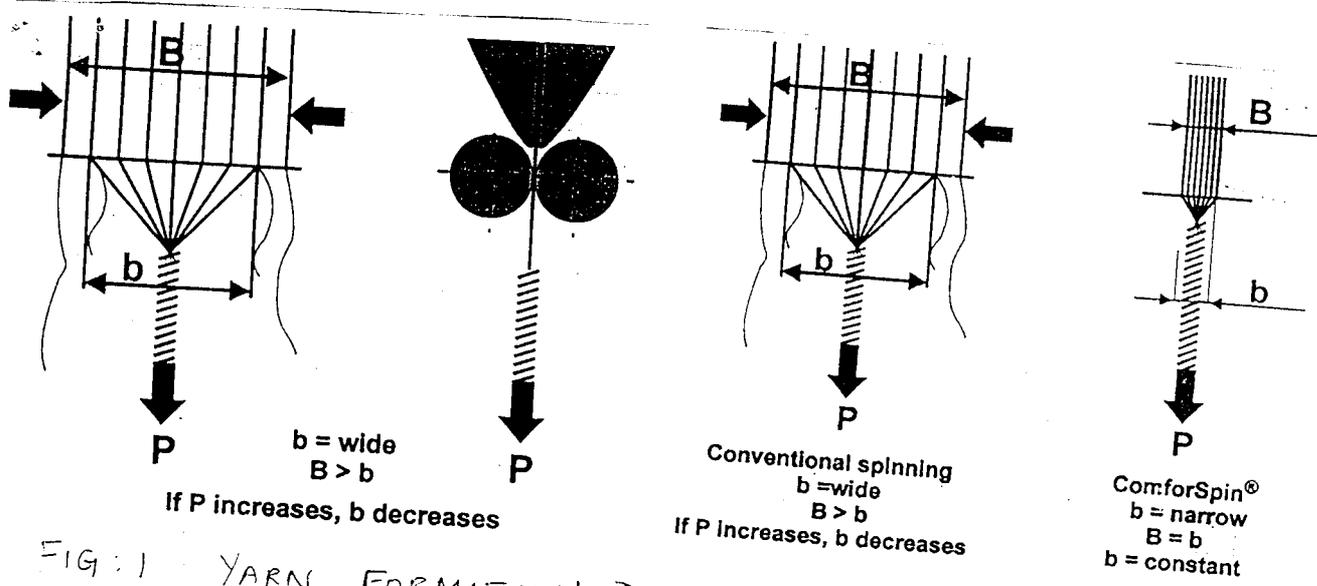


FIG: 1 - YARN FORMATION DURING CONVENTIONAL RING SPINNING AND COMPACT SPINNING PROCESSES.

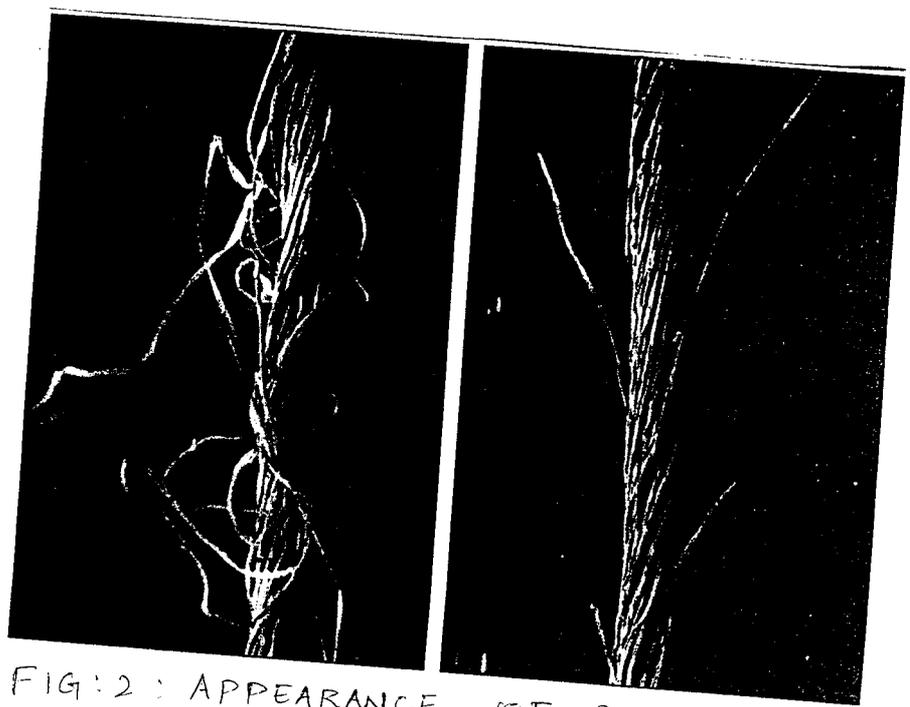
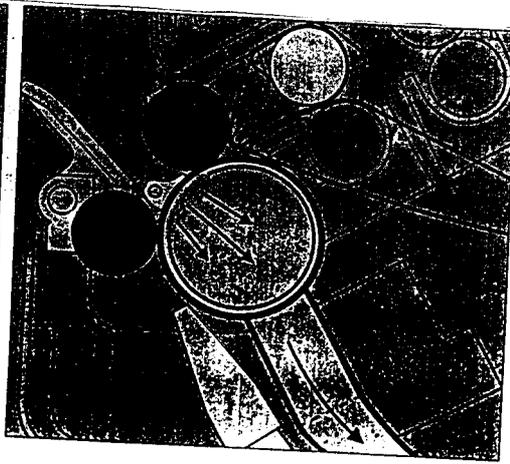
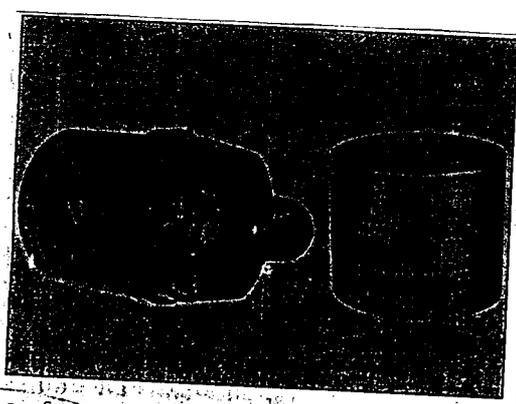


FIG: 2 : APPEARANCE OF RING SPUN YARN AND COMPACT SPUN YARN [right].



- Suction resistant to fibre clinging
- ideally aerodynamic shaped suction

FIG:3: RIETER COM4 SPIN PROCESS.

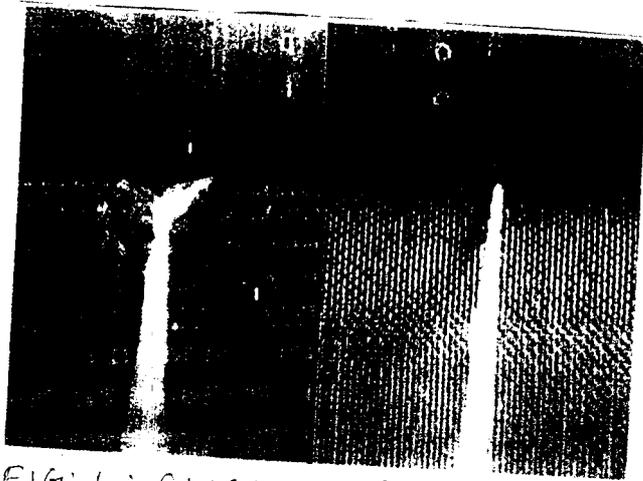


FIG:4: CLASSICAL SPINNING WITH SPINNING TRIANGLE (LEFT) AND COMPACT SPINNING WITHOUT SPINNING TRIANGLE.

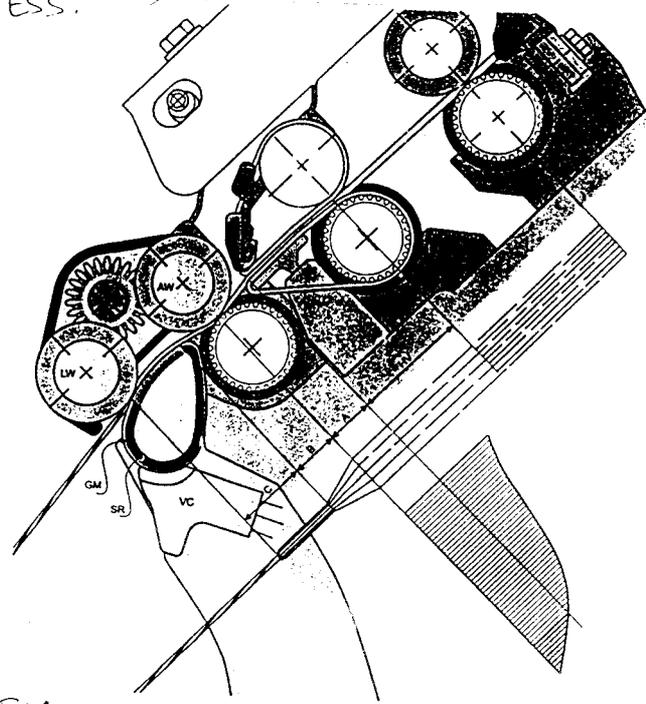


FIG:5: ELITE SPINNING SYSTEM

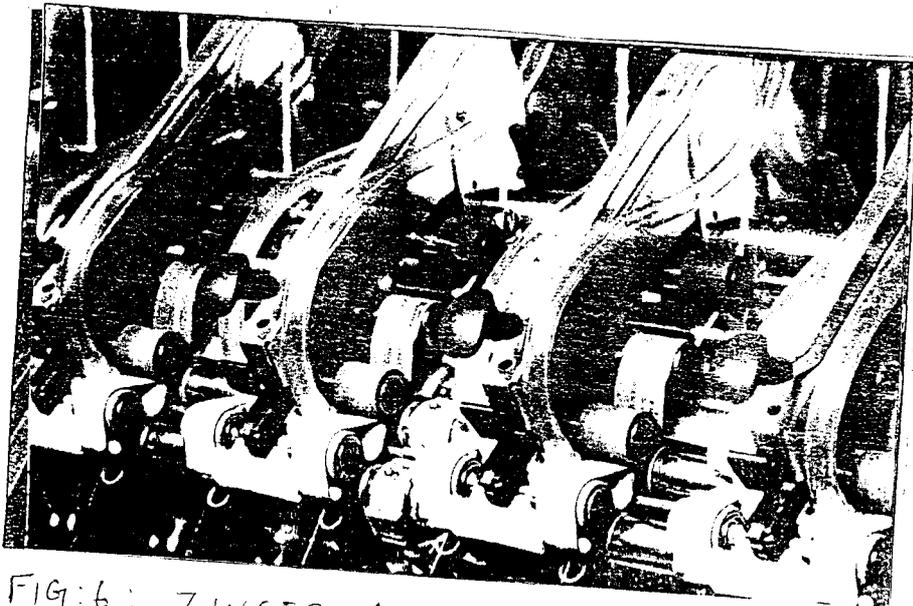


FIG:6: ZINSER AIR-COM-TEX 700 SYSTEM.

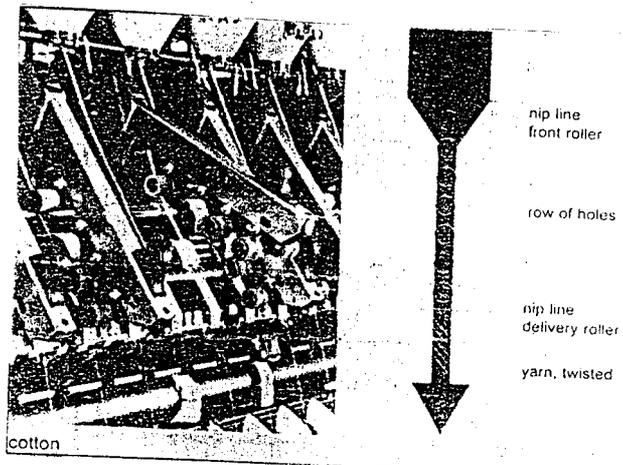


FIG: 7. MAL SPINNING SYSTEM

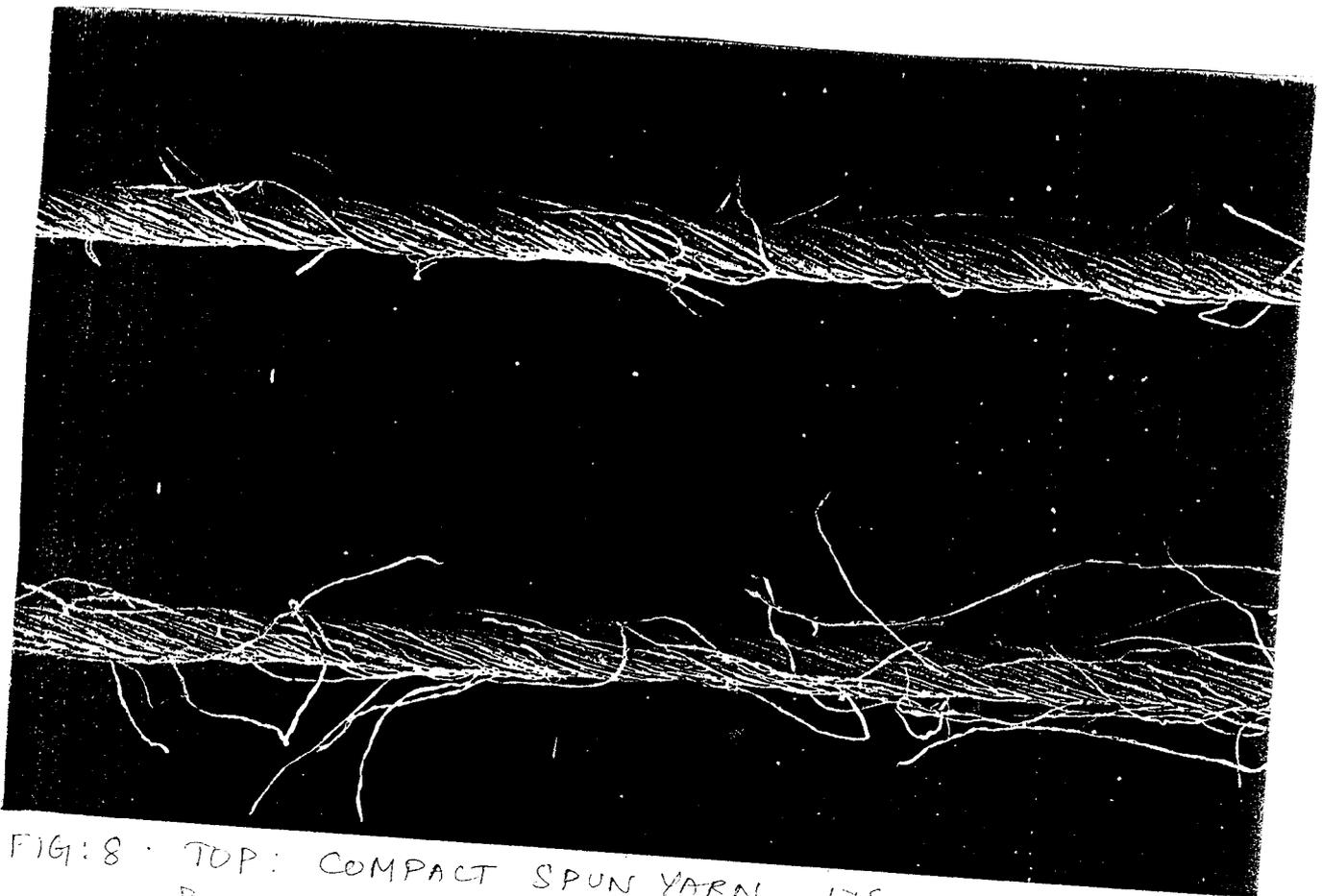


FIG: 8 · TOP: COMPACT SPUN YARN - 17S No. ,
 BOTTOM: THE SAME SPUN YARN AS CLASSICAL RING YARN

elongation; 100% cotton combed

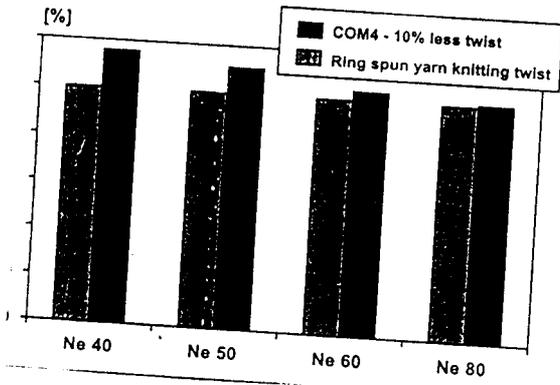


FIG: 9: YARN QUALITY IMPROVEMENT → ELONGATION

100% cotton combed; Ne 40

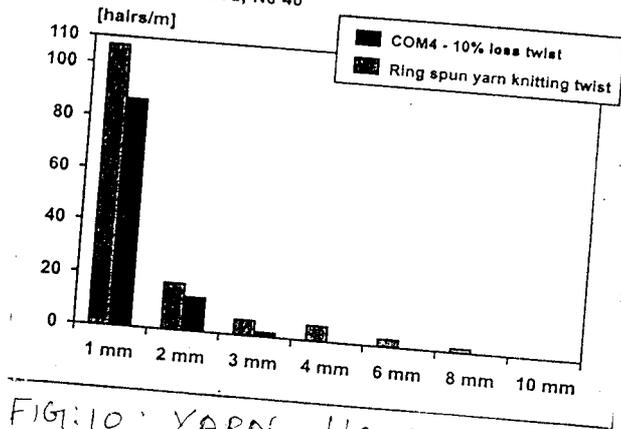


FIG: 10: YARN HAIRINESS. [ZWEIGLE METHOD - 40^s Ne]

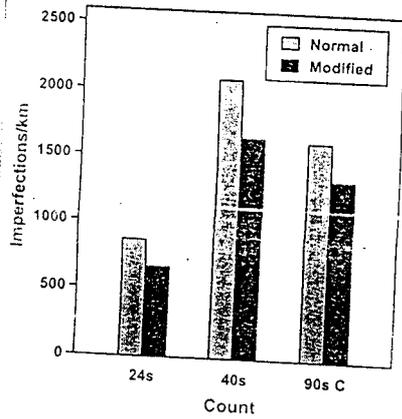


FIG: 11: IMPERFECTIONS IN NORMAL AND MODIFIED APRONS

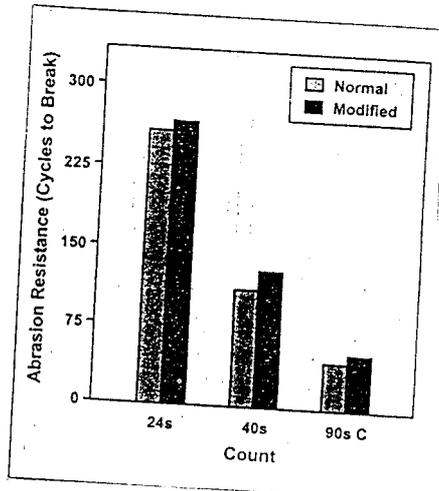


FIG: 12: ABRASION RESISTANCE IN NORMAL AND MODIFIED APRONS.

AIM AND SCOPE

3.AIM AND SCOPE:

The main objectives of our project are:

- To spin compact yarn by simple modification in the drafting system arrangement of existing ring spinning frame.
- To make the arrangement suitable for conversion with the existing frame with minimum cost .
- To spin coarse count (20s carded cotton) and medium count (40s carded cotton) compact yarn and compare yarn properties with conventional rig spun yarn

METHODOLOGY

4.METHODOLOGY:

On the basis of Aim and scope of the project proper condition is maintained for the production of both normal ring spun yarn and compact yarn.

4.1 Machine details:

For the comparative study the spinning frame MEI SUPER RING FRAME in our lab is chosen.

4.2 Count and material:

The following counts and material is chosen for our study.

Counts	20S	40S
TM	3.5	4
TPI	18	24
Roving	hank	U%
20s	0.95	4
40s	1.5	3.8

4.3 Sample size:

Sample size of 10 cops of normal ring spun yarn and compact spun are chosen for testing on both the counts

4.4 DETAILS OF THE MODIFICATION FOR COMPACT YARN SPINNING:

In this work the positive drive to the profile tube apron is omitted and the suction for the compacting zone is connected to the pneumafil suction itself. Nylon ribbon apron is wound over the profile tube

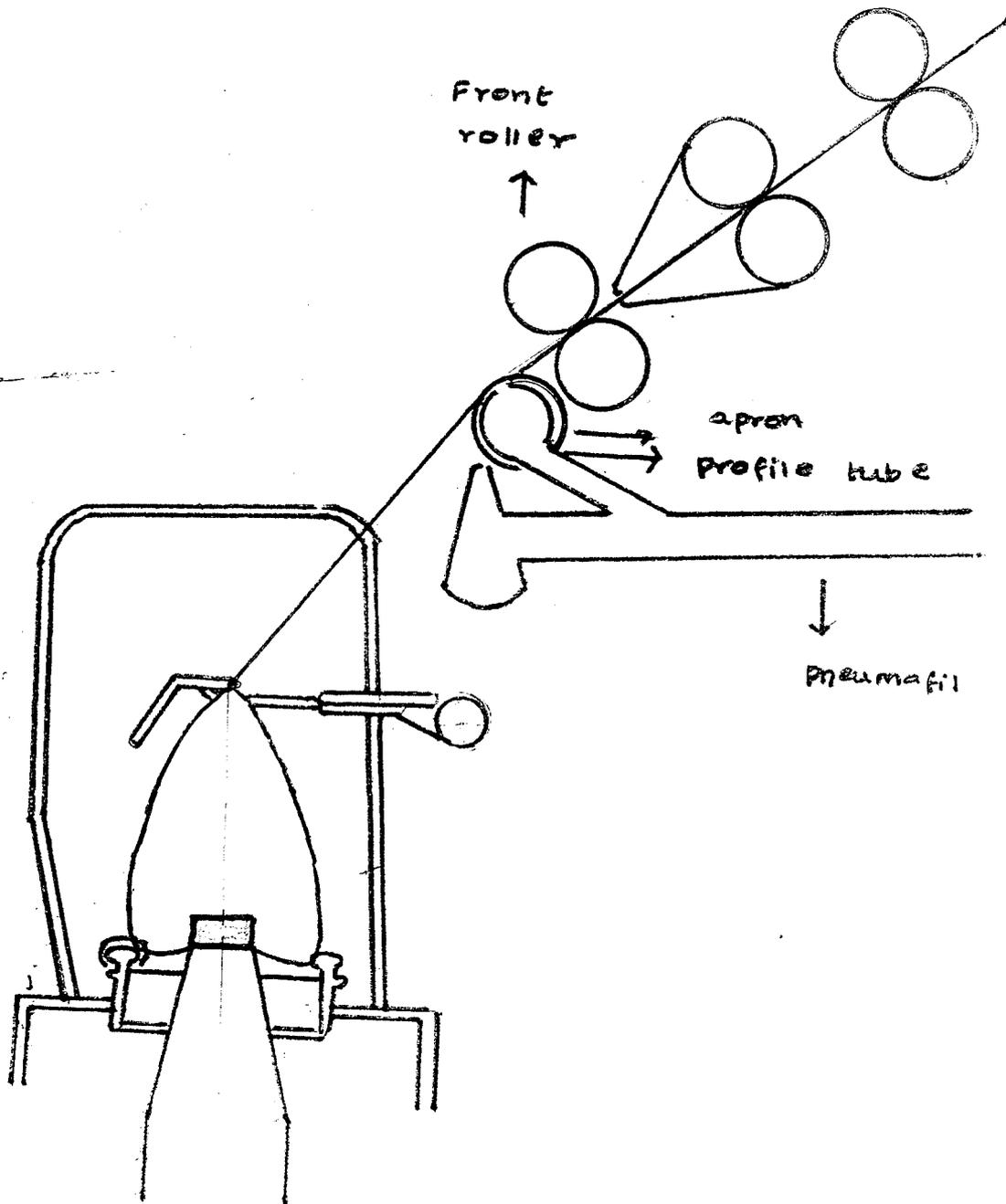
having 3300 pores / sq. inch and the pore size is 0.5 mm. The pneumafil suction pressure is maintained at 12 bar .The slot made in the profile tube is 10mm length and 2mm in width. The slot is made in such a wa to keep the condensing position constant from the front roller.

The profile tube is placed next to the drafting zone as in the suessen Elite spinning .The clamps holding the profile tube is provided with suitable clearance to alter the angle and position of the profile for optimization to create negative nip by visual trials .the profile tube is made of aluminium and nylon hose is used to connect the profile tube to the pneumafil suction.

One suction tube serves for two slots on the profile tube .The pneumafil pipe is placed next to the profile tube and there won't be any disturbance in piecing.

The fibres emerging from the drafting zone are condensed under suction and all the fibres are bound into the yarn structure to get a compact yarn. The spindle speed is kept at 11,600 rpm for both the counts .The normal elliptical flat type traveler which used for ordinary ring spinning is used for compact spinning also.

Since the condensing zone is an extra arrangement accommodated wihin the space availablewe can produce normal ring yarn and compact yarn in a same frame.



4.5 COMPARISON OF YARN QUALITY:

A quality comparison study of yarns covers the following besides the basic characteristics of the yarn quality such as lea strength test and count.

1. Single yarn strength
2. Hairiness test
3. Evenness test

The details about the sample size and equipments used for testing are dealt in the yarn testing section.

TESTING

5. TESTING:

The yarns produced from normal ring spinning and compact spinning are tested for the following characteristics.

Basic characteristics:

1. Lea strength and its C.V.
2. Count and its C.V.

Other characteristics:

1. Single yarn strength – Tensorapid – mean and C.V.
2. Hairiness test – Zweigle G565 – mean for 1,2,3,4,6&8mm length and C.V.
3. U% - Uster tester 4 – mean and C.V.

5.1 Single yarn strength:

The single yarn strength was checked on all the 10 full cops. The single yarn strength was found using the uster tensorapid 3 (6 readings). The mean value, standard deviation, C.V.% and 95% confidence were found for each sample and the overall results were tabulated and analysed. The yarn sample was tested at a standard CRE speed of 5000mm /min

5.2 Hairiness zweigle G 565:

The hairiness was tested in each sample of 10 cops in a Zweigle G 565. The mean value, standard deviation, C.V. value and 95% confidence limit were taken and tabulated and analysed (10 readings). Hair length of 1,2,3,4,6&8mm were counted.

5.3 Lea strength tester:

The lea CSP was tested on lea strength tester working on CRT principle . Mean strength and its C.V. were found for each group of sample for 30 readings and the results are tabulated and analysed.

5.4 Yarn evenness (Uster tester 4):

Yarn unevenness was tested using USTER TESTER 4. A testing speed of 400 m /min was employed and time taken is 2.5 min (5 readings). Test was conducted on each sample and results are tabulated.

RESULTS AND DISCUSSION

6.RESULT AND DISCUSSION:

Result of compact yarn characteristics tested as per the details given in Testing section are given in enclosed tables at the end of this discussions.

Table 1,3,5,7 gives the comparison results of evenness, hairiness and single yarn strength for 40s compact yarn & normal ring yarn

For 40s k compact yarn CV% of strength is less by 6% in comparison to ring spun yarn.

The yarn elongation increases by 10% in medium count for compact yarn when compared with the ring yarn.

For 40s compact yarn, hairiness is reduced by 17%, when compared to the ring spun yarn. U% decreases by about 1.5% and 2% increase in strength and Rkm for 40s compact yarn when compared with ring spun yarn.

There is no significant change in the U% for the coarser count.

Table 2,4,6 shows the testing results for the 20s yarn. There is an increase of 3.5% in strength and Rkm whereas elongation increases by 3%.

There is an reduction of 8% in hairiness

The trial indicated that this simple modification with negative nip has infact given similar improvements in yarn characteristics that has been achieved with positive nip by various famous manufacturers, but it needs to be validated through large scale trials. This simple arrangement can be used as a conversion kit for the existing ring frame to make compact yarn & it is going to be costless. So with less investment spinning mills can think of making compact yarn.

Sample particulars:	40s compact	40s ring spun
Single yarn tenacity:		
Actual strength	188.5	185.2
CV% of strength	15.91	16.92
% Elongation	5.43	4.85
CV% of Elongation	13.69	15.71
Rkm (g/tex)	12.77	12.54
U% Imperfection:		
Mean U%	18.28	18.54
Mean CV%	23.66	24.06
Hairiness:		
No. of hairs above 3mm	1312	1583
Sample particulars:	20s compact	20s ring spun
Single yarn tenacity:		
Actual strength	462.1	445.0
CV% of strength	12.58	13.02
% Elongation	6.63	6.21
CV% of elongation	8.83	8.9
Rkm (g/tex)	15.63	15.07
U% Imperfection :		
Mean U%	13.08	13.28
Mean CV%	16.58	16.79
Hairiness:		
No of hairs above 3mm	1464	1520

Evenness test results :

Table 1:

Nr	U%		CVm	
	40s compact	40s ring spun	40s compact	40s ring spun
Mean	18.28	18.54	23.66	24.06
CV	8.8	8.2	8.8	8.3
Q95	1.99	1.88	2.6	2.49
Max	20.54	20.01	24.84	25.95
Min	16.75	16.65	21.66	21.57

Table 2:

Nr	U%		CVm	
	20s compact	20s ring spun	20s compact	20s ring spun
Mean	13.08	13.28	15.96	16.58
CV	16.58	16.79	6.4	6.9
Q95	0.69	0.82	1.05	1.07
Max	13.53	14.79	17.68	18.72
Min	11.72	12.13	14.88	15.30

Single yarn strength test results:

Table 3:

	B- Force (gf)		Elongation (%)		Rkm (kgf*Nm)	
	40s compact	40s Ring spun	40s compact	40s Ring spun	40s compact	40s Ring spun
Mean	188.5	185.2	5.43	4.85	12.77	12.54
S +/-	30	3.3	.74	.76	2.12	2.03
Q95 +/-	4.1	4.3	0.10	0.11	0.29	0.28
Min	75.8	99.7	2.56	2.17	6.75	5.13
Max	254.4	265.9	6.79	6.58	17.3	18.01
CV%	15.91	16.92	13.69	15.71	15.91	16.92

Table 4:

	B- Force (gf)		Elongation (%)		Rkm(kgf*Nm)	
	20s compact	20s Ring spun	20s compact	20s Ring spun	20s compact	20s Ring spun
Mean	462.1	445.0	6.63	6.21	15.65	15.07
S +/-	58.1	56.95	0.59	0.57	16.63	15.07
CV%	12.58	13.02	8.06	8.83	12.58	12.83
Q95% +/-	8.1	10.3	0.08	0.09	0.27	0.35
Min	308.5	310.8	4.72	4.89	10.45	10.89
Max	467	478	8.17	8.9	21.91	22.09

Hairiness test results:

Table 5:

	S-3 value		Index	
	40s compact	40sRing spun	40s compact	40s ring spun
Men	1312	1583	159	190
S.D.	207,25	138,57	36,48	46,50
CV	15,80	8,75	23,00	24,45
Q95 % +/-	11,31	6,27	16,46	17,50
Max	1561	1429	96	133
Min	1002	1875	201	288
F value	61,73	20,13	21,68	11,19

Total statistics: No. of hairs in length zone

Table 6:

	1mm		2mm	
	40s Ring spun	40s compact	40s Ring spun	40s compact
Mean	14580	14151	2929	2590
S.D.	1081,57	527,89	204,41	171,91
CV	7,42	3,73	6,98	6,64
Q95% +/-	5,31	2,67	20,21	4,75
Min	12697	13465	62	2361
Max	16022	15056	150	2920
F value	49,85	6,36	10,82	1,44

Table 7	3mm		4mm	
	40s ring spun	40s compact	40s ring spun	40s compact
Mean	954	798	506	413
S.D.	66,90	104,89	53,73	83,22
CV	7,01	13,14	10,61	20,13
Q95% +/-	5,02	9,40	7,59	14,41
Min	881	659	441	274
Max	1091	941	592	507
F value	5,60	25,82	11,58	69,70

Table 8:

	6mm		8mm	
	40s ring spun	40s compact	40s ring spun	40s compact
Mean	94	77	25	20
S.D.	26,59	19,57	9,39	6,64
CV	28,23	25,29	37,40	33,37
Q95% +/-	20,21	18,10	26,77	23,89
Min	62	44	13	10
Max	150	101	41	32
F value	10,82	24,72	40,93	7,38

Table 9:

	10mm		12mm	
	40s ring spun	40s compact	40s ring spun	40s compact
Mean	2	3	0	0
S.D.	2,07	1,64	0,48	0,32
CV	86,07	0,61	161,02	316,23
Q95+/-	61,61	43,38	115,26	226,36
Min	0	0	0	0
Max	7	5	1	1
F value	0,30	0,69	4,00	1,00

Table 10:

	1mm		2mm	
	20s ring spun	20s compact	20s ring spun	20s compact
Mean	15915	14855	3112	2906
S.D.	1093,26	1023,16	352,16	343,13
CV value	7,78	6,89	13,90	11,81
Q95% +/-	5,97	4,93	9,54	8,45
Min	14326	13821	2845	2597
Max	15482	16527	3574	3383
F value	23,60	21,67	70,14	67,12

Table 11:

	3mm		4mm	
	20s ring spun	20s compact	20s ring spun	20s compact
Mean	1102	923	461	456
S.D.	176,67	162,61	143,96	123,85
Cv value	18,60	17,62	30,17	27,16
Q95% +/-	15,70	12,61	20,49	19,44
Min	766	746	351	321
Max	1264	1164	630	659
F value	73,05	72,02	12,20	13,19

Table 12:

	6mm		8mm	
	20s ring spun	20s compact	20s ring spun	20s compact
Mean	79	68	18	15
S.D.	35,06	31,04	12,10	11,07
CV value	51,69	45,64	84,42	71,41
Q 95% +/-	33,74	32,67	54,13	51,11
Min	32	28	5	4
Max	141	121	51	41
F value	6,54	7,61	5,70	3,65

Table 13:

	10mm		12mm	
	20s ring spun	20s compact	20s ring spun	20s compact
Mean	4	2	1	0
S.D.	2,98	1,93	1,34	0,32
CV value	110,39	107,34	326,25	316,23
Q95% +/-	82,90	76,84	220,36	226,36
Min	0	0	3	0
Max	7	6	4	1
F value	2,105	1,98	2,14	1,00

Table 14:

	s-3 value		index	
	20s ring spun	20s compact	20s ring spun	20s compact
Mean	1520	1464	162	142
S.D.	342,101	321,99	60,101	57,84
F value	22,110	21,99	50,65	40,70
Q95% +/-	16,73	15,74	34,16	29,14
Min	1130	1112	70	65
Max	1109	1919	248	239
F value	58,60	55,50	7,95	8,90

Lea strength results:

Table 15:

Count	Mean lea strength (lbs)		CSP	
	Ring spun	Compact	Ring spun	Compact
40s	52	55	2080	2200
20s	102	106	2040	2120

CONCLUSION

7.CONCLUSION:

From the study and subsequent analysis of results, following conclusion are drawn.

- Hairiness is reduced by 17% for medium counts and 8% reduction in hairiness for coarser counts.
- There is some increase in strength of about 3% for medium and 2% for coarser counts.
- The evenness improvement is marginal and not significant with medium and coarse counts
- The trial indicated that this simple modification with negative nip has infact given similar improvements in yarn characteristics that has been achieved with positive nip by various famous manufacturers, but it needs to be validated through large scale trials. This simple arrangement can be used as a conversion kit for the existing ring frame to make compact yarn & it is going to be costless. So with less investment spinning mills can think of making compact yarn.

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