A STUDY OF DOUBLED YARN FABRIC PRODUCED FROM RING AND ROTOR YARN

PROJECT REPORT

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G.RAMESH

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BONAFIDE CERTIFICATE

Certified that this project report "**A STUDY OF DOUBLED YARN FABRIC PRODUCED FROM RING AND ROTOR YARN**" is the bonafide work of G.RAMESH who carried out this project work under my supervision during the year 2010 - 2011.

SIGNATURE

Dr.K.Thangamani
PROFESSOR AND HEAD
Department of Textile Technology
Kumaraguru College of Technology
Coimbatore - 641 049.

SIGNATURE

P. CHANDRASEKARAN
SUPERVISOR
ASSISTANT PROFESSOR
Department of Textile Technology
Kumaraguru College of Technology
Coimbatore - 641 049.

Submitted for the Project Viva – Voce Examination held on 26.04.2011

Internal Examiner

External Examiner 26/04/11

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ABSTRACT

ABSTRACT

In this new millennium fabric manufacture require enormous steps to control the cost of production. Cost of production in the sense, cost of raw material, manufacturing cost, machinery cost, labour cost and power cost. Among the above said items, raw material cost contributes about 65% of the total cost. In order to control the raw material cost an attempt has been made to study the Influence of Doubled (Ring and Open End) Yarn on Fabric. Normally cloth is made from either Ring Spun Yarn or with Open End Yarn. An attempt has been made to make the Weft Yarn which is a mixture of Ring and Open End Yarn.

INTRODUCTION

CHAPTER 2

INTRODUCTION

The extremely fast growth of textile consumption caused by increasing demand for better clothing and living stimulated both by practical and aesthetic aspects. These are the main factors accelerating generally the development of Textile Industry.

The Introduction of rotor spinning produced a different kind of change which needs very careful consideration. Until the introduction of rotor spinning, it was possible to regard the yarn as relatively simple structure, consisting in model from Serious of concentric helics of fibrous. Rotor spinning produced a very different structure, and in reviewing the present state of art of rotor spinning, it is important that rotor spinner will produce a new kind of yarn, with which we are not familiar.

The advantage of rotor spinning from economic, human and technical point of view may be listed as:

Elimination of roving frame Passage, Elimination of winding process, Possible use of lower quality raw material, Saving in operating personnel, Creation of Cleaner working condition. Provision of yarn packages with longer length of free yarn, Manufacture of end products with novel textile properties, Noisy operations are eliminated, Physiological strain on the operative is less and Considerable saving in floor space.

The present situation is that the yarns are being used in a Variety of end products where their particular qualities are of greater advantages, such as: Clear (i.e. Absence of neps, knots and vegetable material),Low irregularity, Ability to Produce light raised fabrics, Absorption of moisture and dyes.
This has resulted in rotor yarn being used in the following fields; Satins, sateens, poplins, corduroy, rainwear, Denim, drills, sheetings, woven bedsheets, towels, up-holstery, Wincyotters, Crepes, terry towels etc.

This is one of the important factors, when one has choice to select the yarn as per requirement of end product, to know the difference in between their structural properties, because structural properties have major role in end products.

Yarn quality is decisive for the end use, application which, however also affects quality requirements. Yarn spun on rotor spinning has some difference from ordinary ring spun yarn. It has in the first place excellent regularity i.e. uniform yarn appearance. It is widely reported that good intrinsic evenness of rotor yarn is the results of the back doubling action.

The total yarn production is the same for both the open -end spinning and ring spinning systems, The capital cost of Machinery for the existing ring spinning system is assumed to be 50% of the cost of the system with new machinery. The capital cost of the open-end spinning is based on the prices for the indigenously manufactured system. The cost of other achiness has been taken to be the same for both open-end spinning and ring spinning systems except for the inclusion of fly frames and con winding in the case of latter.

LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.1. Yarn spinning

Combining staple fibers into yarns

2.2. Spinning systems

Spinning systems- produce a yarn based on fiber characteristics of fiber

2.3. Cotton system (staples less than 2.5 inches)

Opening, Carding, Picker, Fibers made parallel, oriented Short fibers removed. Blending can take place here. Layer pulled into "SLIVER"

Cotton system

Combing , Drawing, Redrawing. This is an optional step. Only used in making certain cotton yarns. Fibers made more parallel. Short fibers removed. Smoother, superior yarns result. Several card slivers combined for uniformity. Fibers made more parallel Slivers combined for uniformity

Cotton system

Roving (twisting), Spinning. Sliver attenuated (drawn out to finer diameter) and twisted. "ROVING". Roving attenuated and twist inserted.

2.4. Combed/carded yarns

Yarns made with the combing step included are called

Yarns made with the combing step

Combed yarns are of higher quality, and are more expensive than carded yarns.

Combing is not necessary

Combed/Carded Yarns

In a combed polyester/cotton blend yarn, only the cotton portion needs to be combed.

A 50/50 polyester/combed cotton yarn is of higher quality than a 50/50 polyester/cotton yarn.

Combing is necessary for the production of high-count (fine) cotton yarns, like those used in pin point oxford cloth, but is not necessary for low-count cotton yarns, like those used in denim.

2.5. Spinning

Depending upon the direction of rotation of the spindle during yarn manufacture, yarns may have either S-twist (left hand twist) or Z-twist (right hand twist).

Single yarns, either combed or carded, may be combined by twisting two or more together, to produced plied yarns. The ply twist is usually opposite the yarn twist.

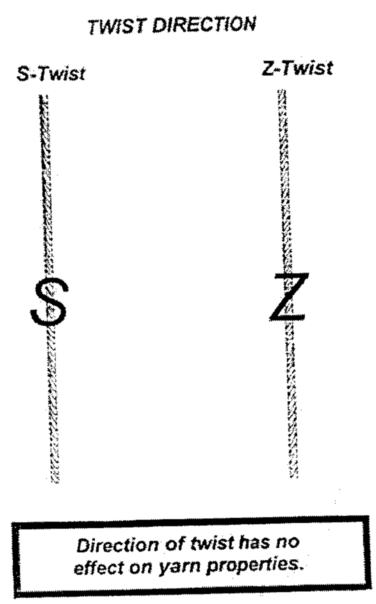


Fig:2.1 Twist Direction

2.6. OPEN END SPINNING

2.6. Open-end spinning

Also called break spinning, this process produces yarns at least 3X faster than ring spinning, depending upon the fineness of the yarn.

Carded

Omits roving formation

Compared to an equivalent size ring-spun yarn, open-end spun yarn is weaker but more uniform. The yarn has a smooth even surface. Bulkier, rougher, more absorbent, more uniform in strength, less likely to pill.

Only low and medium-count yarns can be made by this process.

2.7. Cotton system yarns

2.7.1. Examples of cotton system yarns:

100% Cotton, for denim

100% Combed Cotton, for Blouses

65% Polyester/35% Cotton, for Slacks

50% Polyester/50% Combed Cotton for Shirts

50% Polyester/50% Rayon, for Shirts

70% Polyester/30% Acrylic, for Knits

2.7.2. Examples of woolen system yarns:

Examples of Worsted System Yarns:

100% Wool, for Suits

55% Polyester/45% Wool, for Suits

65% Polyester/20% Rayon/15% Acrylic, for Slacks

100% Nylon, for Carpet

100% Polyester, for Carpet

2.8. Mixture of yarn

2.8.1. Fiber blends in yarns

Blend-

Different fibers are present in the same yarn in planned proportions

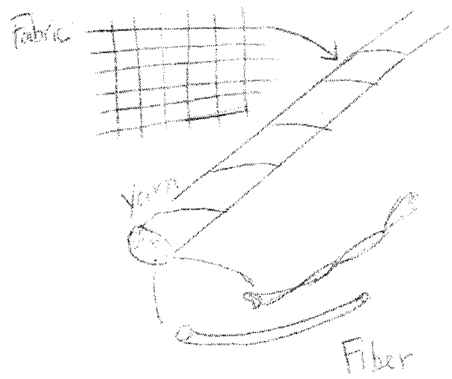


Fig: 2.2. FIBER BLENDS IN YARNS

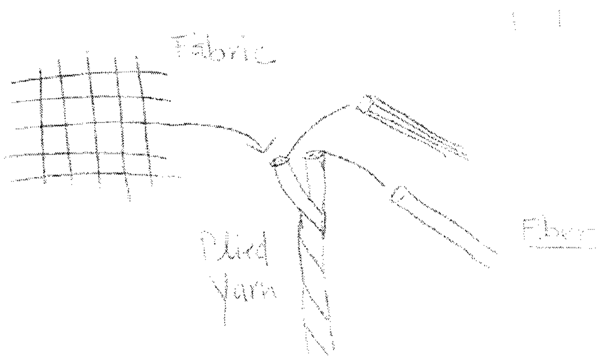


Fig: 2.3. PLIED YARN IN YARNS

Mixture

Mixture- yarns (warp of one type, fill of another)

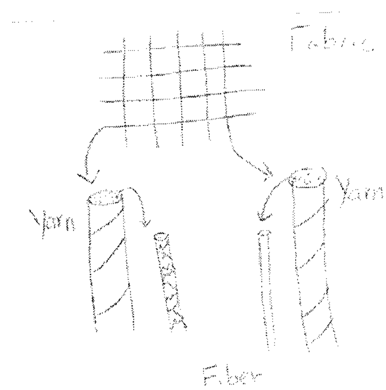


Fig: 2.4 .COMBINATIONS

2.9. Why blend fibers

Fabrics have a better combination of performance characteristics-

Improve spinning, weaving, finishing, uniformity

To obtain better fabric appearance- rabbit hair for certain appearance

To minimize fiber cost-

To obtain unique color effects-

2.10. Compound and fancy yarns

Complex Yarns

(Novelty Yarns, Fancy Yarns)

Complex yarns are used to provide visual interest and surface texture to a fabric. Only 5 to 10% of all yarns manufactured fall into this category.

Complex yarns are Plied complex yarns usually include an effect yarn (E), a core yarn (C), and sometimes a binder yarn (B).

Named

Plied, but seldom add strength to fabric. If used in only one direction they are used in the fill. Usually the smaller the novelty effect the more durable the fabric (less effected by abrasion, less snagging)

Tweed

Flecks of short colored fibers twisted into the yarn, often wool WHY?

Slub- single, spun, fancy yarns, varying yarn diameters along their length; these are usually singles.

True slub- twist varied at regular intervals (thicker less twist)

Elongated tufts of fiber into yarn at regular intervals with a core or binder yarn

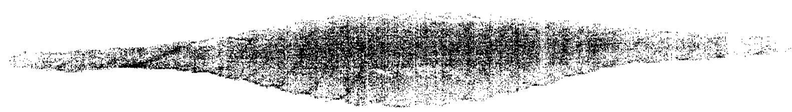


Fig:2.5. Compound and Fancy Yarns

2.11. Types of complex yarns

Thick and thin

Chenille – Resembles a caterpillar in appearance.

Flock or flake, fleck

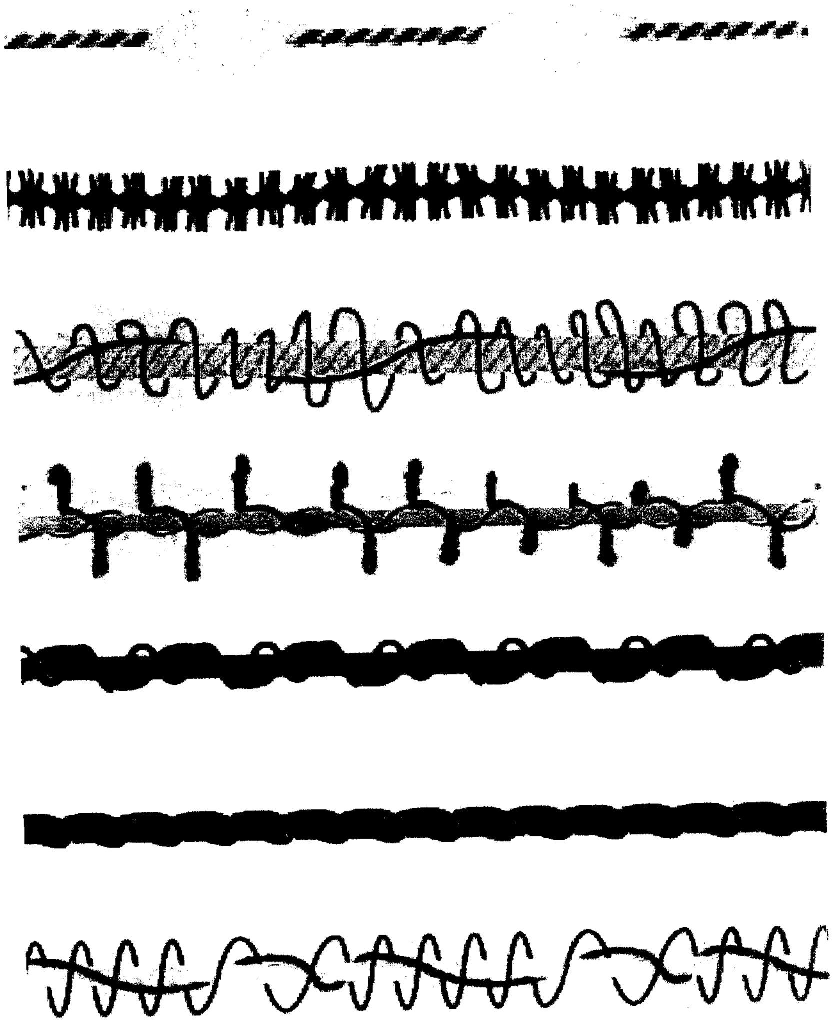


Fig: 2.6 Complex Yarns

Types of complex yarns

Spiral and Corkscrew –

Gimp and Ratiné – E and C are plied around each other; E is larger than in ratiné than for gimp, effect ply is twisted around ground. At intervals the effect yarn kinks out and back on itself.

Crepe highly twisted simple yarn

Bouclé, loop, and snarl

2.11.1. Compound or compositey arns

Regular in appearance along length

Covered Yarns: central yarn that is completely covered Core wrapped with 1 or more yarns

Core Spun Yarns:

Core wrapped with fiber

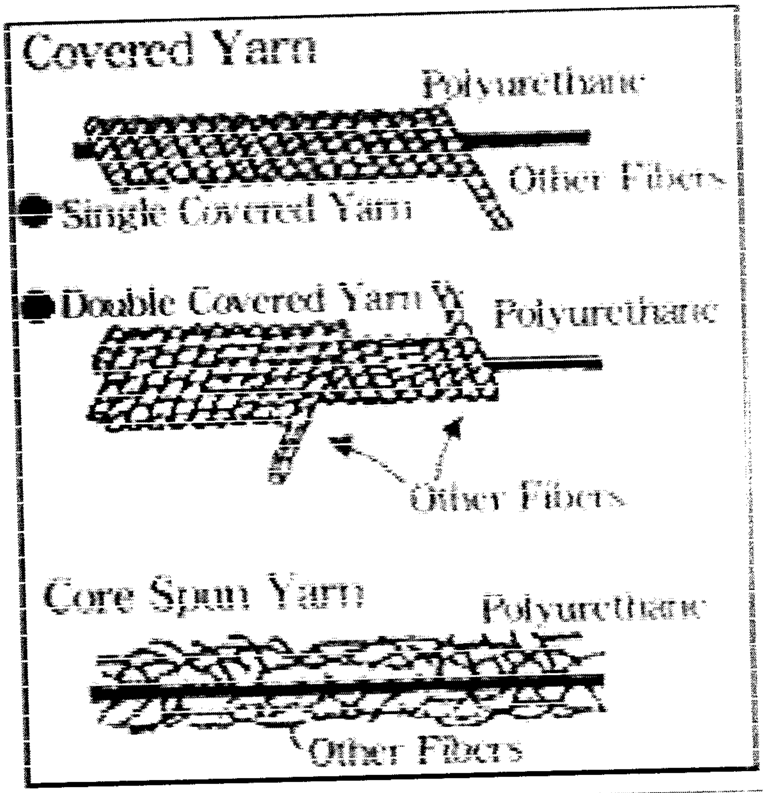


Fig: 2.7 Covered Yarns

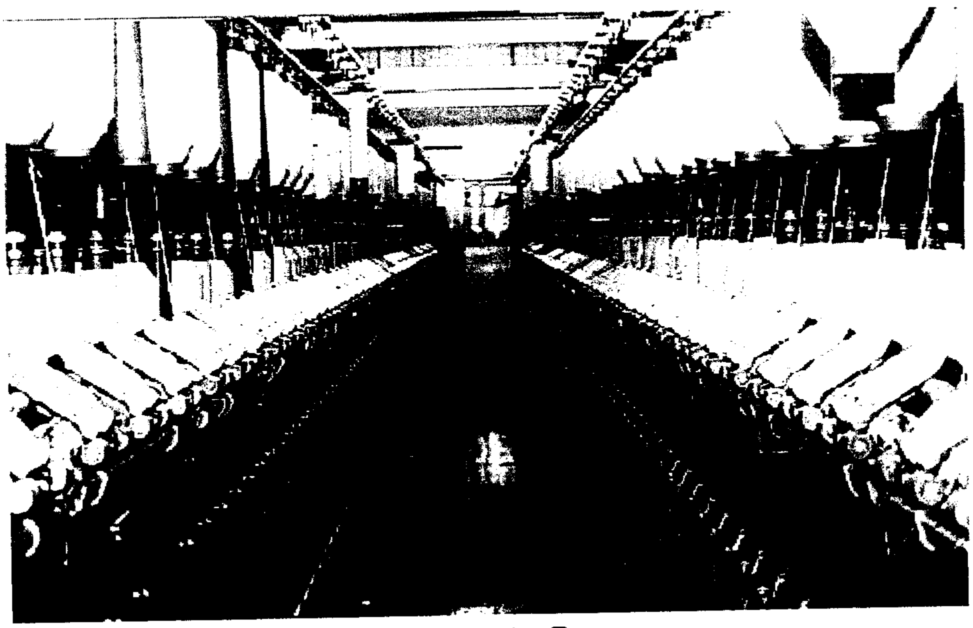
2.12. Types of spinning

2.12.1 Open end

The principal behind open-end spinning is similar to that of a clothes dryer spinning full of sheets. If you could open the door and pull out a bed sheet, it would spin together as you pulled it out. Sliver from the card goes into the rotor, is spun around into yarn and comes out, wrapped up on a package, all ready to go to the next step. This system is much faster than ring spinning with rotor speeds up to 140,000 rpm, and less labor intensive.

The disadvantage is mainly that the open end is limited to coarse counts, cloth made from open-end yarn having a 'fuzzier' feel and poorer wear resistance.

Combed yarns would not be used in open-end spinning, and generally you can feel the coarseness of the yarns that have been spun open end. This type of spinning is always used in lower priced towels.



Typical Spinning Frames

Fig: 2.8 Typical Spinning Frames

2.12.2 Ring spinning

On each side of the frame are the spindles, above them are the draughting (drafting) rollers and on top is a creel loaded with bobbins of roving. The roving (un spun thread) passed downward from the bobbins to the draughting rollers. Here the back roller steadied the incoming thread, while the front roller, which was moving much faster, pulled thread out (attenuated) forcing the fibres to mesh together. The rollers are individually adjustable, originally by mean of levers and weights. The attenuated roving now passes through a thread guide that is adjusted to be exactly above the spindle. Thread guides are on a thread rail, which allows them to be hinged out of the way for doffing or piecing a broken thread. The attenuated roving passes down to the spindle assembly, where it is threaded though a small ring called the traveler. It is this that gives the ring frame its name. From here it is attached to the existing thread on the spindle.

Like the hour and minute hands on a mechanical clock, the traveler, and the spindle share the same axis but travel at different speeds. The spindle travels faster. The bobbin is fixed on the spindle. In a ring frames, the different speed was achieved by drag caused by air resistance and friction. The spindles rotate at 7000 to 8000 rpm, this spins the yarn. The traveler winds the yarn on the bobbin. The ring on the traveler is fixed on a lifting ring rail that guides the thread onto the bobbin in the shape required: i.e. a cop. The lifting must be adjusted for different cotton counts.

Fig: 2.9 Ring Spinning

Ring-spun yarn is a superior cotton yarn that results in a softer, more durable fabric than open-end yarn. The process of ring spinning requires two more processing steps than open-end yarn production and ring-spun yarn takes five times longer to produce. The additional steps involve continuously twisting and narrowing the rope of cotton fibers. This continuous fiber "helix" or twist gives ring-spun yarn extra softness and strength. The resulting towels will feel softer wash after wash.

2.13. Compact spinning

Compact or Condensed Spinning minimizes width and height of the spinning triangle associated with ring spinning. Introduction of this technology began in late 1990s.

In compact spinning, the spinning triangle associated with conventional ring spinning is eliminated by air pressure compaction. This happens by suction and compaction on a perforated revolving drum/ apron in the front zone of the drafting system.

The process is characterized by the introduction of a fourth nip point down stream of the exit from the conventional 3/3 drafting system, which acts as an aerodynamic condenser.

The aerodynamics consideration of the fibers through suction results in narrower spinning zone with individual fibers more effectively bound into the yarn assembly. This offered the potential to create a near perfect yarn structure by applying air suction to condense the fiber stream in the main drafting zone, therefore virtually eliminating the spinning triangle.

The spinning triangle is a weak zone due to less twist in this region. Under normal working conditions most of the breaks occur in the vicinity of the spinning triangle. The strength of the fibrous mass in the spinning triangle determines the attainable spindle speed. Hence, if the spinning triangle is avoided or its length reduced, the achievable spindle speed could be increased

These Compact Spinning systems offer the possibility of using cotton with short staple lengths to produce high quality yarns that use to required long or extra long staple cottons.

Compact spinning technology has potential for improving both the quality and profitability aspects of cotton yarn manufacturing, depending on the objectives of the textile manufacture, different approaches are available. One approach could be to reduce the cost of the raw fiber while maintaining quality. Another could be reducing the twist while using the same raw fiber. Yet another is to eliminate some or all of combing while still producing acceptable yarn quality.

Let me make this statement, compact Spinning is usually used for economical reasons. Compact Spinning will allow the factory to make a better yarn from lesser quality cotton.

Thus improving the quality of the towel made from lesser quality cotton. It will not give you the same quality as combed yarns.

2.14. Twist

The direction in which the yarn is spun is called twist. Yarns are characterized as S-twist or Z-twist according to the direction of spinning. Tightness of twist is measured in TPI (twists per inch or turns per inch). Two or more spun yarns may be twisted together or plied to form a thicker yarn. Generally, spinning of single plies are spun with a Z-twist, and plying is done with an S-twist. More on this later.

"Twist" in spun yarns is often labeled S-twist or S-laid (for left-handed twist) and Z-twist or Z-laid (for right-handed twist), due to the respective left and right of the central sections of those two letters. To visually determine the handedness of the twist of a yarn, sight down a length of it; the direction of the twists as they progress away from you, left or right, reveals their handedness."

S and Z Twist

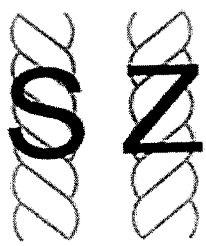


Fig: 2.10 S and Z Twist

The twist is inserted to the staple yarn to hold the constituent fibres together, thus giving enough strength to the yarn, and also producing a continuous length of yarn. The twist in the yarn has a three-fold effect; first, the twist increases cohesion between the fibres by increasing the lateral pressure in the yarn, thus giving enough strength to the yarn. Second, twist increases the helical angle of fibres and maximizes fibre strength to the yarn. Due to the above effects, as the twist increases, the yarn strength increases up to a certain level, beyond which the increase in twist actually decreases the strength of staple yarn. The continuous filament yarn also requires a small amount of twist in order to avoid the fraying of filaments and to increase abrasion resistance. Yarn is often ply-twisted in a direction opposite to a single yarn twist to improve evenness, strength, elongation, bulkiness, luster and abrasion resistance, and to reduce twist liveliness, hairiness and variation in strength. Third, we need to have the strength and evenness in order to run the yarn through the weaving machine.

All these operations take place continuously in a relative order during the spinning process. The product of ring spinning is the yarn of given count, twist type (S or Z), draft and (TPI) Twists per Inch.

2.15. Single ply or double ply

First, let's talk about structure and define our terms. A singles is, well, a single strand of yarn. At its most technical, some define it as being a yarn which is twisted in only a single direction, so you can technically have yarn composed of multiple strands, but if there's only one direction of twist it's still a singles.

Plied yarn is one where multiple strands of yarn, each yarn already spun, are put together and twisted in the opposite direction from that in which they were first twisted. A 2-ply yarn has two strands; a 3-ply yarn has three. There are lots and lots of other plying structures, but those are the major ones you will see in towels, singles, 2-ply, and 3-ply. Any time you ply your yarn, you're making it stronger. This is because twist adds strength; multiple directions of twist add even more strength. You're also tucking some of the surface of the yarn inside, away from the elements and wear and tear. Plied yarns will always be stronger and sturdier than singles yarns.

Plying can also even out unevenness in your singles — whether we're talking about varying amounts of twist throughout your yarn, or getting a little thick and thin, sometimes called slubs. Plying regularizes your yarn, and also changes how the yarn behaves, how it feels, and how finished fabrics made from it behave and feel. In general, a 2-ply yarn will have a somewhat nubbly texture — the two strands twist around each other and there are little bumps

You will hear about all kinds of different action that the towel mill can do to the yarns in the spinning process.

Regular (if a term could be so described) yarns are twisted to give strength and to allow the looms to weave the towel. But in recent years we have developed other types of twist that will give the yarns more softness and make them more absorbent. De twisting the yarn will open the cotton fibers so that they can trap air and moisture between them, this will increase softness and absorbency. It also will all air to reach the deep inner parts of the yarn and will decrease the time a towel will take to dry after use or after washing. These types of towels are now called various names.

- Zero Twist
- Low twist
- Quick Dry
- Micro Cotton

The first basic difference between low-twist, zero twist and ringspun cotton is the fibers used to construct both. While ringspun towels use a combination of long and short staple cotton fiber, low-twist and zero twist must be constructed only from longer staple cotton yarn.

Zero twist must actually be twisted into a yarn and they detwisted and wound with Poly Vinyl Alcohol (PVA) yarn to keep the cotton intact so that it can be woven. The PVA dissolves during dyeing, leaving the extremely low-twist cotton behind. Actually the term zero twist is incorrect, it really has a very low twist.

Low twist yarns can be made similar to the above process or by wrapped with a very fine yarn either 80s single or 90s singles so that the yarns can be woven. Low twist yarns have a slightly higher twist per inch than zero twist.

Twisted cotton yarn towels, which have been the norm for decades in the United States, are usually thinner (lower weight) and rougher when compared to low-twist, which has a much better hand and is noticeably fluffier. Twisted yarns does not pill or shed an excessive amount of lint as compared to Zero twist or low twist. Manufacturers and suppliers of low-twist towels also maintain they are more absorbent than ringspun towels. This seems to be true.

Just to get ahead of ourselves, let us talk briefly about weight, since a Zero Twist or Low Twist towel has cotton in the loops that are of lower twist, the pile yarns are more open and thus they are fluffier. This means they are bulkier than regular twisted towels. This means that when folded on the shelf in a store they will appear to be thicker and plusher. Both good qualities, but the retailer and the manufacture know this as well, so a Zero Twist towel will be lighter in total weight and in GSM (Grams Per Square Meter, we will discuss this later) than a regular twist towel. Actually the norm is that a Zero Twist will be about 30% lighter that a regular twist and still look the same in terms of bulkiness on the shelve in the stores. This is good for two reasons, one, the cost of a Zero Twist or Low twist is higher because of the better cotton requirements and the extra steps in manufacturing so the lower weight will help offset the additional cost. Second, it is actually environmentally better because since there is less cotton, less cotton is being used from our environment and, as the towels will dry faster in your automatic dryer. Thus saving energy.

The only disadvantage to Zero Twist and to a smaller extent to Low twist is the linting issue. Put a Zero Twist in your dryer at home and at the end of the cycle pull out the lent filter. You will be surprised at all of the cotton fibersl stuck to the filter. Makes sense, if the cotton fibers are not tightly twisted together, they are not holding each other together and therefore will come out of the towel during wash and drying. Thus a Zero Twist and again to a lesser extent low twist towel will not last as long nor have the strength of a regular twisted towel. We gave up the strength for softness and bulk.

Now of course the retailers test a large majority of the towels that they buy and offer to the consumer. They found this out, yet they know you still wanted the softness and the bulk of these towels. So the factories figured out how to put an enzyme treatment in the wash process of the towels that will help the cotton fibers stick together. It really works and most all Zero Twist are treated this way to give you a much better product.

Don't let this small problem turn you off to Zero Twist or Low twist (which we discussed can be made without PVA) products. They certainly are usually much softer than regular twisted yarn towels, they feel like a chamois and seem to wick the moisture right off your skin. They are luxurious in feel and appearance. Most people really love these types of towel and once they try it will never go back to a regular twisted towel.

You can however find regular twisted towel in the market that are very close to the softness of Low twist or Zero twist. That is because the factory used very high quality yarns made with very high quality cotton to make the yarns. It would also be that the softness came form the use of very fine yarns to make the towel. Most regular twisted towel would use 16 singles and the loop yarn, if you were to use 20 singles the yarn would be finer and thus would feel softer

METHODOLOGY

CHAPTER 3

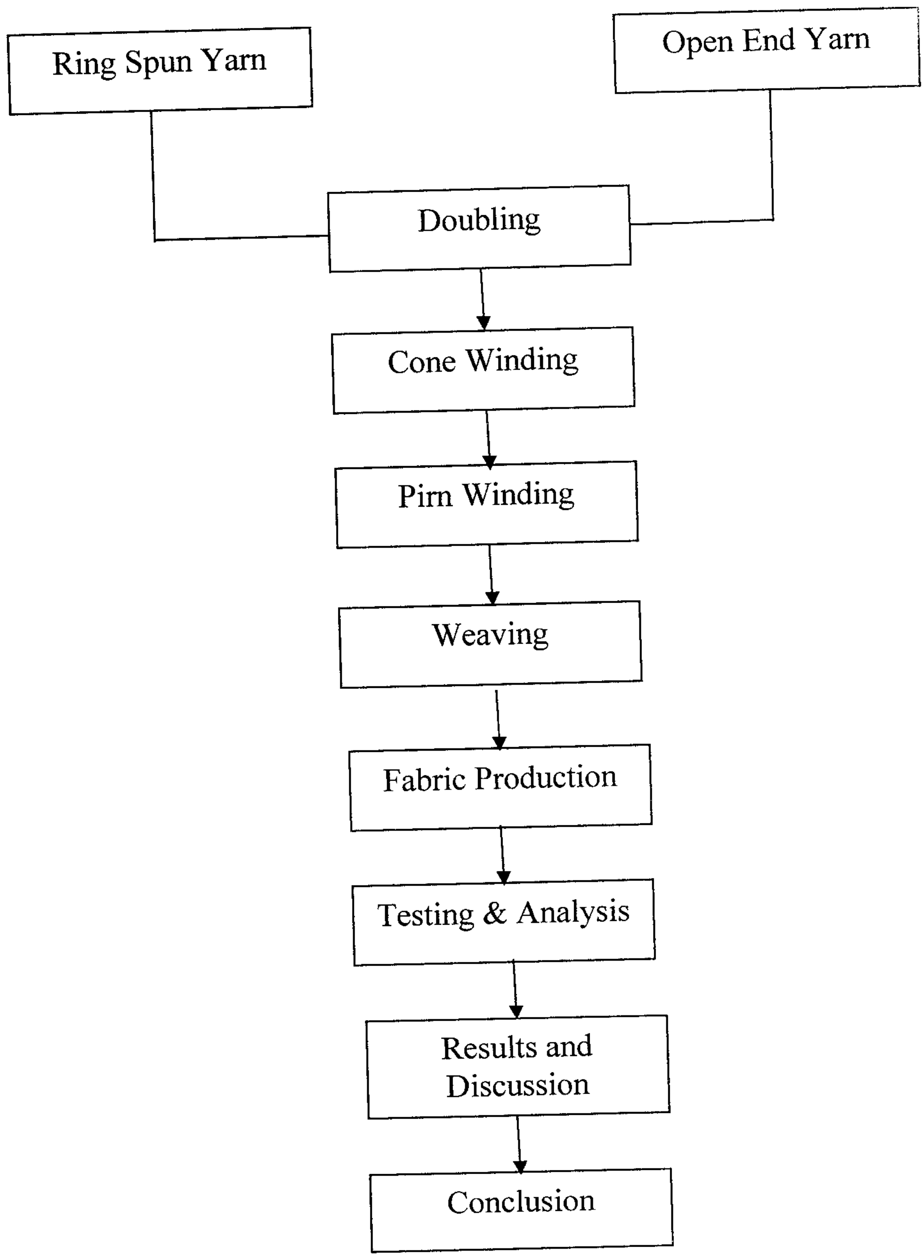
METHODOLOGY

3.1 Yarn Count : Warp – $2/20^s$ Ring Yarn

Weft – $2/20^S$

3.2 Fabric Weave : Plain

3.3 Process Flow Chart



Procedure :

Three fabrics are woven with three different weft yarns.

1. Sample No 1 : Warp ($2/20^s$) Ring Yarn – Weft ($2/20^s$) Ring Yarn
2. Sample No 2 : Warp ($2/20^s$) Ring Yarn – Weft ($2/20^s$) Ring & Open End Yarn
3. Sample No 3 : Warp ($2/20^s$) Ring Yarn – Weft ($2/20^s$) Open End Yarn

The above three samples were woven in CIMMCO POWER LOOM in Karur. The following test will be carried out in the above three samples.

1. Tensile Strength
2. Water Vapour Permeability
3. Abrasion Resistance
4. Pilling
5. Air Permeability
6. Drape Coefficient
7. Tearing Strength.

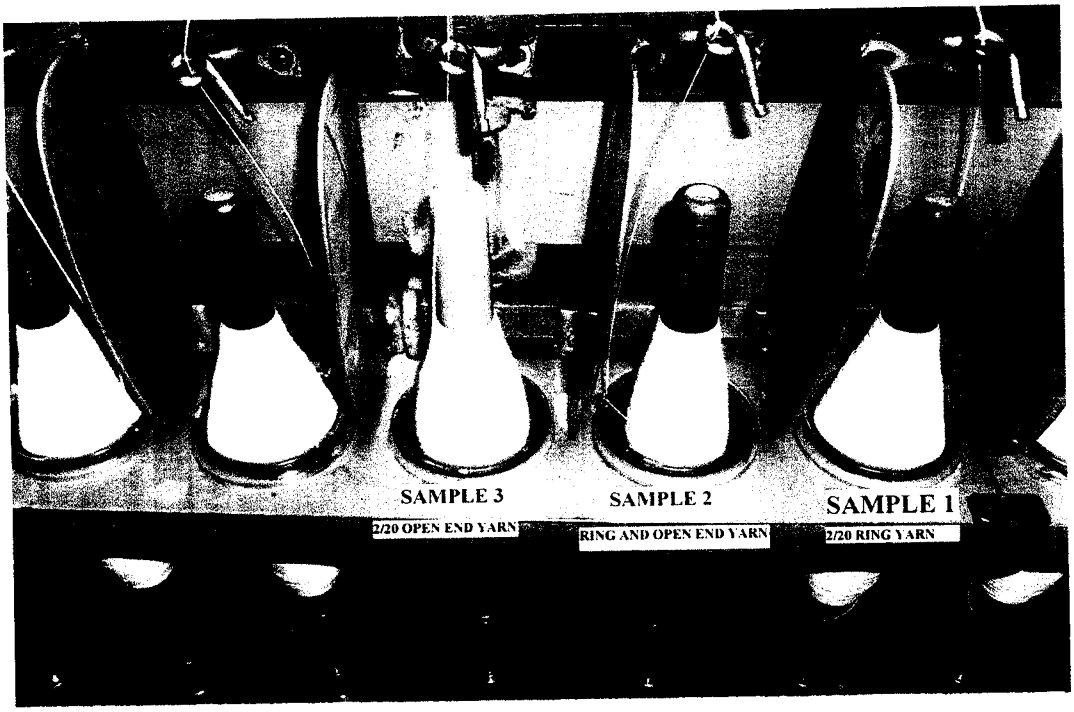


Fig No 3.1 Samples at doubling machine

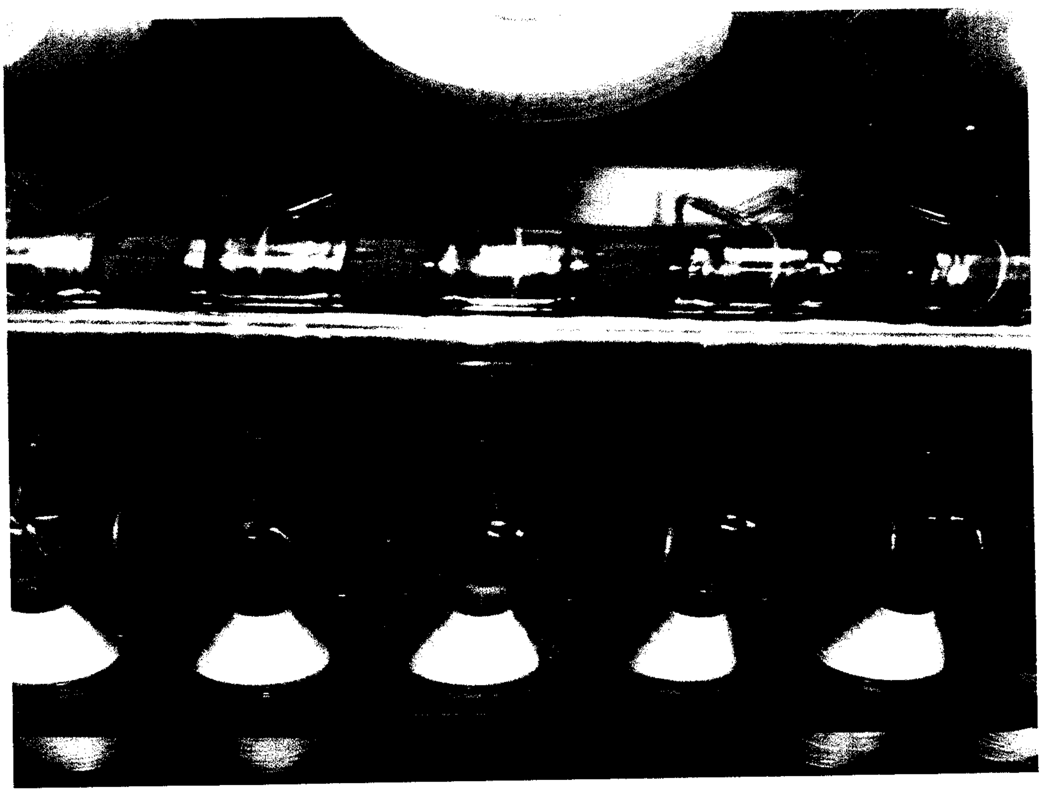


Fig No. 3.2 Samples at Full cop stage in doubling machine

CHAPTER 4

RESULTS AND DISCUSSION

Table 4.1 Test results of fabric

S.No	Test Parameters	Sample No 1 Ring + Ring Yarn (Doubled ring Yarn as weft)	Sample No 2 Ring + Open end yarn (Doubled ring and Open End Yarn as weft)	Sample No 3 Open End + Open End (Doubled Open end yarn as weft)
1.	Tensile strength Tenacity (gf/Tex)	1238.19	1141.0	1041.45
2.	Water Vapour permeability (g/m^2 /day)	~~3038.08~~ 2794	2882.85	~~2794.15~~ 3038.
3.	Abrasion resistance (%)	96.55	98.20	97.81
4.	Pilling – (grade)	4	4^{H}	3^{H}
5.	Air Permeability (cc/sec/cm)	11.31	10.91	10.62
6.	Drape Coefficent	78.2	77.4	74.6
7.	Tearing Strength (lbs/ inch)	104.8	102.2	100.4

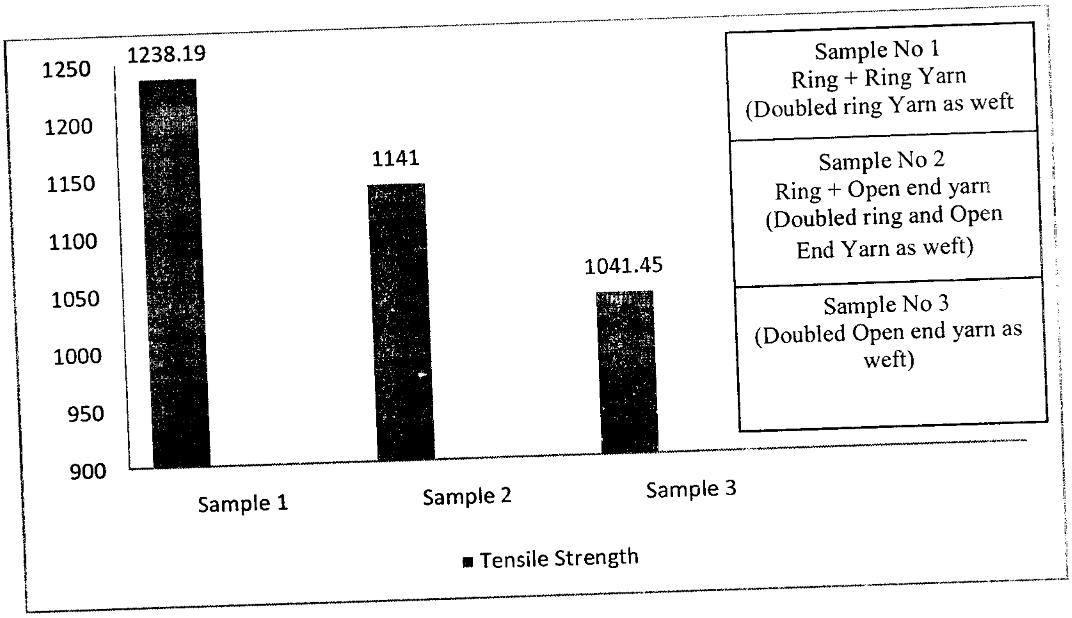


Fig No: 4.1 Comparison of Tensile Strength

Discussion on Tensile strength:

1) Doubled ring spun yarn (Ring + Ring Yarn Sample 1) which was used as weft is having high tensile strength due to the fibres in a rotor-spun yarn are less parallel than those in a ring spun yarn. The core twist structure and the lower degree of parallelism are thw cause of the lower strength of rotor-spun yarn.

2) Doubled Ring and open end yarn (Ring + Open End Yarn, Sample 2) which was used as weft is having Equivalent Tensile Strength over the sample 1 due to the presence of combined fibre characteristics.

3) Due to less number of Spiral fibres in the cross section the doubled open end yarn (Open end + Open end, Sample 3) is having less Tensile strength due to the structure of rotor yarn is differ from the ring yarn in the pronounced variation over the yarn length of the helix angle of the outer layer.

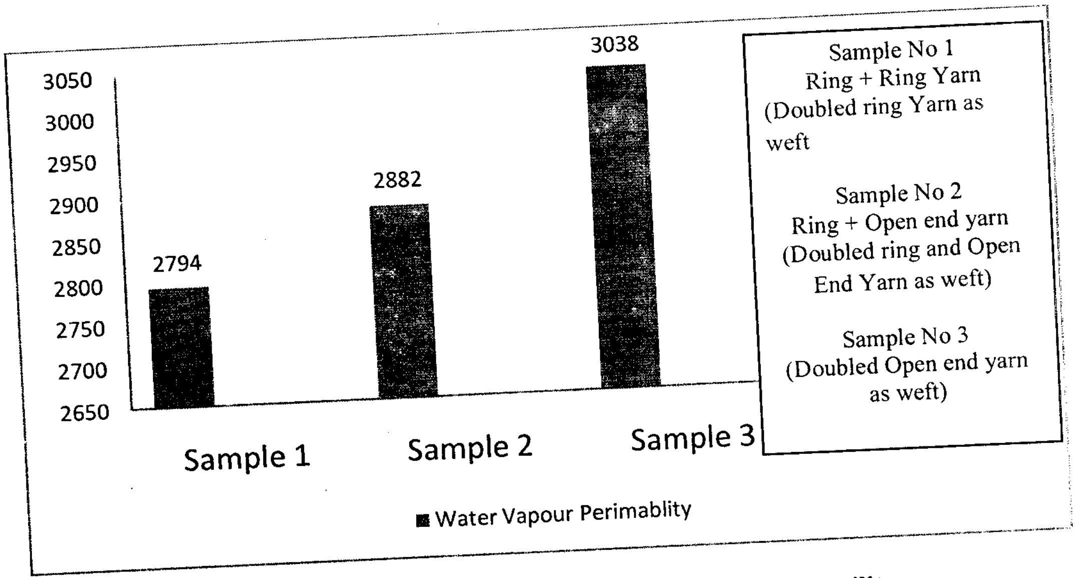


Fig No:4.2 Comparison of Water vapour Permeability

Discussion on water vapour permeability

1) Doubled ring spun yarn (Ring + Ring Yarn Sample 1) is having superior water vapour permeability over Doubled Ring and open end yarn (Ring + Open End Yarn, Sample 2) and Doubled open end yarn (Open end + Open end, Sample 3) due to more number of spiral fibres in the cross section.

2) Sample no 2 is having good water vapour permeability over sample No 1 & 3.

3) Sample No 3 is having less water vapour permeability due to absorption capacity is less.

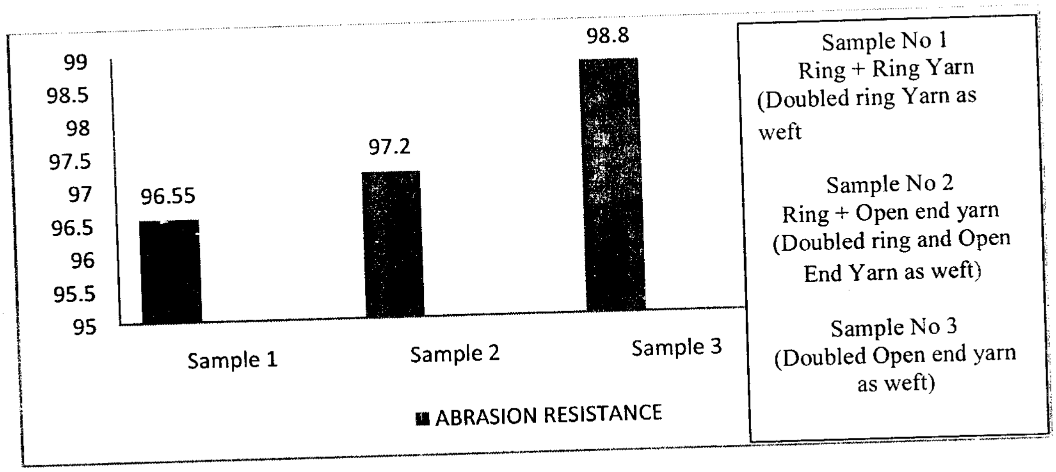


Fig No: 4.3 Comparison Of Abrasion Resistance

Discussion on Abrasion Resistance:

1 The open end yarn fabric has more abrasion resistance over the open end + Ring, Ring+ Ring Yarn because more number of surface fibres will contribute during the Abrasion of rotor-yarn.

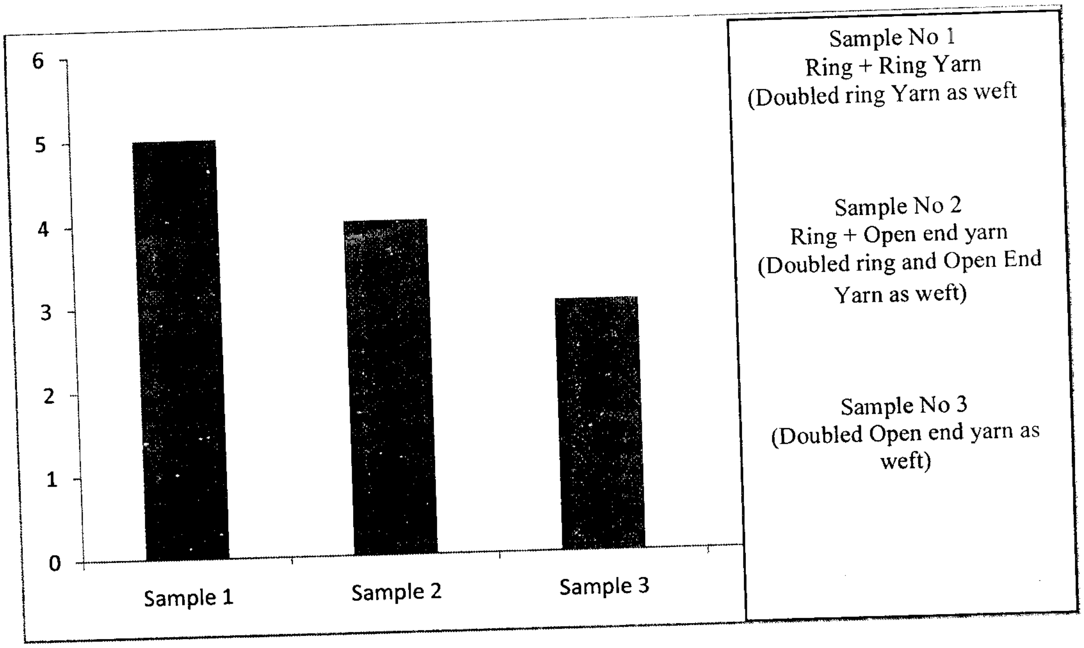


Fig No : 4.4 Comparison of Pilling

Discussion on Pilling:

1) Due to ring spun yarn contains envelope twist (twisting in the fibre from the outside inwards) will create more hairy fibre. This hairy fibre create the pilling.

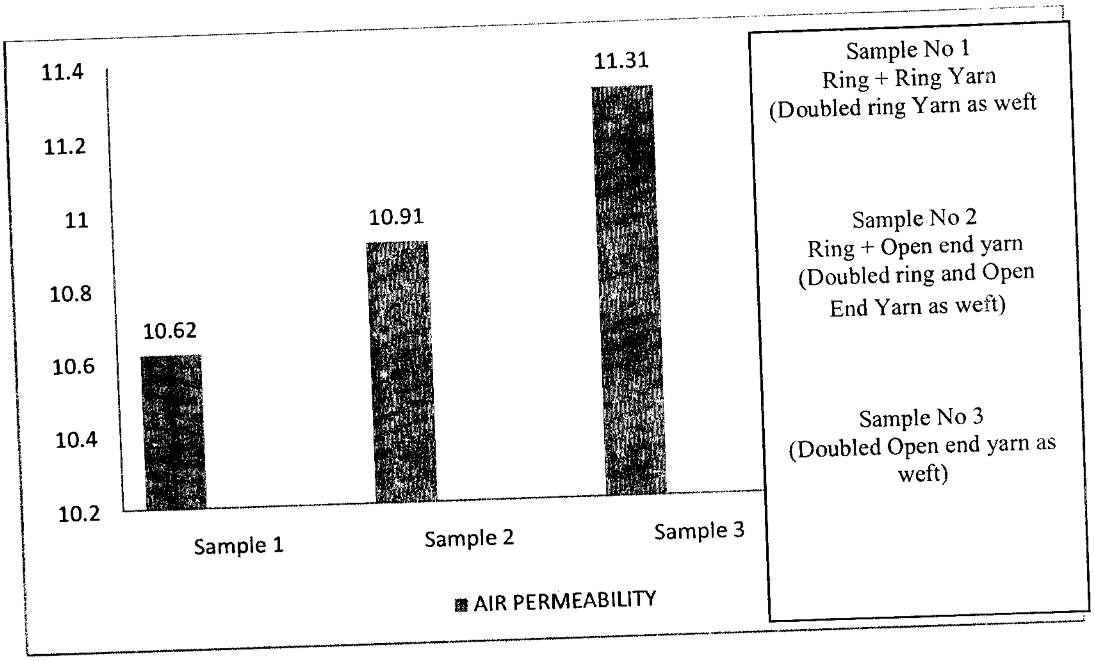


Fig No: 4.5 Comparison Of Air Permeability

Discussion on Air Permeability

1) Due to Rotor-Spun yarn is more open, more voluminous and rougher than the ring spun yarn the Air permeability is more in the open end yarn
2) The doubled ring + Open end yarn is having lesser Air permeability than the open end yarn and higher than the ring+ Ring Yarn fabric.

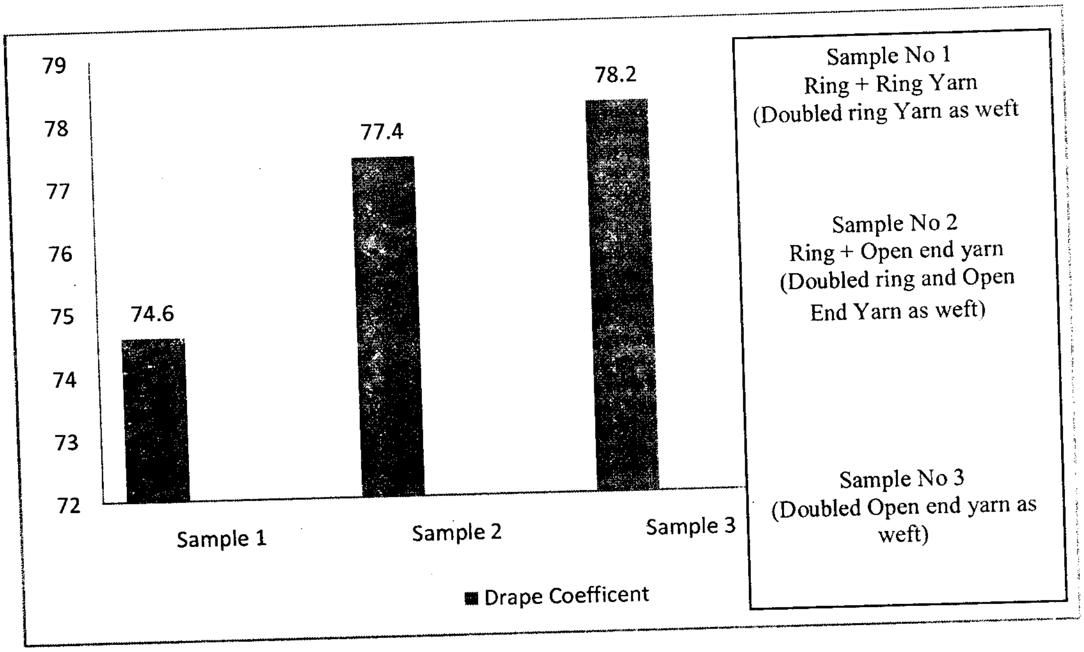


Fig No: 4.6 Comparison of Drape Co-efficient

Discussion on Drape Coefficient:

1) Due to lower Bending Rigidity smoother surface the ring yarn fabric posses a lower Drape Co-efficient and higher Drape.
2) Due to higher Bending Rigidity smoother surface the ring + open end yarn fabric posses an equivalent Drape Co-efficient and higher Drape.
3) Due to higher Bending Rigidity smoother surface the open + open end yarn fabric posses higher Drape Co-efficient and lower Drape.

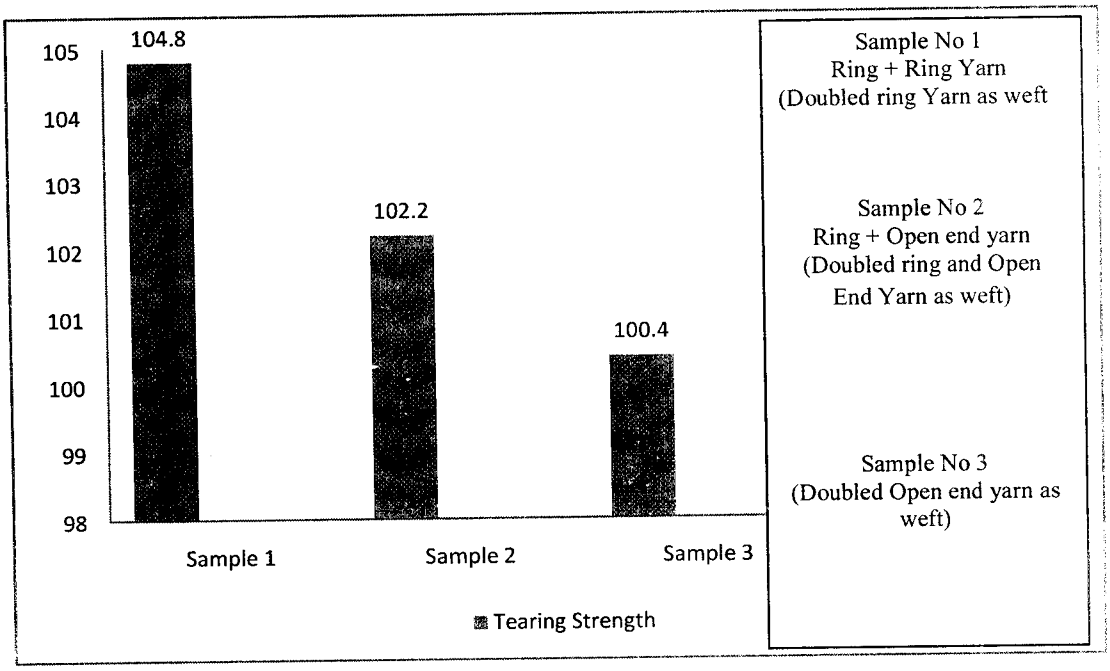


Fig No: 4.7 Comparison of Tearing Strength

Discussion on Tearing Strength:

1) Due to high Tensile strength on Sample no 1, Tearing Strength also more
2) Sample no 2 is having equivalent Tearing Strength over the sample no 1 Due to very good Tensile Strength on the doubled Yarn.
3) Due to less tensile Strength in sample no 3 the tearing strength is also less.

CONCLUSION

Chapter 5

CONCLUSION:

In this project results, it is found that the fabric produced from three different varieties of $2/20^s$ weft yarn has the following findings such as,

1. Fabric produced from doubled ring and ring yarn as weft has high tensile strength, Tearing strength with poor pilling effect.
2. Fabric produced from doubled ring and rotor yarn as weft is having equivalent tensile strength, equivalent tearing strength with very good abrasion resistance, pilling, air permeability, and drape coefficient over the doubled ring and ring yarn weft fabric.
3. Fabric produced from doubled open end yarn as weft is having less tensile strength, tearing strength equivalent abrasion and drape coefficient over the doubled ring and ring yarn weft fabric.

From the above results the Doubled yarn fabric produced from ring and rotor yarn as weft can be used in applications such as curtains, sofa cover, bed cover, bed spread and Table mat.

STATISTICAL ANALYSIS

Chapter 6

Statistical Analysis – One way Anova

6.1 Tensile Strength Analysis:

Tenacity					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	96773.186	2	48386.593	6.32	0.013
Within Groups	91741.372	12	7645.114		
Total	188514.557	14			

6.2 Water Vapour Permeability Analysis:

Water Vapour Permeability					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	152450.243	2	76225.121	12.4	0.001
Within Groups	73766.246	12	6147.187		
Total	226216.489	14			

6.3 Abrasion Resistance Analysis:

Abrasion Resistance					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	7.484	2	3.742	56.282	0.000
Within Groups	0.798	12	0.066		
Total	8.281	14			

6.4 Air permeability Analysis

Air permeability					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	1.182	2	.591	85.214	0.000
Within Groups	.083	12	.007		
Total	1.265	14			

6.5 Drape coefficient Analysis

Drape coefficient					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	40.133	2	20.067	46.308	0.000
Within Groups	5.200	12	.433		
Total	45.333	14			

6.6 Tearing Strength Analysis

Tearing Strength					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	44.933	2	22.467	18.216	0.000
Within Groups	14.800	12	1.233		
Total	59.733	14			

REFERENCE

Chapter 7

REFERENCE

1. **Kennedy –SJ** The importance of Conservation to the Textile Industry and the American Public, TMEL Rept. No. 52, Textile, clothing and footwear div., Quartermaster R. and D. Center, Natick, Massachusetts, Feb. 1951 – Clothing Comfort and Function by Lyman Fort and Norman R.S. Hollies Pg. no:179-180.

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3. AUTEX Research Journal, Vol. 8, No4, December 2008 © AUTEX http://www.autexrj.org/No4-2008/ *100* **COMPARITIVE STUDIES ON RING ROTOR AND VORTEX YARN KNITTED FABRICS Rameshkumar C.1, Anandkumar P.1, Senthilnathan P.1, Jeevitha R.1, Anbumani N.2** Department of Textile Technology Bannari Amman Institute of Technology, Sathyamangalam-638401 Department of Textile Technology PSG College of Technology, Coimbatore-641004.

4. Pakistan Journal of Applied Sciences 2(8) 800 to 803, 2002 Effect of Single end strength of Various Double yarn on traring Strenght of Double weft fabric Sh.M. Navaz, Iftikhar Ahamad, University of Agriculture Faisalabad, Pakistan.

5. Physical Testing of textiles by P.Angappan, 1992, Pg no 321-330.

6. Physical Testing of textiles by Dr.V.K.Kothari, 1997 Pg No. 320 – 327.

APPENDIX

CHAPTER 8

APPENDIX

```
ONEWAY Tenacity BY Fabric
  /STATISTICS DESCRIPTIVES HOMOGENEITY
  /MISSING ANALYSIS

  /POSTHOC=BTUKEY ALPHA(0.05).
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Descriptives

Tenacity

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	1.2382E3	100.78019	45.07027	1113.0529	1363.3231	1138.47	1363.06
2	5	1.1410E3	95.32623	42.63119	1022.6348	1259.3612	1025.03	1289.35
3	5	1.0414E3	60.75858	27.17206	966.0043	1116.8877	976.20	1138.62
Total	15	1.1402E3	116.04019	29.96145	1075.9498	1204.4716	976.20	1363.06

Test of Homogeneity of Variances

Tenacity

Levene Statistic	df1	df2	Sig.
.827	2	12	.461

ANOVA

Tenacity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	96773.186	2	48386.593	6.329	.013
Within Groups	91741.372	12	7645.114		
Total	188514.557	14			

Post Hoc Tests

Homogeneous Subsets

Tenacity

Tukey B

Fabric	N	Subset for alpha = 0.05	
		1	2
3	5	1.0414E3	
2	5	1.1410E3	1.1410E3
1	5		1.2382E3

Means for groups in homogeneous subsets are displayed.

```
ONEWAY WVP BY Fabric
  /STATISTICS DESCRIPTIVES HOMOGENEITY
  /MISSING ANALYSIS

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Oneway

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[DataSet3]

Descriptives

WVP

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	3.0381E3	99.17409	44.35200	2914.9411	3161.2229	2882.85	3104.61
2	5	2.8828E3	78.40400	35.06333	2785.4986	2980.2014	2771.97	2993.73
3	5	2.7941E3	49.58704	22.17600	2732.5756	2855.7164	2771.97	2882.85
Total	15	2.9050E3	127.11538	32.82105	2834.6318	2975.4202	2771.97	3104.61

Test of Homogeneity of Variances

WVP

Levene Statistic	df1	df2	Sig.
1.282	2	12	.313

ANOVA

WVP

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	152450.243	2	76225.121	12.400	.001
Within Groups	73766.246	12	6147.187		
Total	226216.489	14			

Post Hoc Tests

Homogeneous Subsets

WVP

Tukey B

Fabric	N	Subset for alpha = 0.05	
		1	2
3	5	2.7941E3	
2	5	2.8828E3	
1	5		3.0381E3

Means for groups in homogeneous subsets are displayed.

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NEWAY ABRREST BY FABRIC
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 /MISSING ANALYSIS

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Oneway

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DataSet4]

Descriptives

ABRREST

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	96.5500	.34735	.15534	96.1187	96.9813	96.32	97.15
2	5	98.2060	.18338	.08201	97.9783	98.4337	97.89	98.32
3	5	97.8120	.21253	.09505	97.5481	98.0759	97.60	98.03
Total	15	97.5227	.76911	.19858	97.0967	97.9486	96.32	98.32

Test of Homogeneity of Variances

ABRREST

Levene Statistic	df1	df2	Sig.
.672	2	12	.529

ANOVA

ABRREST

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.484	2	3.742	56.282	.000
Within Groups	.798	12	.066		
Total	8.281	14			

Post Hoc Tests

Multiple Comparisons

ABRREST

Tukey HSD

(I) FABRIC	(J) FABRIC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-1.65600*	.16307	.000	-2.0911	-1.2209
	3	-1.26200*	.16307	.000	-1.6971	-.8269
2	1	1.65600*	.16307	.000	1.2209	2.0911
	3	.39400	.16307	.077	-.0411	.8291
3	1	1.26200*	.16307	.000	.8269	1.6971
	2	-.39400	.16307	.077	-.8291	.0411

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

ABRREST

Tukey HSD

FABRIC	N	Subset for alpha = 0.05	
		1	2
1	5	96.5500	
3	5		97.8120
2	5		98.2060
Sig.		1.000	.077

Means for groups in homogeneous subsets are displayed.

```
ONEWAY AIRPERMEA BY FABRIC
  /STATISTICS DESCRIPTIVES HOMOGENEITY
  /MISSING ANALYSIS

  /POSTHOC=BTUKEY ALPHA(0.05).
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Oneway

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Descriptives

AIRPERMEA

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	11.3140	.11238	.05026	11.1745	11.4535	11.20	11.49
2	5	10.9120	.06611	.02956	10.8299	10.9941	10.80	10.97
3	5	10.6300	.06164	.02757	10.5535	10.7065	10.52	10.66
Total	15	10.9520	.30058	.07761	10.7855	11.1185	10.52	11.49

Test of Homogeneity of Variances

AIRPERMEA

Levene Statistic	df1	df2	Sig.
1.179	2	12	.341

ANOVA

AIRPERMEA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.182	2	.591	85.214	.000
Within Groups	.083	12	.007		
Total	1.265	14			

Post Hoc Tests

Homogeneous Subsets

AIRPERMEA

Tukey B

FABRIC	N	Subset for alpha = 0.05		
		1	2	3
3	5	10.6300		
2	5		10.9120	
1	5			11.3140

Means for groups in homogeneous subsets are displayed.

```
ONEWAY DRAPECOEFF BY FABRIC
  /STATISTICS DESCRIPTIVES HOMOGENEITY
  /MISSING ANALYSIS

  /POSTHOC=TUKEY BTUKEY ALPHA(0.05).
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Oneway

Notes

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[DataSet6]

Descriptives

DRAPECOEFF

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	78.20	.837	.374	77.16	79.24	77	79
2	5	77.40	.548	.245	76.72	78.08	77	78
3	5	74.40	.548	.245	73.72	75.08	74	75
Total	15	76.67	1.799	.465	75.67	77.66	74	79

Test of Homogeneity of Variances

DRAPECOEFF

Levene Statistic	df1	df2	Sig.
.604	2	12	.563

ANOVA

DRAPECOEFF

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	40.133	2	20.067	46.308	.000
Within Groups	5.200	12	.433		
Total	45.333	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable:DRAPECOEFF

	(I) FABRIC	(J) FABRIC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Tukey HSD	1	2	.800	.416	.175	-.31	1.91
		3	3.800*	.416	.000	2.69	4.91
	2	1	-.800	.416	.175	-1.91	.31
		3	3.000*	.416	.000	1.89	4.11
	3	1	-3.800*	.416	.000	-4.91	-2.69
		2	-3.000*	.416	.000	-4.11	-1.89

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

DRAPECOEFF

	FABRIC	N	Subset for alpha = 0.05: 1	2
Tukey HSD[a]	3	5	74.40	
	2	5		77.40
	1	5		78.20
	Sig.		1.000	.175
Tukey B[a]	3	5	74.40	
	2	5		77.40
	1	5		78.20

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 5.000.

```
ONEWAY TEARSTRENGTH BY FABRIC
  /STATISTICS DESCRIPTIVES HOMOGENEITY
  /MISSING ANALYSIS

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Oneway

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Descriptives

TEARSTRENGTH

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	5	104.80	.837	.374	103.76	105.84	104	106
2	5	102.20	1.483	.663	100.36	104.04	100	104
3	5	100.60	.894	.400	99.49	101.71	100	102
Total	15	102.53	2.066	.533	101.39	103.68	100	106

Test of Homogeneity of Variances

TEARSTRENGTH

Levene Statistic	df1	df2	Sig.
.566	2	12	.582

ANOVA

TEARSTRENGTH

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	44.933	2	22.467	18.216	.000
Within Groups	14.800	12	1.233		
Total	59.733	14			

Post Hoc Tests

Multiple Comparisons

TEARSTRENGTH

Tukey HSD

(I) FABRIC	(J) FABRIC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1	2	2.600*	.702	.008	.73	4.47
	3	4.200*	.702	.000	2.33	6.07
2	1	-2.600*	.702	.008	-4.47	-.73
	3	1.600	.702	.098	-.27	3.47
3	1	-4.200*	.702	.000	-6.07	-2.33
	2	-1.600	.702	.098	-3.47	.27

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

TEARSTRENGTH

Tukey HSD

FABRIC	N	Subset for alpha = 0.05: 1	2
3	5	100.60	
2	5	102.20	
1	5		104.80
Sig.		.098	1.000

Means for groups in homogeneous subsets are displayed.