7

EFFECT OF PEACH FINISH ON STRETCH DENIM

A PROJECT REPORT

Submitted by

P.GAVASKAR (08BFT07)

N.JAISHREE (08BFT12)

A.PREETHI (08BFT21)

In partial fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

TEXTILE TECHNOLOGY (FASHION TECHNOLOGY)

DEPARTMENT OF FASHION TECHNOLOGY

KUMARAGURU COLLEGE OF TECHNOLOGY

(An Autonomous Institution affiliated to Anna University of Technology, Coimbatore)

APRIL 2012

KUMARAGURU COLLEGE OF TECHNOLOGY

(An Autonomous Institution affiliated to Anna University of Technology, Coimbatore)

BONAFIDE CERTIFICATE

Certified that this project report **"EFFECT OF PEACH FINISH ON STRETCH DENIM"** is the bonafide work of

P.GAVASKAR (0810203007)

N.JAISHREE (0810203012)

A.PREETHI (0810203021)

who carried out the project work under my supervision.

11.4.12

SIGNATURE

Dr.J.Srinivasan
HEAD OF THE DEPARTMENT
Professor
Department of Fashion Technology,
Kumaraguru College of Technology,
Coimbatore-641049

SIGNATURE

Dr.R.Shanthi
SUPERVISOR
Asst. professor (SRG)
Department of Fashion Technology,
Kumaraguru College of Technology,
Coimbatore-641049

Certified that the candidates with the University Register No. 0810203007, 0810203012, 0810203021 were examined by us in the project viva-voce examination held on ...12.04.12............

12.4.12
(INTERNAL EXAMINER)

(EXTERNAL EXAMINER)

ACKNOWLEDGEMENT

First and foremost we, thank the "God Almighty" for endowing us with his immense blessings which helped to overcome the hurdles, paving way for successful completion of the study.

We express our deep gratitude to our respected Co-Chairman Dr.B.K.Krishnaraj Vanavarayar and our sincere gratitude to our Director Dr.J.Shanmugam and our Principal Dr.S.Ramchandaran for their support and for proving the required facilities for carrying out this study.

We also express our gratefulness to Dr.J.Srinivasan, Professor and Head of the Department of Fashion Technology, Kumaraguru College of Technology for having been a source of encouragement and for instilling the vigor to do the project.

We express our heartfelt thanks to our Project Co-ordinator and Guide Dr.R.Shanthi, Asst.Professor (Sr.Grade) Department of Fashion Technology, Kumaraguru College of Technology for her innovative guidance, expert suggestion and constant encouragement at every step of our success.

We express our sincere thanks to Prof.V.Sankaran, Coordinator and Mr.Gopinath, Senior Scientific Officer, KCT TIFAC CORE and Mr.VaradaRajan, for their immense support and facilitating to carry our project at TIFAC.

Last but not the least our heartfelt gratitude to Department of Textile Technology, Kumaraguru College of Technology. Words can hardly express our hearty and sincere thanks to well wishers for their confidence in us, critical comments of the work, patience in listening to my reflections and articulated responses have stimulated our thoughts for further work.

Words fail to express our thanks to our beloved parents and friends who are my sounding board and pillar of strength.

P.GAVASKAR

N.JAISHREE

A.PREETHI

ABSTRACT

The performance and comfort factors of garments during usage are very important. Generally, the comfortable stretching of fabrics according to body movements as well as recovery after stretching, are good desirable properties. In recent years, due to the demand for more comfortable clothing, which is more adjustable to the body and has stretchable characteristics, spandex-containing denim fabrics for casual wear have been increasingly preferred. The new generation stretch denim is paving way due to its softness, ease of body movement and comfort. Denim finishing included desizing to soften the fabric and stonewashing to remove colour and add contrast to the fabric. With the advent of modern technologies, these processes have been replaced with surface treatments like peach finish. Peach skin is a smooth finish applied to finely woven fabric. The soft and suede finish are the results of brushing of the fabric using emery rollers. This finish allows suits and dresses to flow with the movement and drape beautifully. The feel of the peach skin is soft, smooth and moderately wrinkle-resistant. An attempt has been made to study the performance characteristics of four fabrics having different spandex proportions. In terms of stiffness, crease recovery, abrasion resistance, weight loss, stretch and recovery and colour index in order to view the morphology of fibres revealed the performance properties of the treated denim fabrics when compared to their original untreated fabrics. The novelty of this system is that it does not uses chemicals thereby making the process ecologically safe and economical .

TABLE OF CONTENTS:

LIST OF TABLES:

1. INTRODUCTION

Denim is a type of cotton textile, known for its use in blue jeans and other clothing. Denim uses a sturdy twill weave with a characteristic diagonal ribbing. Originally used for workmen's clothes, denim is now ubiquitous and has even entered the world of high fashion. Nearly everyone has at least one denim garment in the closet these days. Levi Strauss is credited with making the first blue jeans out of denim in the 1850s, for gold miners in California. In the 1930s and 40s, commercially sold denim work wear became very popular, with new companies such as Dickies and Wrangler joining the trend. Comfortable, durable, and associated with blue collar culture, denim soon became fashionable among the working class youth throughout the United States. Denim jackets became a fashion statement in the 1950s along with jeans.

Throughout the decades, denim continued to gain a wider market. By the 1970s, women were wearing denim as often as men, and denim skirts and dresses could be found in numerous styles. In the 80s, designer jeans were the rage, and a style once associated with the working class was updated for affluent yuppies. Denim- one of the world's oldest fabrics – is most commonly associated with jeans. Today, denim jeans are one of the most popular clothing items, which are loved by many people around the globe regardless of the gender, culture, climatic conditions, seasons and social occasions. The special features of jeans are trousers made from denim. The American blue jeans were made by Jacob Davis, Calvin Rogers, and Levi Strauss in 1873. Starting in the 1950s, jeans, originally designed for cowboys, became popular among teenagers. Historic brands include Levi's, Lee, and Wrangler. Jeans come in various fits, including skinny, tapered, straight, boot cut, Mommy-cut, maternity, and flare. Jeans are now a very popular form of casual dress around the world, and have been so for decades.

Initially, jeans were simply sturdy trousers worn by workers, especially in the factories during World War II. During this period, men's jeans had the zipper down the front, whereas women's jeans had the zipper down the right side. By the 1960s, both men's and women's jeans had the zipper down the front. Historic photographs indicate that in the decades before they became a staple of fashion, jeans generally fit quite loosely, much like a pair of bib overalls without the bib. Indeed, until 1960, Levi Strauss denominated its flagship product "waist overalls" rather than "jeans". They come in many styles and colours; however, "blue jeans" are particularly identified with American culture, especially the American Old West. Americans spent more than $14 billion on jeans in 2004 and spent $15 billion in 2005. During the 1960s the wearing of jeans became more acceptable, and by the 1970s it had become general fashion in the United States for casual wear. The casual drug use of the era led to the addition of a "pill pocket" inside the right front pocket.

The apparel industry has severely impacted by the impact of global economy down-turn but the state of denim jean industries was relatively better. The denim industry continues to hold the advantageous position over the apparel categories owing to longer life span of jeans as compared to other apparel items. Denim jeans' appeal at retail reflects consumers' positive attitudes towards denim. According to the Lifestyle Monitor, 78% of consumers love or enjoy wearing denim. Consumers reported wearing denim jeans an average of four days a week, and 60% said they wore them to work. The comfort and versatility of cotton denim jeans translate into steady purchases. Among consumers who had recently bought apparel, 45% said they had purchased denim jeans (second only to knit shirts). Of those who said they planned to buy apparel in the coming month, 40% said they planned to purchase jeans — 62% because they needed them (e.g., to replace old ones) and 28% because they wanted something new and different.

Generally, price is the top purchase driver for apparel; overall, 84% of consumers named price as the most important factor in their apparel purchases. However, jeans differ from other apparel product categories in that price is not the key factor for most shoppers. When consumers were asked to name the most important feature for their next denim jeans purchase, only 16% named price; the top response was fit (50%), followed by style (19%). Women were more likely than men to care most about fit (55% vs. 41%).

In spite of the downturn in consumer spending, sales of premium denim jeans have grown and are expected to remain strong. The fact that jeans shoppers care less about price than about style and fit enables the premium denim jeans market to continue to attract consumers. Premium denim jeans are at the cutting edge of jeans fashion, and their innovative fabrications and finishes, along with their well-known attention to fit, entice consumers to make discretionary jeans purchases. Denim's fashionability and versatility also help consumers rationalize the expense of pricier jeans, as evident from 2008 sales figures. According to NPD, sales of women's premium denim jeans were up 16% from 2007 to 2008, and growth was especially strong in men's premium denim, as sales rose 21% in 2008.

Spandex was first created in 1959 by Joseph Shivers, a chemist. The elastic was immediately incorporated in the fashion industry, and in the 1970s it was combined with denim. Today, every jeans manufacturer has its own version of stretch denim. Stretch denim is made by combining elastane fibre with cotton. Spandex and Lycra are two of the most commonly used elastics. This is what gives the denim its stretch. Stretch denim jeans have the ability to conform to your body's shape each time you put them on.

With most denim, it takes time to "wear in" a pair of jeans so they fit perfectly. The elastan fibre makes the jeans stretch, so they can fit right every time. Denim is a specific fabric in which stretch occurs, adding a comfort factor to work wear and casual wear . Be-cause of the advantages of using elastane in fabric structure, elastane has gained much attention for use in woven fabric and also by denim producers. Especially since the 1990's have woven fabrics containing elastane been commonly used in denim based products.

Always first to market with the latest innovation in denim, Lee released stretch denim into the Australian market in 1980s - within 18 months, the trend for stretch denim had sky rocketed establishing Lee's reputation as the purveyors of the latest denim trends.

Peaching is simply a process that involves sanding the fabric. The technique can be applied to just about any type of fibre. The material is brushed with the use of automated machinery. In either case, rollers with abrasive bristles, similar in appearance to a toothbrush.

are brushed across the fabric. This helps to break some of the small fibres on the exterior of the material and teases them out. Teasing the broken fibre ends is what created the peached appearance and feel for the sanded fabric.

Along with the use of abrasive rollers, peached fabric can also be created by the use of chemical abrasion. With this method, the fibres are gently broken down with the use of chemical compounds, rather than being sanded by bristles. Laundry abrasion is also a means of producing peached fabric. Essentially, it is the motion within the laundering process that creates the break in the outside fibres and helps to produce the soft feel that is associated with peached fabric.

The material and construction of denim fabric make it very durable. New trademark names for various fit/cuts highlight focus on how jeans fit; including adjusting cut or offering more ease in menswear and womenswear. Consumers have cited satisfaction in fit as a reason why they select a particular brand or designer style. Designer jeans tend to be more costly.

Other features are stretch waistbands for men's pants that give and adjust as the individual moves or bends. Also, styles may have half-elastic back or side elastic inset waistbands for children's smaller sizes and to contour Misses' and Women's jeans.

The study was undertaken to serve both the consumer and industry preferences with the following objectives.

1. Development of denim material with different spandex content.

2. Optimization of the peach finish.

3. Testing(physical, mechanical and comfort properties) of the fabric before and after the finish.

4. Development of apparel with the peach finished fabric.

5. Assessment of the garment for comfort properties.

2. REVIEW OF THE LITERATURE

The review of literature undertaken for this study is reviewed under the following heads

2.1 Role of denim fabric:
2.2 Yarn development
2.3 Weaving of the fabric
2.4 Stretch denim
2.5 Finishing for denim
2.6 Peach finish

2.1. ROLE OF DENIM FABRIC:

Denim is known worldwide for its fit, ease and durability. As one of the few fabrics in the world that is used in both high fashion and work-a-day apparel, common denim is a quintessentially American creation. Since denim is so versatile and simple to use in manufacture, it's become a staple textile in many different industries besides apparel, with steady demand around the world. Denim is an old favorite, with a pedigree that goes back to the days of the western American gold rush.Denim has a long history in the world of fashion. Denim has almost reached an iconic status amongst the youngsters and whilst it is really difficult to point the time of exact evolution of the outfit called "jeans" into a youth icon, there is no doubt of their impact! The fabric was known as a work clothing textile for a lot of history, and was popular in the frontier West. Used by the U.S. Navy for uniforms, manufacturer Levi Strauss started to manufacture work clothing from the fabric in 1853. Denim fabric soon became signature American apparel. Denim is perhaps one of the most versatile materials that have never faded into oblivion in spite of the mushrooming of different materials and attires. It is almost an object of worship all across the world irrespective of religion, nationality or sex for that matter. Indeed, it has been conceptualized by fashion designers and worshippers all around the world in the form of skin tight jeans, shrugs, minis, micros, pedal pushers, jackets and many more. Denim blue jean styles are more varied today than ever before, but their durability and convenience are almost as dependable as ever. Denim jeans wear well because of the fabric construction techniques used.

Fabrics used for today's denim jeans vary. The most common types of yarns used are cotton, polyester and elastane yarns like spandex and lycra.Each type of fabric wears differently but all are rugged. After much research, today the fashion world can wear more than a hundred kinds of jeans fabrics including stretch, ramie cotton, poly, chemical denim washes and mechanical denim washes. Out of all these, stretch denim, according to a survey, rates the highest in the popularity chart. It is roughly 98% cotton and contains 2% spandex to create desired stretch. The spandex imparts the wonderful fit and the easy movement.

The fashion world has caught the trend for strength denim; especially the female consumer due to skinny jeans causing rave in this arena. Ramie cotton denim is not all that popular with youngsters because of the slightly higher prices in the markets. Mechanical denim washes are also popular among the worshippers of jeans to attain the "torn and dirty' look. The denims include stone wash and micro standing. In the stone washing process; newly dyed jeans are put in a special washing machine which is filled with pumice stones in order to achieve the desired soft hand, fashionable look. The different jeans styles available make them all the more appealing.

The trend that has spread like wild fire with people all over the world is skinny jeans. Trendy girls love to wear skinny jeans combined with high heeled pump shoes and love to flaunt their figures. Skinny jeans are best avoided for plus sized women as they stick to your body.

2.2. YARN DEVELOPMENT:

Yarn, fibres or filaments formed into a continuous strand for use in weaving textiles or for the manufacture of thread. A staple fibre such as cotton, linen, or wool, is made into yarn by carding, combing (for fine, long staples only), drawing out into roving, then spinning.[18] Continuous filaments, such as silk, rayon, and nylon, may be formed directly into yarn or may be cut into short lengths and prepared like staple fibres'. Yarns are twisted to give them strength and smoothness; a clockwise twist is known as the Z twist and a counter clockwise twist is known as the S twist. Two or more strands twisted together form ply yarns. In slub yarns areas are left untwisted to vary the diameter for ornamental effects. Complex yarns, such as bouclé and ratiné, are made by twisting together yarns of different tensions or diameters[15]. The relation between the weight of the raw fibre of staple yarns and the yarn length is expressed by the yarn number; the finer the yarn, the higher the number. In filament yarns the yarn number, expressed in deniers, increases with the coarseness of the yarn.

A yarn consisting of an inner core yarn surrounded by staple fibres. A corespun yarn combines the strength and/or elongation of the core thread and the characteristics of the staple fibres which form the surface. A yarn produced at the spinning frame by feeding a yarn through the delivery rollers only, simultaneously with the spinning of the staple fibres. A yarn consisting of an inner core yarn surrounded by staple fibres. A corespun yarn combines the strength and/or elongation of the core thread and the characteristics of the staple fibres which form the surface.

2.2.1. RING SPINNING:

The Ring Spinning is the most widely used form of spinning machine due to significant advantages in comparison with the new spinning processes. The ring spinning machine is used in the textile industry to simultaneously twist staple fibres into yarn and then wind it onto bobbins for storage. The yarn loop rotating rapidly about a fixed axis generates a surface referred to as "balloon". Ring frame settings are chosen to reduce yarn hairiness and the risk of glazing or melting the fibre.[16]

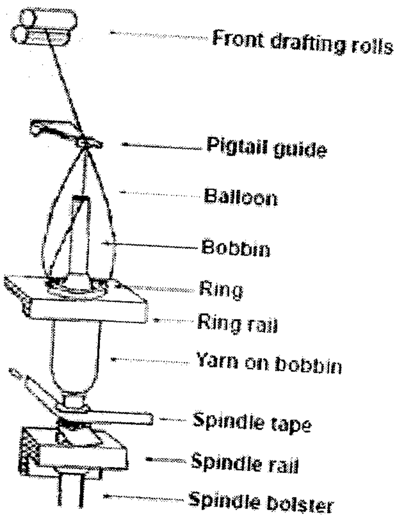
2.2.2. OBJECTIVES OF RING SPINNING:

- To draft the roving fed to the ring spinning frame i,e to convert roving into very fine strand called yarn.
- To impart strength to the yarn by inserting the necessary amount of twist.
- To collect twisted strand called yarn onto handy and transportable package by winding the twisted thread on a cylindrical bobbin or tube.

Ring Spinning is the oldest of the present day spinning processes. Fiber material is supplied to the ring-spinning machine in the form of roving. The fiber mass of the roving is reduced by a drafting unit. The twist inserted moves backwards and reaches the fibers leaving the drafting unit. The fibers lay around one another in concentric helical paths. The normal forces encountered by the fibers enhance the adhesive forces between the fibers and prevent fibers from flying or slipping past each other under the tensile strain.It is the process of further drawing out roving to the final yarn count needed, inserting twist to the fibres by means of a rotating spindle and winding the yarn on a bobbin. These three stages take place simultaneously and continuously.

A mechanically driven spindle, on which the yarn package firmly sits, is responsible for twist. A stationary ring is around the spindle, which holds the traveler. Yarn from the drafting unit is drawn under the traveler, and then led to the yarn package. In order to wind the twisted yarn on a bobbin tube carried by the spindle, the traveler is required to cooperate with the spindle. The traveler moves on the ring without any physical drive, but is carried along by the yarn it is threaded with. The rotation rate of traveler is lower than the spindle, and this difference in the speeds of traveler and the spindle enables the winding of the yarn on the tube. A controlled up and down movement of the ring determines the shape of the yarn package, called Cop or Bobbin. Ring spinning technology provides the widest range in terms of the yarn counts it can produce.

Ring spinning is a comparatively expensive process because of its slower production speeds and the additional processes (roving and winding) required for producing ring spun yarns. Ring spun yarns produce high quality and are mainly produced in the fine (60 Ne, 10 tex) to medium count (30 Ne, 20 tex) range, with a small amount produced in the coarse count (10 Ne, 60 tex) range. End uses include high quality underwear, shirting, towels.The fibers in the ring yarn are highly parallel and helical in nature, and the fiber arrangement is uniform along the thickness of the yarn. The yarn has a compact structure, with essentially no wrapper or hooked fibers. The self-locked structure is the result of intensive fiber migration, which in turn is influenced by the triangular geometry of the spinning zone and the high spinning tensions. The high axial strength of the yarn is the result of unique self-locked structure.



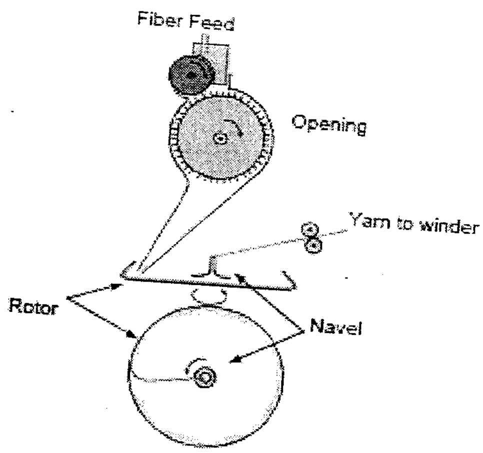
2.2.3. OPEN-END SPINNING:

The first functioning of rotor spinning ,machine was presented at the ITMA in 1967.Yarn spinning according to the rotor spinning principle predominates for all non conventional spinning methods.It omits the step of forming a roving.After drafting, the sliver is fed into a rotary beater.This device ensures that the fibers are beaten into a thin supply which enters a duct and gets deposited on the sides of the disc(rotor).The transportation of the fibers is achieved through air currents.Rotor Spinning is a more recent method of yarn formation compared to Ring Spinning. This is a form of open-end spinning where twist is introduced into the yarn without the need for package rotation. Allowing for higher twisting speeds with a relatively low power cost. In rotor spinning a continuous supply of fibres is delivered from delivery rollers off a drafting system or from an opening unit.[17]

The fibres are sucked down a delivery tube and deposited in the groove of the rotor as a continuous ring of fibre. The fibre layer is stripped off the rotor groove and the resultant yarn wound onto a package. The twist in the yarn being determined by the ratio of the rotational speed of the rotor and the linear speed of the yarn.Sliver is fed into the machine and combed and individualized by the opening roller. The fibres are then deposited into the rotor where air current and centrifugal force deposits them along the groove of the rotor where they are evenly distributed. The fibres are twisted together by the spinning action of the rotor, and the yarn is continuously drawn from the centre of the rotor. The resultant yarn is cleared of any defects and wound onto packages.

The production rates of rotor spinning is 6-8 times higher than that of ring spinning and as the machines are fed directly by sliver and yarn is wound onto packages ready for use in fabric formation the yarn is a lot cheaper to produce. Rotor spun yarns are more even, somewhat weaker and have a harsher feel than ring spun yarns. Rotor spun yarns are mainly produced in the medium count (30 Ne, 20 tex) to coarse count (10 Ne, 60 tex) range. End uses include denim, towels, blankets socks, t-shirts, shirts and pants. The use of this system has two basic advantages. It is fed by sliver, not as with the ring frame by roving, and so eliminates the speedframe from the process line. It can also be modified to remove any remaining trash, thereby improving the yarn quality.

Open-end spinning produces a different type of yarn to ring frame spinning. Open-end yarns tend to be more uniform, lower in strength, more extensible, bulkier, more abrasion resistant and more absorbent. It is likely then with all of these differences, only some of which are beneficial, that open-end spinning will not replace ring spun yarn as originally thought, but will be a complimentary product. Open-end spinning operates at a rate up to five times that of ring spinning and can be effectively used for cotton, polyester-cotton blends, as well as other short and medium staple systems. Synthetic staple fibres such as polyester alone can not be effectively open end spun due to dusting of oligomer from the fibres that interferes with the spinning action of the rotor.



2.3. FABRIC DEVELOPMENT:

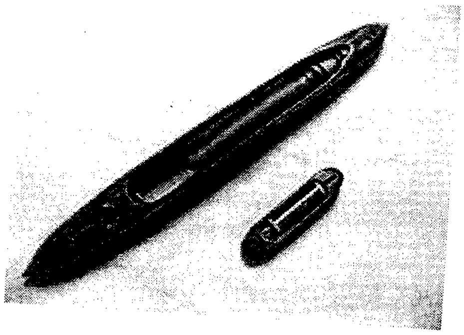
Twill weaves are the weaves that find a wide range of application. They can be constructed in a variety of ways. The main feature of these weaves that distinguishes from other types is the presence of pronounced diagonal lines that run along the width of the fabric.[19]

The basic characteristics of twill weaves are:

- They form diagonal lines from one selvedge to another.
- More ends per unit area and picks per unit area than plain cloth.
- Less binding points than plain cloth
- Better cover than plain weave
- More cloth thickness and mass per unit area.

Weaving is done by intersecting the longitudinal threads, the **warp**, i.e. "that which is thrown across", with the transverse threads, the **weft**, i.e. "that which is woven". The major components of the loom are the warp beam, heddles, harnesses or shafts (as few as two, four is common, sixteen not unheard of), shuttle, reed and take-up roll. In the loom, yarn processing includes shedding, picking, battening and taking-up operations. These are the principal motions.[20]

- **Shedding**. Shedding is the raising of part of the warp yarn to form a shed (the vertical space between the raised and unraised warp yarns), through which the filling yarn, carried by the shuttle, can be inserted. On the modern loom, simple and intricate shedding operations are performed automatically by the heddle or heald frame, also known as a harness. This is a rectangular frame to which a series of wires, called heddles or healds, are attached. The yarns are passed through the eye holes of the heddles, which hang vertically from the harnesses. The weave pattern determines which harness controls which warp yarns, and the number of harnesses used depends on the complexity of the weave. Two common methods of controlling the heddles are dobbies and a Jacquard Head.



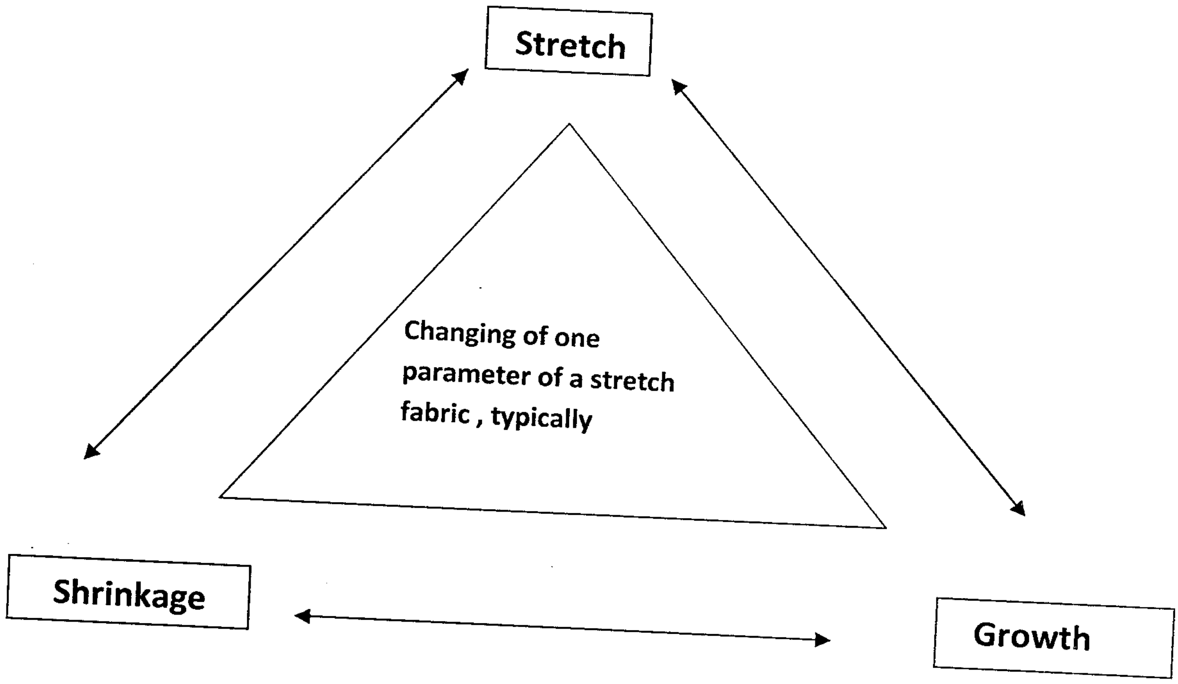
- **Picking**. As the harnesses raise the heddles or healds, which raise the warp yarns, the shed is created. The filling yarn in inserted through the shed by a small carrier device called a shuttle. The shuttle is normally pointed at each end to allow passage through the shed. In a traditional shuttle loom, the filling yarn is wound onto a quill, which in turn is mounted in the shuttle. The filling yarn emerges through a hole in the shuttle as it moves across the loom. A single crossing of the shuttle from one side of the loom to the other is known as a pick. As the shuttle moves back and forth across the shed, it weaves an edge, or selvage, on each side of the fabric to prevent the fabric from raveling.
- **Battening**. As the shuttle moves across the loom laying down the fill yarn, it also passes through openings in another frame called a reed (which resembles a comb). With each picking operation, the reed presses or battens each filling yarn against the portion of the fabric that has already been formed. The point where the fabric is formed is called the fell. Conventional shuttle looms can operate at speeds of about 150 to 160 picks per minute.

There are two secondary motions, because with each weaving operation the newly constructed fabric must be wound on a cloth beam. This process is called taking up. At the same time, the warp yarns must be let off or released from the warp beams. To become fully automatic, a loom needs a tertiary motion, the filling stop motion. This will brake the loom, if the weft thread breaks. An automatic loom requires 0.125 hp to 0.5 hp to operate.

2.4. STRETCH DENIM:

Spandex was first created in 1959 by chemist Joseph Shivers at DuPont's Benger Laboratory in Waynesboro,Virginia. The elastic was immediately incorporated in the fashion industry, and in the 1970s it was combined with denim. Today, every jeans manufacturer has its own version of stretch denim. Stretch denim jeans have the ability to conform to your body's shape each time you put them on. With most denim, it takes time to "wear in" a pair of jeans so they fit perfectly. The elastan fiber makes the jeans stretch, so they can fit right every

TRIANGLE OF STRETCH, SHRINKAGE AND GROWTH:



Meric states that mechanical properties of the fabric containing elastane and concluded that high elastane content makes the yarn flexible; however , the yarn that will be used with elastane should allow the fabric to move freely and should not cause any the formation in the fabric. Moreover, it was determined that the elastane drafting ratio plays an important role in the tensile and tearing strength of the fabrics and this properties decrease with increasing rates of the elastane ratio within the fabric.

Nilgun Ozdil states that , by adding a more than enough amount of elastane to the fabric structure introduces a higher degree of stiffness, which would degrade handling properties of the fabric.

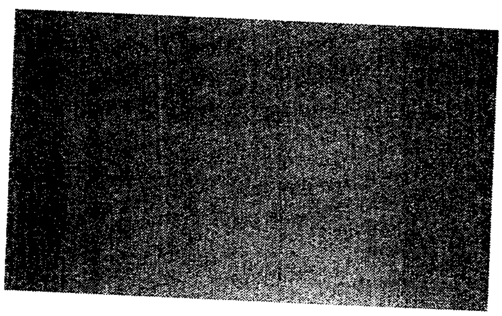
2.5. FINISHING FOR DENIM:

Most Denim jeans or other denim garments are subjected to a wash treatment to give them a slightly worn-out look. In the traditional stone-washing process, the blue denim was faded by the abrasive action of Light weight pumice stones on the garment surface, which removed some of the dye. However, too much abrasion resulted in the damage of the fabric, particularly at the hems and waist-bands.

2.5.1. STONE WASH FINISHES:

Stone washing is a process that is used to give denim a worn out look. It also increases the denim's softness and flexibility. Stone washed jeans have been popular for quite some time.[4] The late 1960's popularized the worn out look for jeans. It was not until more than ten years later that this style became more widely accepted. In late 1986, Women's Wear Daily reported vigor anticipation regarding the revival of stone washed jeans stating, "Stonewashed jeans revival seen hot for spring" (Daria). During this time, all jean companies were offering some sort of vintage style denim, including stone wash (Daria). On average, businesses in 1987 who offered a variety of stone wash jeans, boosted their business by 25 percent (Lockwood). Today, stone wash remains a highly popular finish for jeans. Even high-end companies, such as Dolce and Gabbana, Armani, and Abercrombie and Fitch, now offer their own lines of stone washed denim.

In order to stone wash jeans, the original way, they are washed with pumice stones [5]. Since the pumice stones have a rough surface they will scrap off a layer on the denim so that some of the white threads from the cloth will become more visible [4]. This is what causes the jeans to appear naturally worn. However, this method for stone washing jeans is very hard on the denim fabric. Using the pumice stones shortens the life span of the jeans and has negative effects on the environment [5]. Also, it is hard to control the amount of wear and tear the fabric will undergo during this process. However, more importantly, there is a problem with disposing of environmental waste and grit caused by this process [6]. There is also an issue concerning the amount of water that must be used to achieve the desired stone wash finish. In order for the manufacturers to achieve this finish, the jeans must be thrown in the washer several times [5]. This is why manufacturers have come up with an alternative method to achieve the stone wash finish.

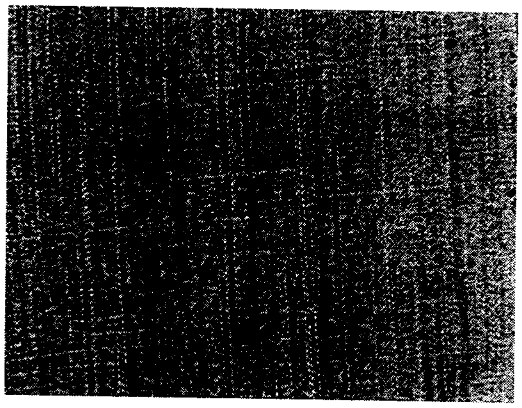


2.5.2. SANDED FINISHES FOR DENIM:

Denim is a textile that we use nearly everyday because of it's comfort, versatility, and durability. We use denim in jeans, jackets, purses, skirts, and a variety of other garments and fashion accessories[1]. Denim is made out of cotton, and often times is blended with other fibers such as polyester and spandex to help create movement and flexibility in the garment . Most garments made of denim have been chemically treated, or "finished". There are many ways to finish denim, including stone washing, dirty washing, tearing, enzyme washing, tinting, and sanding [2].

A sanded finish for denim is achieved through a combination of pumice stones, enzymes and sand; used to create the illusion of aged denim jeans . Although the purpose of this is generally for aesthetics, this process also loosens the fibers in the denim, making the denim fit more comfortably and move more easily. Sanding jeans creates an uneven, worn look, which is ideal for daily casual wear, and also for pairing with solid colors or denim jackets . However, it is very labor intensive to sand finish denim, therefore a pair of jeans that has been sand finished will usually be slightly more expensive than one that has not . It is a necessity to finish denim in order to get a final soft touch. Most denims are enzyme washed or stonewashed for an overall softness, however, it is essential to sand-wash, or sandblast, for a more strategically placed worn and frayed finish . The picture on the next page displays what a sand-finished pair of jeans looks like[3].

There are many types of finishes for jeans, and sand finishing is just one of the many ways to make denim more aesthetically pleasing the eye. This type of finish became popular around the 1980's, and is still a huge trend today because of it's ability to make jeans look and feel more versatile . Although there are many ways to go about finishing jeans, sanded finishes continue to prove to be a popular choice among consumers throughout the years.



2.5.3. ENZYME WASH FINISHES FOR DENIM:

To break down the meaning and definition of my topic, I think we should know what each piece of it means. An enzyme is a biological chemical compound that reduces complex organic compounds to simpler compounds. This is important to the enzyme wash because one of its main selling points is that it is different from other types of denim finishes because it is organic and non-harmful to the environment. A reason that enzyme washing is so ecologically friendly is the natural origins of enzymes biodegrade rather than lingering in the water supply in the environment [9].

Now, the definition of enzyme wash is a fabric finish that uses cellulase enzyme to remove surface fuzz from cellulosic fabrics [9]. The cellulases are used because they loosen up the indigo dye in the denim [12]. The main purpose of the enzyme wash is to make the denim appear worn, rugged, broken in and used. The enzymes are used in denim finishing as an alternative to stonewashing, meaning that stonewashes and enzyme washes are very similar, but the enzyme wash still has its advantages [10]. Jeans tend to be softer with the enzyme wash as a result of the organic enzymes that eat away at the fabric from the cellulose [11]. Although this wash "eats away" at the fabric, it does not jeopardize its strength to hold up and it will make the fabric less likely to leave residue in drains or on other clothing [12]. Stonewash damages fibers during the wash, which differs from the enzyme wash that creates a great vintage look without damage (Jeans and Accessories).

2.5.4. STROM DENIM:

Storm Denim™ is a technology that was created to use as a garment finish on denim that would make the fabric water repellant. Now one might say they have already heard of water repellant apparel. This is a true statement, however on those pieces of apparel water repellant technology has only been used as a fabric finish. This means that is was a chemical finish that was first applied and after that process may have gone through other garment finishing processes. The unique design of Storm Denim™ lets its technology be the last finish to the denim allowing it to shows its features in its highest ability.[13]

Alexander Wang was the first designer to adapt this idea of Storm Denim™. He used this technology on a pair of jeans he showed on a runway in New York. He took it as a promotional idea to be fashionable and weather conscious at the same time. His designs will be sold at Barneys in the fall this year. Turning the page to another aspect of using this new technology was Mark's Work Warehouse. For more obvious reasons this technology will be used for Men's work clothes as the function has durability and water resistance that would be greatly beneficial to heavy wear and tear at work. This Canadian retailer will be selling it's products online this spring. These are just the first couple of ways Storm Denim™ have began to make its way into the hands of consumers and will likely grow over time.

The researchers at Cotton Inc. had a precise goal while creating this garment finish. "We wanted to offer a high degree of water repellency for use in rainwear and outerwear, while maintaining the comfort and breathability of cotton," states William A. Rearick, Cotton Incorporated Director, Textile Chemistry Research. (Cotton Inc.)[14] They successfully created a technology that has grown incredibly fast and taken different directions for advancement. These types of innovations continue to keep denim new and creative.Storm Denim™ has taken a new step in a creative direction.

2.6. PEACH FINISH:

Peach skin is a smooth finish applied to finely woven Micro Fiber fabric. The soft, suede finish are the results of sanding or chemical treatment of the fabric. This finish allows suits and dresses to flow with movement and drape beautifully. The feel of peach skin is soft, smooth and moderately wrinkle-resistant. It is a medium weight fabric that has fuzzy, suede like feel.

Peach Skin fabric suits and dresses are ideal for any season and weather due to its light weight and texture. Peach skin is not too heavy nor too hot which makes it perfect for any season. The feel of this luxurious fabric is soft, smooth and moderately wrinkle-resistant. Wrinkles fall out by simply hanging the ensemble. Style Magazine says "once you wear a Peach Skin suit, you will never want to take it off."

As a technique that creates a feel that is soft to the touch, peaching is a relatively easy way to create material that can be used in a number of different ways. Here is some information on how to create peached fabric, and how the material can be used.

Peaching is simply a process that involves sanding the fabric. The technique can be applied to just about any type of fiber, although it does seem to work more effectively with natural materials. After the fabric is woven, sections of the material are dipped in chemical compounds that permeate the fabric. The sections are then stretched taut and left to dry.

Once the sections have dried, the material is brushed either by hand or with the use of automated machinery. In either case, rollers with abrasive bristles, similar in appearance to a toothbrush, are brushed across the fabric. This helps to break some of the small fibers on the exterior of the material and teases them out. Teasing the broken fiber ends is what created the peached appearance and feel for the sanded fabric.

Along with the use of abrasive rollers, peached fabric can also be created by the use of chemical abrasion. With this method, the fibers are gently broken down with the use of chemical compounds, rather than being sanded by bristles. Laundry abrasion is also a means of producing peached fabric. Essentially, it is the motion within the laundering process that creates the break in the outside fibers and helps to produce the soft feel that is associated with peached fabric.

Because peached fabric holds its shape very well and is soft to the touch, the material is often used in household textiles such as casual tablecloths and napkins. Kitchen curtains can also be made from peached fabric. When it comes to clothing, peached fabric is an ideal choice for casual shirts, golfing shirts, and undergarments. The sanding techniques do not take away from the ability of the material to absorb and maintain color, which means that peached fabric is available in any color or pattern that one can imagine.

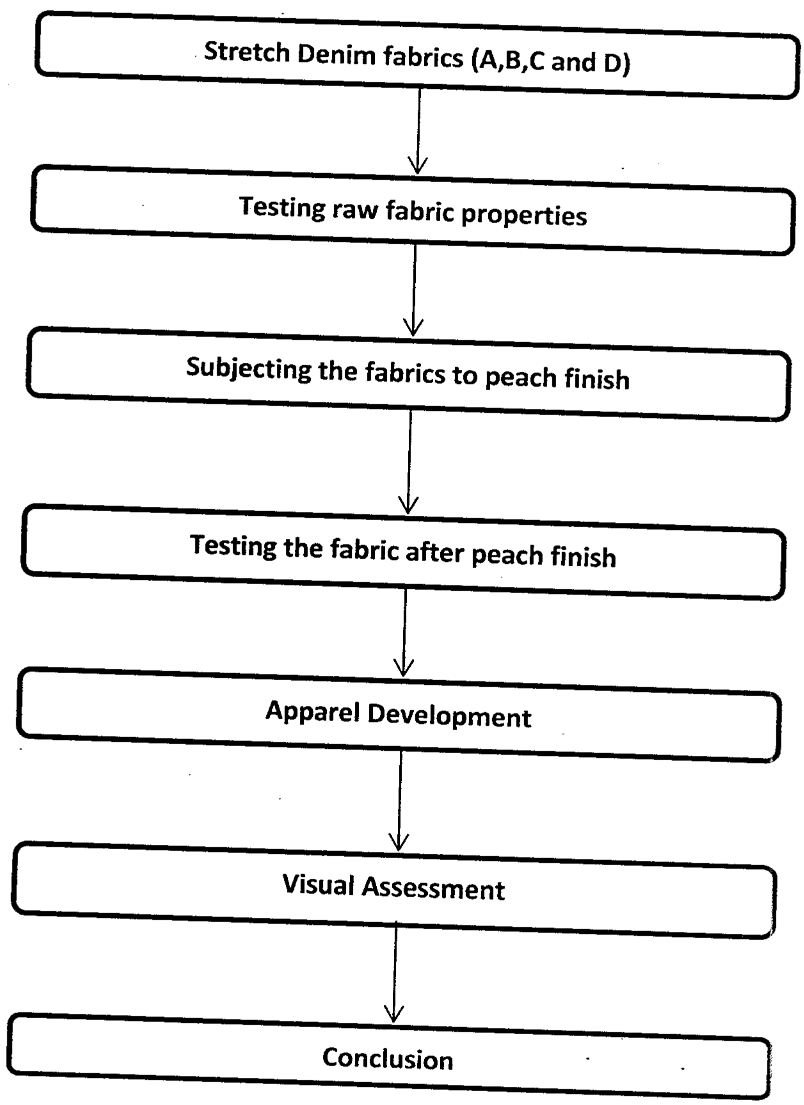
Both the finished product and the fabric treatment derive the name from a few observations about the look and feel of the material that results from the process. Looking at the material through the lens of a microscope, the material will appear to have a small layer of fuzz on the top, much like the fuzz that is found on the outside of the peach peel. Because the end result is both the look of peach fuzz and a feel that is not unlike rubbing a hand across the fuzz on a peach, the popular name came into common use in no time.

3. METHODOLOGY

The methodology of this study includes the following:

3.1. Selection of the fabric
3.2. Peach finish
3.3. Testing of the fabric
3.4. Apparel Development
3.5. Visual Assessment
3.6. Statistical analysis

Flowchart of the methodology:



3.1. SELECTION OF THE FABRIC:

Four types of denim fabrics having different amounts of spandex ratios were used for determining the performance properties of denim fabrics.

TABLE 3.1.1: PROPERTIES OF DENIM FABRIC

FABRIC CODE	THE LAYOUT OF WEFT CORE-YARN IN FABRIC	RATIO OF COTTON /SPANDEX %
A	ALL WEFT ARE PLAIN YARN	100 / 0
B	2 PLAIN YARN + 1 CORE-SPUN YARN	98.5 / 1.5
C	1 PLAIN YARN + 1 CORE-SPUN YARN	98.25 / 1.75
D	1 PLAIN YARN + 2 CORE-SPUN YARN	98 / 2

TABLE 3.1.2: PARAMETERS OF THE FABRIC

		FABRIC CODE			
PARAMETERS		A	B	C	D
YARN COUNT	WARP	10	10	10	10
	WEFT	11	12	12	12
WEAVE		3/1 RHT	3/1 RHT	3/1 RHT	3/1 RHT
SHRINKAGE % (AATCC 135)	WARP	3	3	3	3
	WEFT	3	8	10	12
TENSILE STRENGTH (Kg)	WARP	70	65	65	65
	WEFT	50	45	42	43
TEAR STRENGTH(Gms)	WARP	4500	4500	5000	4500
	WEFT	3500	3000	3100	3000
STRETCH %		-	19	24	30

3.2. PEACH FINISH:

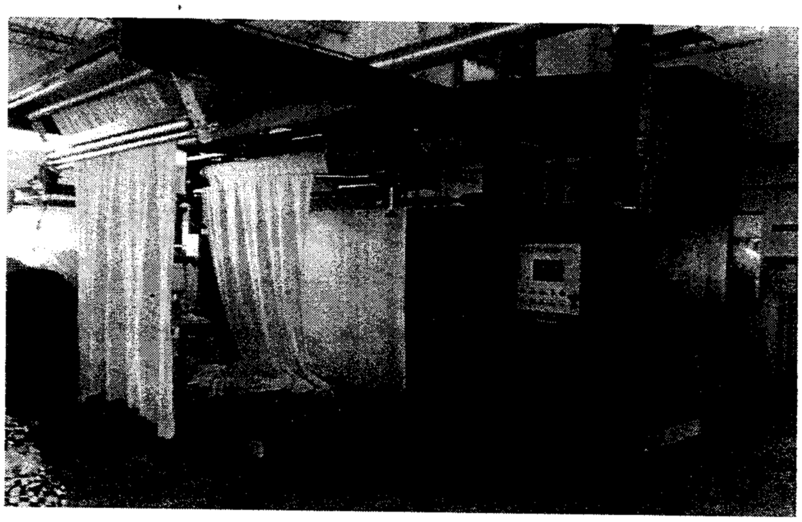
The peach skin effect refers to a super soft and fluffy touch which is created by slightly emerizing the fabric surface using state-of-the-art technology. The peach skin finish can be applied to almost any of the fabrics. Advantages of peach finish are:

- Super-soft
- Fluffy to the touch
- Wash resistant
- Oeko-Tex® Standard 100, class 1

Lafer is surely the most universally accepted and most popular "brush" sueding technology available. When using the Ultra Soft brushing mode, special metal plates allow keeping the fabric well spread at all times avoiding channeling and streaking. On conventional machines without these supports, the lengthwise tension causes a downward pressure that distorts the brush bristles causing channeling (lengthwise creasing) which on most fabrics will produce lengthwise streak marks and "centre to selvedge differences". The exclusive "Carbosint" diamond like emery developed by Lafer allows significantly reduce machine stops for emery replacements.

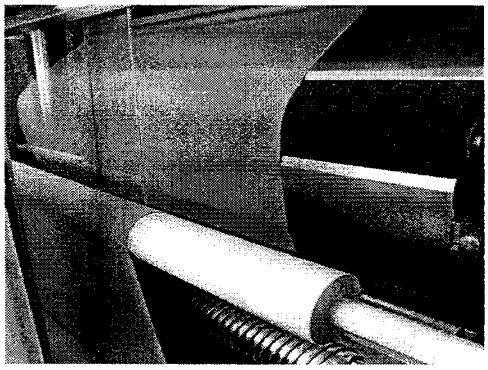
The machine is completely driven by AC motors with Inverters and has the following advantages:

- Accurate Control Of The Fabric Tension for automatic control of fabric tension.
- Possibility of Combined Process Abrasive Brush/ Sueding Roller to have new finishing effects and an higher production.
- Separate Control For Each Of The 8 Units.
- Process of Both Faces of the Fabric in one passage, for the machine suitable for woven fabrics.
- Individual Dust Suction Boxes, for each brush, in order to remove efficiently the powders generated during processing.



Each brushing unit is equipped with AC motor with Inverter for drive of the brush, fabric approaching roller, so that it is possible to control independently:

- The sense of rotation of each brush.
- The rotating speed of each brush.
- The approaching of the fabric to each brush.



These characteristics make this machine extremely versatile, suitable to every kind of fabric and in particular to knitted fabrics and elastic fabrics.

PARAMETERS:

The width of the lafer Ultrasoft comes around 220 cms. An electronic system maintains the raising energies constant while varying the fabric or drum speed, brush speed, taker-in tension, fabric return tension, drum tension and plaiter tension.

- RPM - 26
- Machine speed - 23
- Brush speed - 90
- Drum tension - 72 kg
- Taker-in tension - 16 kg
- Fabric return tension - 14 kg
- Plaiter tension - 10 kg

3.3. TESTING OF THE FABRIC:

The testing of the fabric was done under the following heads:

- Mechanical testing - Abrasion resistance, Crease recovery, Stiffness test, Drape, Stretch and recovery, Pilling.
- Physical testing - EPI, PPI, Thickness, Cover factor.
- Comfort testing - Air permeability, Water vapour permeability, Wicking, Thermal conductivity.
- Colour characteristics - Colour difference, colour strength, K/S value.

3.3.1. TESTING OF MECHANICAL PROPERTIES:

3.3.1.1. ABRASION RESISTANCE ASTM D4060:

The ability of a material to withstand mechanical action such as rubbing, scraping, or erosion, that tends progressively to remove material from its surface. Such an ability helps to maintain the material's original appearance and structure. Abrasion is one aspect of wear and is the rubbing away of the component fibres and yarns of the fabric. Abrasion may be classified into:

i) Flex abrasion (the flat area of the fabric is abraded)

ii) Edge abrasion (the kind of abrasion occurs at folds and collars)

iii) Flat abrasion (rubbing is accompanied by flexing and bending.

The resistance of materials and structures to abrasion can be measured by a variety of test methods. The samples of size of 38mm diameter is cut using template. The initial weight of the sample is found using electronic balance. The samples are placed in a mushroom shaped sample holder. The mushroom shaped holders are mounted on the machine in such a way that the samples are exposed to abradent material (emery paper). The machine is started and after the completion of 50 cycles the machine is stopped. The sample is removed from the holder and weighed. The weight loss of the abraded samples is calculated by using the formula:

$$\text{Weight loss} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} * 100$$

3.3.1.2. CREASE RECOVERY TEST BS EN 22313:

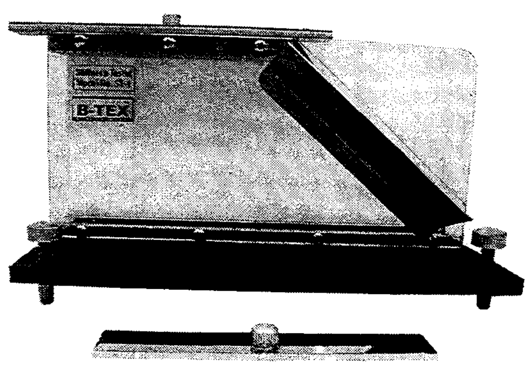
Creasing of a fabric during wear is not a change in appearance that is generally desired. The ability of a fabric to resist creasing is in the first instance dependent on the type of fibre used in its construction. The essence is that a small fabric specimen is folded in two and placed under a load for a given length of time to form crease and it is allowed to recover for a further length of time and the angle of the crease that remains is measured. The magnitude of this recovery angle is an indication of the ability of a fabric recovers from accidental creasing.

In the test the specimens are folded in two, the ends being held by tweezers. Half the specimens are folded face to face and half of them back to back. They are then placed under a load for 5 min and are transferred immediately to the holder of the measuring instrument and one leg of the specimen is inserted as far as the back stop. The instrument is adjusted continuously to keep the free limb of the specimen vertical. When a fabric is creased the resulting deformation has two components: one is fibre and yarn displacement relative to one another and the second is the stretching of the fibres on the outside of the curve. The smaller the radius of curvature, the more likely it is that the fibres are actually stretched rather than the curvature being accommodated by fibre displacement.

3.3.1.3. STIFFNESS TEST BS 3356:

Fabric stiffness indicates the resistance of the fabric to bending and it is a key factor in the study of handle and drape. Cantilever principle of working is used to determine the stiffness of fabrics stiffness is related with handle and drape of the fabric. A sample size of 6" X 1" is cut 10 samples in warp way and weft way direction. The tester is cut on a table, so that the horizontal platform and the index lines are at eye level. The specimen is placed in between the platform and the template so that the fabric and the zero mark of the template coincides with the datum line. Both template and fabric are slowly pushed forward. The fabric will tend to drop are the edge on its own weight. Both are moved forward until the tip of the fabrics cuts the index lines when viewed in the mirror. The bending length is measured from the scale. From the above readings flexural rigidity is calculated using the formula:

Flexural Rigidity = (Weight of the sample * Bending length *10^3) mg.cm



3.3.1.4. DRAPE:

Drape is the ability of a fabric to assume a graceful appearance in use. Drapeability of a fabric can be determined using the instrument. Drape meter and is expressed in terms of drape co-efficient. The sample can be prepared by cutting the specimen fabric to the desired size of 30 cm diameter to facilitate the fixing in the supporting disc by using a template designed as an accessory for the drape tester. The transparent lid of drape tester is opened and the supporting disc is presses down to the platform and locked at the position is taken out by unsewing rushed net. The conditional specimen is then carefully transferred and placed over the bottom supporting disc. The top supporting disc is then placed over the fabric and it made tight by securing on the knurled nut over the threaded stem of the supporting disc. Carefully Press the supporting disc by un-twisting anticlockwise. The supporting disc unit is released and allowed to raise by means of a compressed spring. This allows the edge of the fabric to drape freely under its own weight. The top level is now closed and sheet of paper size 30 cm x 35 cm is placed over it. The light is switched on .Draw the outline of the projected and area of the specimen. The formula to calculate the drape co-efficient is,

$$\text{Drape co-efficient} = \frac{\text{Drape area - small disc}}{\text{Large disc - small disc}}$$

3.3.1.5. STRETCH AND RECOVERY BS EN. 14704-1:2005 :

The stretch and recovery of material was analyzed through BS EN. 14704-1:2005 property of a material by virtue of which it tends to recover its original size and shape immediately after the removal of the force causing deformation. The fabric samples shall be conditioned for a minimum of 20h in a tension free state. The prepared specimens shall be conditioned in a tension free state for a further 4h after preparation, to minimize the effects of handling during preparation.

a) Elongation, S, expressed as a percentage

$$S = \frac{E - L}{L} * 100$$

Where, E is the extension (mm) at maximum force on the 5^{th} cycle

L is the initial length (mm)

b) Force decay due to time, A – expressed as a percentage

$$A = \frac{V - W}{V} * 100$$

Where, V is the maximum force from the final cycle

W is the maximum force on the final cycle, after a specified holding period.

c) Force decay due to exercising, B, expressed as a percentage

$$B = \frac{X - Y}{X} * 100$$

Where, X is the maximum force at the specified elongation on an initial cycle

Y is the maximum force at the same specified elongation on subsequent cycle.

d) Un-recovered elongation, C, expressed as a percentage

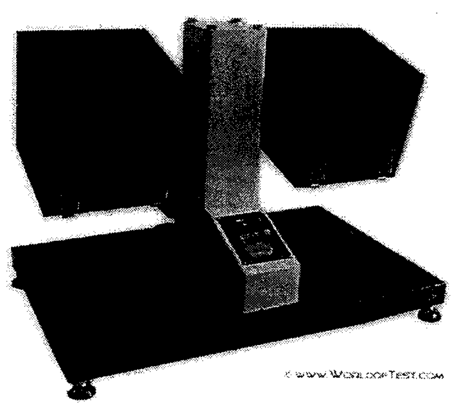
$$C = \frac{Q - P}{P} * 100$$

Where, Q is the distance between applied ref marks after a specified recovery period

P is the initial distance between applied reference marks.

3.3.1.6. PILLING ASTM D3511:

The formation of little fuzzy balls on a fabric surface caused by the rubbing off of loose ends of fiber too long or strong to break away entirely.To determine the pilling and fuzzing characteristics pilling tester is used. The fabrics to be tested must be wound on special pipes of Polyurethane (by means of the fitting kit) which are then placed into the cork paneled boxes. After setting the required rotation number (999999 max.) and the rotating speed (30 or 60 rpm), press the function key to start testing. Once the preset cycle is over, the pilling forming on the sample is evaluated and classified by comparison with the special set of standard photographs. When using the kit for the snagging test, the fabrics deterioration caused by the entangling into pointed materials with known characteristics is simulated.



3.3.2. TESTING OF PHYSICAL PROPERTIES:

3.3.2.1. ENDS PER INCH (EPI):

Ends per inch (or EPI) are the number of warp threads per inch of woven fabric. In general, the higher the ends per inch, the finer the fabric is. It is very commonly used by weavers who must use the number of ends per inch in order to pick the right reed to weave with. The number of ends per inch varies on the pattern to be woven and the thickness of the thread.

Plain weaves generally use half the number of wraps per inch for the number of ends per inch, whereas denser weaves like a twill weave will use a higher ratio like two thirds of the number of wraps per inch. Finer threads require more threads per inch than thick ones, and thus result in a higher number of ends per inch. [21]

3.3.2.2. PICKS PER INCH (PPI):

Picks per inch (or PPI) is the number of weft threads per inch of woven fabric. A pick is a single weft thread, hence the term. In general, the higher the picks per inch, the finer the fabric is. The number of picks per inch in a piece of woven cloth varies depending on what stage the cloth is at. Before the cloth is woven the weft has a certain number of picks per inch, which is directly related to what size reed.

After weaving the number of picks per inch will increase, and it will increase again after being washed. This increase in the number of picks per inch and shrinkage in the size of the fabric is known as the take-up. The take-up is dependent on many factors, including the material and how tightly the cloth is woven. Tightly woven fabric shrinks more (and thus the number of picks per inch increases more) than loosely woven fabric, as do more elastic yarns and fibres.

3.3.2.3. COVER FACTOR:

Cover factor is the degree of closeness of yarn (both warp and weft) in a fabric. Formula to calculate cover factor is,

$$\text{Cover factor} = \frac{k_1 + k_2 - k_1 k_2}{28}$$

Where $k_1 = EPI / (n)^{1/2}$

$k_2 = PPI / (n)^{1/2}$

3.3.3. TESTING OF COMFORT PROPERTIES:

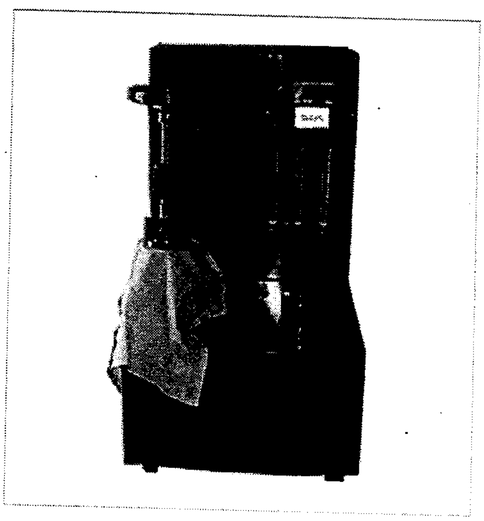
3.3.3.1. AIR PERMEABILITY ASTM D2752:

Air permeability is an important property for woven and it depends on many parameters of the fabric. The porosity of a fabric as estimated by the ease with which air passes through it. The pilot test must be performed long enough to evacuate a minimum of 1.5 - 2 pore volume of air in order to gather sufficient and representative data.

This typically can be accomplished within 8 to 12 hours of test operation. The tests need to be conducted for a long enough period of time for the measured vacuums and extracted concentrations to reach equilibrium conditions. Initial extracted concentrations observed are not indicative of equilibrium conditions and tend to be higher than during system operation. Sufficient steps should be performed in order to adequately establish the relationship between vacuum, air flow rates and the mass removal rate.

The highest vacuum step applied should be at the maximum capabilities of the air pump or blower used. Lower vacuum step tests should also be performed, because results from operating at the vacuum extremes helps to determine the vacuum required obtaining optimum mass removal rates. Changes in barometric pressure should be monitored at the beginning and end of each vacuum step, in order to determine baseline shifts in apparent vacuum.

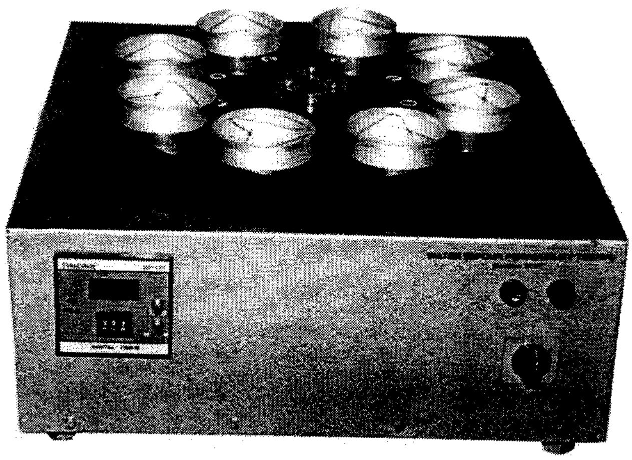
Vacuum monitoring readings should be taken at wells and/or probes at nominal 15 minute intervals through each vacuum step. Air flow rates should be measured at the extraction well frequently throughout each vacuum step in order to document any increase or decrease in flow. Blowers/vacuum pumps need to have explosion proof motors, starters, and electrical systems.



3.3.3.2. WATER VAPOUR PERMEABILITY:

The water vapour permeability is the measure for breathability for a textile's ability to transfer moisture. The water vapour permability tester is capable of holding 8 samples. Evacuate the air from the sealing tube / membrane cavity. Testing of water permeability should be performed in stable ambient conditions. It is assumed, that ambient conditions are stable if temperature and humidity are within specified thresholds.

It has a nut of circular opening in which the samples are mounted on the sample holders which rotate at specified revolution per minute with the help of motor pulley & belts. A moisture analyzer should be plugged to mains at least 30 minutes before test initiation. Distilled water that is used for the test should have temperature close to ambient temperature of test room. Water should be stored in test room for at least 24 hours before test procedure initiation for its thermal stabilization.



3.3.3.3. WICKING:

The ability of a material to not only absorb water but to actually move it away from our bodies. Wicking fabrics are modern technical fabrics which draw moisture away from the body. For this test, strips of material are clipped to a bar at a fixed height above beakers of water and dye. The distance the water travels up the material is measured at various intervals over thirty minutes. A good "wickable" fabric will transport all the water straight up. To determine the wickability, four specimens (which are from warp and weft) are to be prepared. The specimens are suspended vertically with its ends dipping into the solution(50g dye in 100ml water). The effects for warp and weft directions at different heights are observed. The average time is calculated.

3.3.3.4. THERMAL CONDUCTIVITY:

Thermal conductivity is the quantity of heat conducted per second normally across unit area of cross section of the material per unit temperature difference. It denotes the heat conducting power. Its unit is Watts/meter/Kelvin.

To determine thermal conductivity, Lee's disc is used. In this test, steam is passed through the chamber. As heat gets conducted into the brass disc through the bad conductor, it gets heated up. The temperature is noted from time to time. At one stage the temperature becomes steady. When the temperature becomes steady for at least 10 minutes the steady temperature is noted ($\theta_2{}^0C$)

The temperature of steam is noted ($\theta_1{}^0C$). Now the cardboard is removed and the brass disc is heated in direct contact with the steam chamber until the temperature rises by about 5^0C above the steady temperature. The disc is now separately suspended from the ring after removing from the steam chamber. Temperatures are noted in steps of 30secs from (θ_2 + 5) ^0C to (θ_2 –5) ^0C and the values are tabulated (Table) . A graph is drawn with temperature on the Y axis and the time on the X axis.

A horizontal line is drawn corresponding to steady temperature θ_2 ^0C . The time dt for a fall of temperature of θ_2 ^0C is found by taking two points one degree above 2 and the other one degree below. Note down the mass (M) of the brass disc B as noted over it or determine it's mass using balance . It's diameter is found and hence the radius (r) is determined using vernier calipers.The thickness (l) of the brass disc is found using vernier calipers and thickness of the bad conductor (d) with a screw gauge.

Co-efficient of thermal conductivity (k) is calculated by,

$$K = \frac{M * S * D * (R+2L) * (d\theta/dt)}{3.14 * R^2 * (2R+2L) * (\theta_1 - \theta_2)}$$

Where, M = Mass of the disc (kg)
S = Specific heat (Joule/kg/Kelvin)
D = Thickness of the sample (m)
R = Radius (m)
L = Thickness of the disc(m)
θ_1 = Temperature of steam
θ_2 = Steady temperature
$d\theta/dt$ = Rate of heat radiation of brass disc.

3.3.4. COLOUR CHARACTERISTICS:

In textiles, colour quality is the product quality and one of the major items in product quality is closeness of the match. A closeness of match should be exactly identical or duplicate to standard. The instrumental colour matching technique was evolved to overcome some of the difficulties in industries and it is currently practiced in most of the advanced industries. Computer colour matching (CCM) technique is more useful and important to access the various parameters accurately related to dyeing and printing.

3.3.4.1. COLOUR DIFFERENCE:

The extent to which a pair of colour will differ from each other under various illuminants are calculated using different formulae. Formulae, which figure in most of the programmes are HUNTER-LAB, ANLAB, FMC II, CIELAB, JPC 79, CMC, etc. Pass-fail analysis as per user defined tolerance limits. Shade sorting, mostly as per 555 systems.

Dye strength evaluation and residual tone analysis, the most common basis being minimum wavelength, tristimulus values XYZ. Whiteness and yellowness indicates as per formula, the most common being CIE indices. Objective fast evaluation, with respect to gray scale for colour change and staining. Statistical methods for data analysis, setting up tolerance limits automatically.

3.3.4.2. K/S VALUE:

Reflectance values measured with the help of spectrometer are converted into k/s function which is additive and hence it is valid for a mixture of dyes. Thus,

$$K/S = (1-R*R)/2R$$

Where, K = Co-efficient of absorption

S = Co-efficient of scattering

R = Reflectance of the colourant at given wavelength

K/S are called as Kubelka – Munk function.

3.3.4.3. COLOUR STRENGTH:

Colour analysis of dye solution has little relevance beyond dye strength estimation. Earlier, reflectance spectrophotometry was developed into a reliable technique for colour measurement. Transmittance measurements can enable an accurate determination of strength ratios of dyes.

A large number of factors such as monochromaticity of light, interactions of dye in solution, influence of dye bath conditions affects the linearity and additivity. Despite these limitations it is possible to accurately estimate the colour strength.

3.5. VISUAL ASSESSMENT:

A group of 20 members were selected under the age of 18-22 for the assessment of fabric before and after peach finish and the results were given in the table 3.5.1. A Profoma which included details regarding general appearance, colour, evenness, lusture and texture is shown below:

3.5.1. PROFORMA FOR VISUAL ASSESSMENT:

S.no	**Finished samples**		**Criteria analyzed**													
			General appearance			**Colour**			**Evenness**		**Texture**			**Lustre**		
			Good	**Medium**	**Fair**	**Bright**	**Medium**	**Dull**	**Even**	**Uneven**	**Smooth**	**Medium**	**Coarse**	**High**	**Medium**	**Low**
1	**A**	**Be**														
2		**Af**														
3	**B**	**Be**														
4		**Af**														
5	**C**	**Be**														
6		**Af**														
7	**D**	**Be**														
8		**Af**														

3.6. STATISTICAL ANALYSIS:

Analysis of variance (ANOVA) is a collection of statistical models, and their associated procedures, in which the observed variance in a particular variable is partitioned into components attributable to different sources of variation. In its simplest form, ANOVA provides a statistical test of whether or not the means of several groups are all equal, and therefore generalizes *t*-test to more than two groups. Doing multiple two-sample t-tests would result in an increased chance of committing a type I error. For this reason, ANOVAs are useful in comparing two or more means.

There are several types of ANOVA. Many statisticians base ANOVA on the design of the experiment, especially on the protocol that specifies the random assessment of treatments to subjects; the protocol's description of the assignment mechanism should include a specification of the structure of the treatments and of any blocking. It is also common to apply ANOVA to observational data using an appropriate statistical model.

Some popular designs use the following types of ANOVA:

- One-way ANOVA is used to test for differences among two or more independent groups. eg. Different levels of urea application in a crop. Typically, however, the one-way ANOVA is used to test for differences among at least three groups, since the two-group case can be covered by a t-test. When there are only two means to compare, the t-test and the ANOVA F-test are equivalent; the relation between ANOVA and t is given by $F = t^2$.
- Factorial ANOVA is used when the experimenter wants to study the interaction effects among the treatments.
- Repeated measures ANOVA is used when the same subjects are used for each treatment.

IMPORTANCE OF ANOVA:

Analysis of variance (ANOVA) is defined as the "Separation of variance ascribable one group of cause from the variance ascribable to another group".

- ANOVA is the most powerful statistical tools.
- ANOVA is general method of analyzing data from designed experiments.
- ANOVA is a powerful process that is useful to analyze the variance between any number of sample.
- ANOVA is useful to find significance level between any number of samples and we can analyze whether difference is statistically significant (or) not
- This is specially useful to give conclusions for the data obtained in researches.
- It is most powerful than t-test as it has no limit in samples that we analyze, T-test is useful to analyze up to only 30 samples

The method of ANOVA tests the hypotheses that:

H_0: $\mu_1 = \mu_2 = \mu_3, = \dots = \mu_k$ or

H_a: Not all the means are equal

3.6.1. ANOVA table – Basic layout:

Source	**Sum of squares (SS)**	**Degree of freedom (df)**	**Mean Square**	**F-statistics**	**P-value**
Between samples	SSB	k-1	$MSB = \frac{SSB}{k-1}$	$F = \frac{MSB}{MSE}$	Value from table
Within samples	SSE	n-k	$MSE = \frac{SSE}{n-k}$		
Total	SSTO	n-1			

ACCEPTANCE CRITERIA FOR THE NULL HYPOTHESIS:

If the F-statistics computed in the ANOVA table is less than the F-table statistics or the P-value if greater than the alpha level of significance, then there is not reason to reject the null hypothesis that all the means are the same.

That is **accept H_0 if: F-Statistics < F-table** or **P-value > alpha.**

Thus, this test uses the F-distribution (probability distribution) function and information about the variances of each population (within) and grouping of populations (between) to help decide if variability between and within each populations are significantly different.

4. RESULTS AND DISCUSSION

The results of yarn and fabric tests are discussed under the following heads:

4.1 Yarn Properties

4.2 Fabric Properties - Physical properties

4.3 Fabric Properties - Comfort properties

4.4 Fabric Properties - Mechanical properties

4.5 Fabric Properties - Colour Characteristics

Physical Properties:

- EPI
- PPI
- Thickness
- Cover factor

Comfort Properties:

- Thermal conductivity
- Water Vapour Permeability
- Wicking

Mechanical Properties:

- Abrasion resistance
- Crease recovery
- Drape
- Flexural rigidity
- Pilling

4.1 YARN PROPERTIES

		Sample A		Sample B		Sample C		Sample D	
S.No	Property	Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
1.	Count	10	10	10	12	12	16	10	16
2.	Shrinkage %	3	3	3	8	3	10	3	12
3.	Tensile (kg)	70	50	65	35	65	30	55	25
4.	Tear(gms)	4500	3500	4500	3000	5000	2600	4500	2400
5.	Stretch%	0	0	19	19	24	24	30	30
6.	Growth%	0	0	4	4	4.5	4.5	7	7

4.2. PHYSICAL PROPERTIES:

The physical properties of stretch denim before and after peach finish is shown in the table 4.1.1 and analysis of variance for physical properties of stretch denim before and after is shown in the table 4.1.2

4.2.1. Physical Properties Of Stretch Denim Before And After Peach Finish:

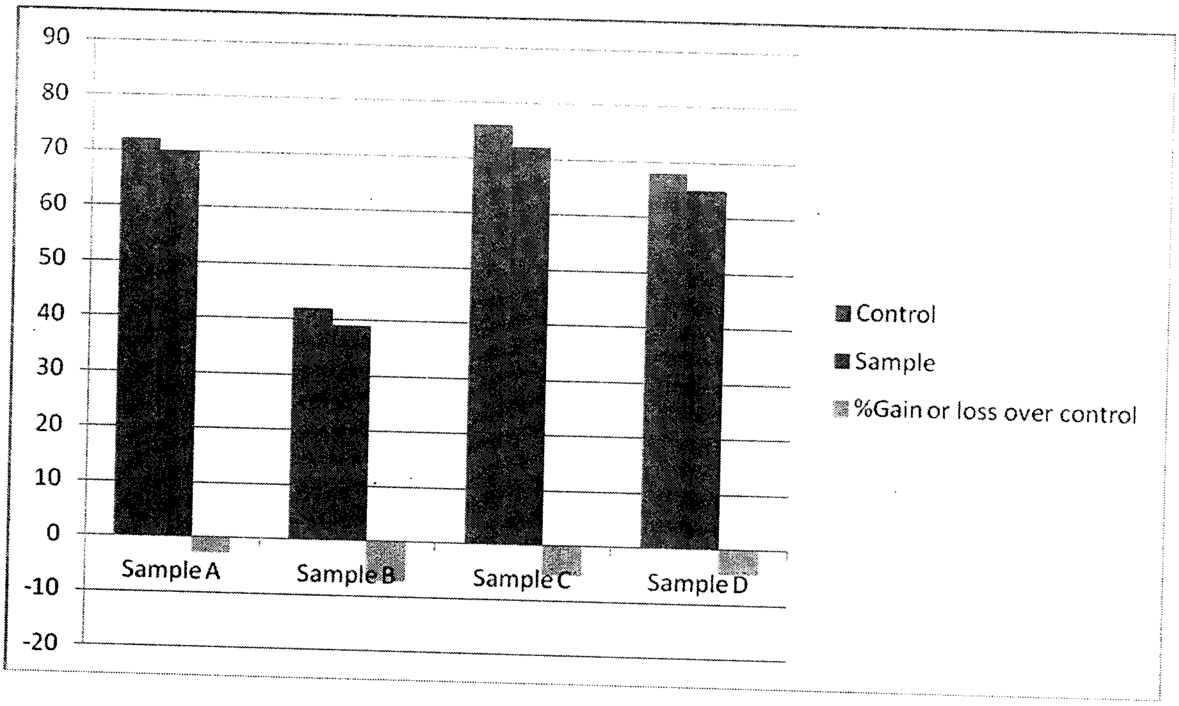
S.No	Name of the test	Control A	Sample A	%Gain or loss over control A	Control B	Sample B	%Gain or loss over control B	Control C	Sample C	%Gain or loss over control C	Control D	Sample D	%Gain or loss over Control D
1.	EPI	72	70	-2.778	42	39	-7.142	76	72	-5.26	68	65	-4.41
2.	PPI	57	54	-5.26	54	50	-7.14	45	41	-8.889	47	45	-4.25
3.	Thickness	0.47	0.45	-4.25	0.51	0.47	-7.8	0.45	0.38	-50.55	0.51	0.46	-9.8
4.	Cover factor	-141.96	-130.571	-8.02	-128.6	-111.96	-12.99	-117.82	-101.39	-13.94	-110.036	-100.53	-8.63

4.2.2. Analysis of variance for physical properties of stretch denim before and after peach finish:

	Source of variation	SS	df	MS	F
EPI	B/w groups	18	1	18	0.0767*
	Within groups	1408	6	234.6667	
PPI	B/w groups	21.125	1	21.125	0.6541*
	Within groups	193.75	6	32.29166	
Thickness	B/w groups	0.04267	1	0.04267	2.3486*
	Within groups	0.007267	4	0.001816	
Cover factor	B/w groups	303.142	1	303.142	4.7302*
	Within groups	256.3422	4	64.0855	
*Significant at 5% level		**Significant at 1% level			

EPI of Stretch Denim Before And After Peach Finish is shown in the fig 4.2.3

Fig.No:4.2.3.



An overall reduction in values was noticed in EPI and PPI after peach finish, when compared to control in all the four samples tested. This may be attributed to the movement of yarns within the fabric due to abrasion of the emery rollers. Thickness and cover factor values have also shown reduction leading to changes in the comfort characteristics of the fabric.

The ANOVA results reveal a significant difference at 5 % level for all the four physical properties mentioned above.

4.3. COMFORT PROPERTIES:

The comfort properties of stretch denim before and after peach finish is shown in the table 4.2.1 and analysis of variance for comfort properties of stretch denim before and after is shown in the table 4.2.2

4.3.1. Comfort Properties of Stretch Denim Before And After Peach Finish:

		Sample A			Sample B			Sample C			Sample D		
S.No	Name of the test	Control A	Sample A	%Gain or loss over control A	Control B	Sample B	%Gain or loss over control B	Control C	Sample C	%Gain or loss over control C	Control D	Sample D	%Gain or loss over Control D
1.	**Wicking**												
	Warp	5.5	7.5	36.36	8	9.5	18.75	8	9	12.5	6.5	7	7.69
	Weft	5.3	7.5	41.51	8	9.3	16.25	8	9	12.5	6.2	7	12.9
2.	**Thermal Conductivity**	3.7	4.2	17.16	2.6	3.2	23.46	2.4	2.9	23.14	2.4	2.7	15.67
3.	**Water Vapour Permeability**	2893.5	3181.0	9.03	2869.0	3211.7	11.94	2960.9	3064.9	3.5	2844.6	3095.4	8.82

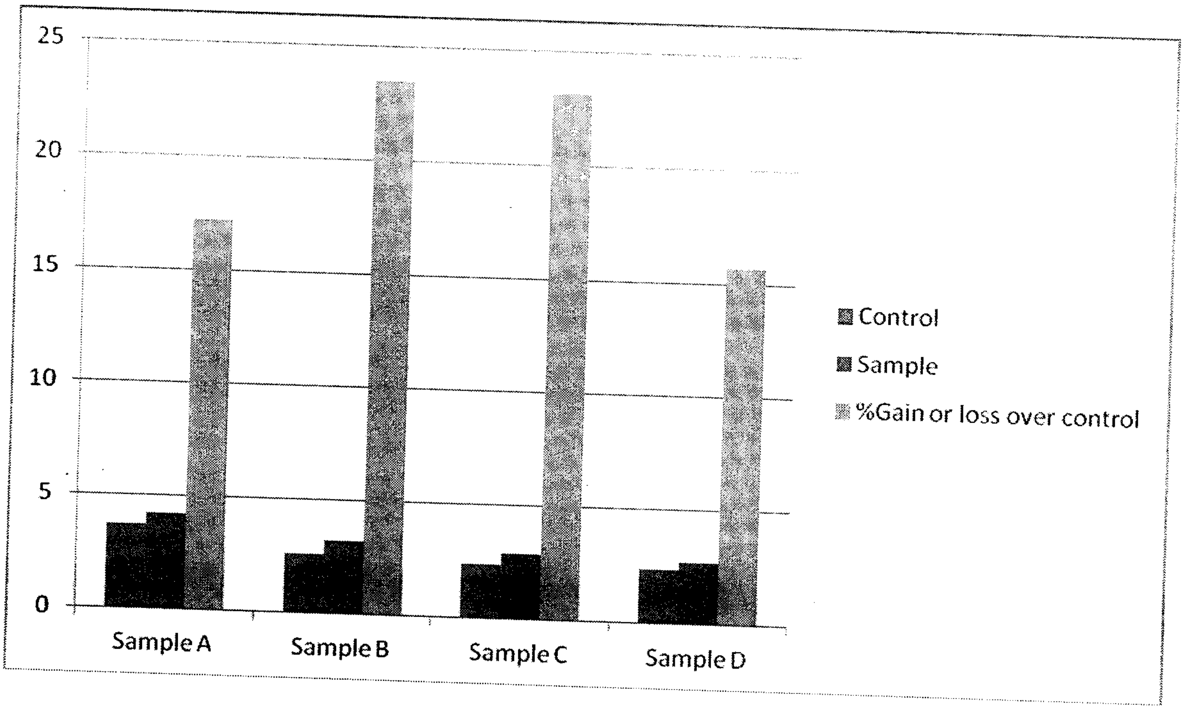
4.3.2. Analysis Of Variance for Comfort Properties of Stretch Denim Before And After Peach Finish:

		Source of variation	SS	df	MS	F
Wicking	**Warp**	**B/w groups**	1.5	1	1.5	1.2*
		Within groups	5	4	1.25	
	Weft	**B/w groups**	1.6	1	1.6	1.2*
		Within groups	5.2	4	1.3	
Thermal conductivity		**B/w groups**	1.1	1	1.1	2.3*
		Within groups	5.4	4	4.7	
Water vapour permeability		**B/w groups**	4.6	1	4.6	3.4*
		Within groups	9.2	4	4.2	

*Significant at 5 % level **Significant at 1% level

Thermal Conductivity of Stretch Denim Before And After Peach Finish is shown in the fig 4.3.3

Fig.No:4.3.3.



An overall increase in values was noticed in wicking, water vapour permeability and thermal conductivity after peach finish, when compared to control in all the four samples tested because spacing between the yarn gets increased due to the pressure of the rollers applied during finishing. Thus the increase in overall values attributes to the increase in comfort properties.

The ANOVA results reveal a significant difference at 5 % level for all the four comfort properties mentioned above.

TIFAC – Centre of Relevance & Excellence (CORE)
IN TEXTILE TECHNOLOGY & MACHINERY
SUPPORTED BY
Technology Information, Forecasting and Assessment Council (TIFAC)
(Department of Science & Technology (DST), Govt. of India) & Textile Industries

KCT/TIFAC/SSO/12

Date: 22.03.12

To

A. Preethi,
B. Tech - Fashion Technology,
Kumaraguru College of Technology,
Coimbatore - 641 049

Ref: Your Letter dated 19.03.12

With reference to the above, we have tested your sample for Water Vapour Permeability and the report is as follows,

Sample No.	Water Vapour Permeability (gm/m^2/day)	Average
1.	3181.08	2963.91
	2869.09	
	2960.85	
	2844.62	
2.	2893.56	3066.38
	3211.67	
	3064.85	
	3095.44	

SAMPLE 1 - Denim without peach finish
SAMPLE 2 - Denim peach finish

K. Gopinath
Senior Scientific Officer
KCT - TIFAC CORE

Address for Communication
TIFAC – CORE in Textile Technology & Machinery
KUMARAGURU COLLEGE OF TECHNOLOGY
COIMBATORE – 641 049 TAMILNADU
Phone: +91 422 2661171 (Direct), 2669401 – 405. (Extn. 1171), Telefax: +91 422 2661171
E-mail: kct.tifaccore@gmail.com Website: http://kct.missionreach.org.in

4.4. MECHANICAL PROPERTIES:

The mechanical properties and its analysis of variance of stretch denim before and after peach finish is shown in the table 4.3.1 and 4.3.2.

4.4.1. Mechanical Properties of Stretch Denim Before And After Peach Finish:

S.No	Name of the test	Control A	Sample A	%Gain or loss over control A	Control B	Sample B	%Gain or loss over control B	Control C	Sample C	%Gain or loss over control C	Control D	Sample D	%Gain or loss over Control D
1.	Drape	0.80	0.72	-10.26	0.78	0.71	-9.78	0.79	0.71	-9.62	0.79	0.71	-10.13
2.	Abrasion Resistance	1.96	2	1.99	3.7	4	6.1 4	2.12	2.56	20.75	2.04 6.1	2.32	13.69 2.127 .56
3.	Crease Recovery												
	Warp	120	105	-12.5	115	110	-4.34	121	105	-13.22	122	102	-16.39
	Weft	118	110	-6.77	115	102	-11.3	120	105	-12.5	120	102	-15
4.	Flexural Rigidity												
	Warp	105.37	70.58	-33.01	142.99	99.83	-30.18	164.78	120.23	-25.21	223.95	164.78	-26.42
	Weft	105.37	84.36	-19.93	150.03	123.23	-17.86	84.36	70.59	-16.32	58.4	51.11	-12.48

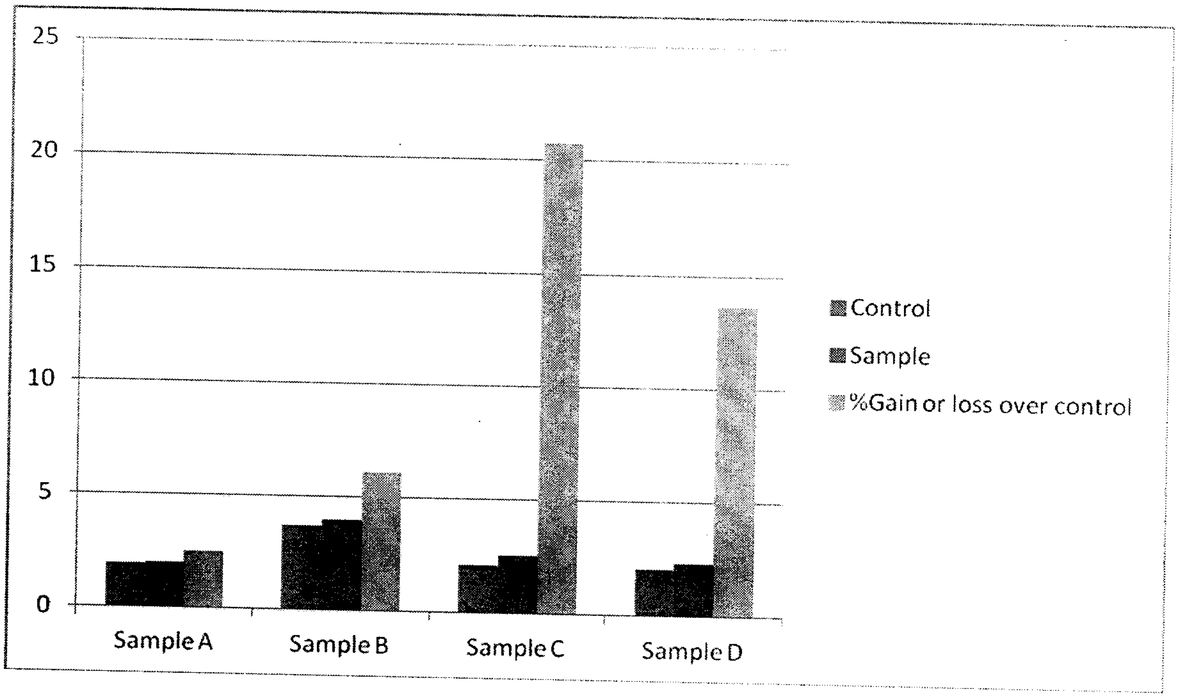
4.4.2. Analysis Of Variance for Mechanical Properties of Stretch Denim Before And After Peach Finish:

		Source of variation	SS	df	MS	F
Drape		B/w groups	0.009048	1	0.009048	2.17*
		Within groups	1.67	4	4.17	
Abrasion Resistance		B/w groups	0.147894	1	0.147894	0.166*
		Within groups	3.549962	4	0.8874	
Crease Recovery	Warp	B/w groups	2.1667	1	2.1667	6.8**
		Within groups	6.3333	4	5.3333	
	Weft	B/w groups	3.6667	1	3.6667	5.7**
		Within groups	2.6667	4	5.6667	
Flexural Rigidity	Warp	B/w groups	3.242	1	3450.242	3.6*
		Within groups	5674.293	4	1418.573	
	Weft	B/w groups	3.7633	1	3.7633	0.2107*
		Within groups	7.754	4	5.188	

*Significant at 5% level **Significant at 1% level

Abrasion resistance Of Stretch Denim Before And After Peach Finish is shown in the fig 4.4.3

Fig.No:4.4.3.



Reduction in values was noticed in drape, crease recovery and flexural rigidity after peach finish, when compared to control in all the four samples tested due to decrease in thickness and GSM which makes the fabric more flexible. Increase in abrasion resistance values show that the fabric has high resistance to tear.

The ANOVA results reveal a significant difference at 5 % level for drape, abrasion resistance and flexural rigidity and also it shows significant difference at 1% level for crease recovery.

4.4 COLOUR CHARACTERISTICS

4.5.1. 100% Cotton:

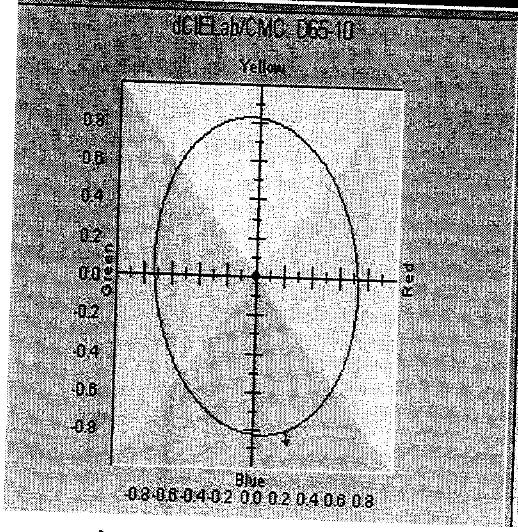
Standard Name	L*	a*	b*	C*	h°
100% Cotton	25.41	1.08	-3.74	3.89	286.15

Trial Name	DL*	Da*	Db*	DC*	DH*	DEcmc	P/F DEcmc	%STR-WSUM	%STR-SUM	%STR-S
100% Cotton fi...	2.83 L	-2.11 G	-7.86 B	7.75 B	-2.48 G	9.66	Failed	77.51	84.78	93.87

100% Cotton

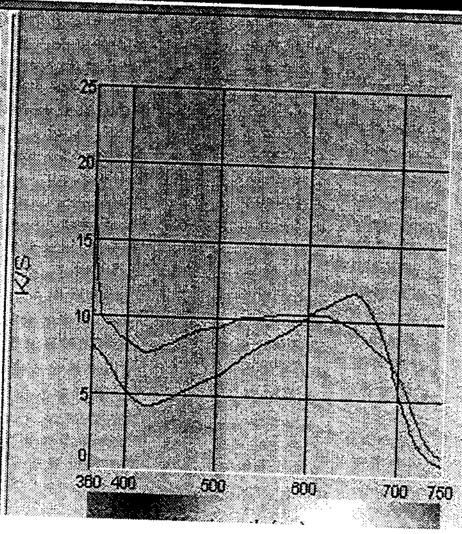
100% Cotton finished

100% Cotton



100% Cotton

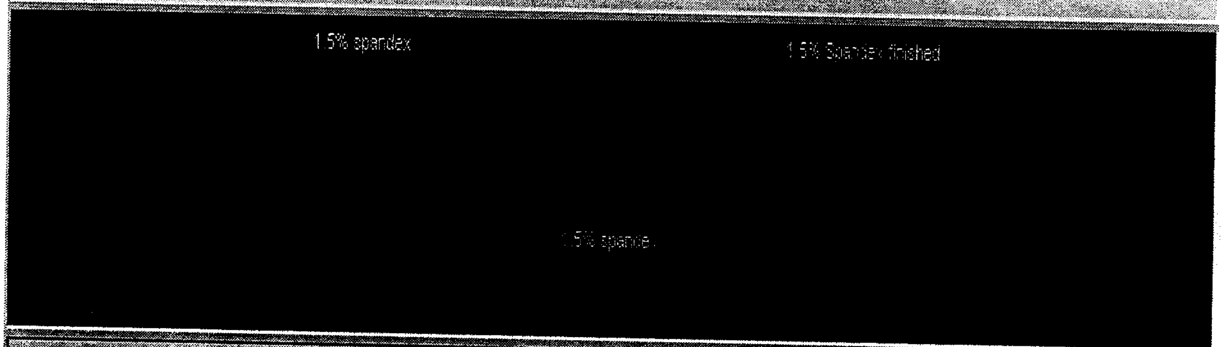
WL (nm)	K/S
360	20.29
370	10.44
380	9.48
390	8.85
400	8.39
410	8.02
420	7.71
430	7.86
440	8.13
450	8.36
460	8.72
470	8.97
480	9.21

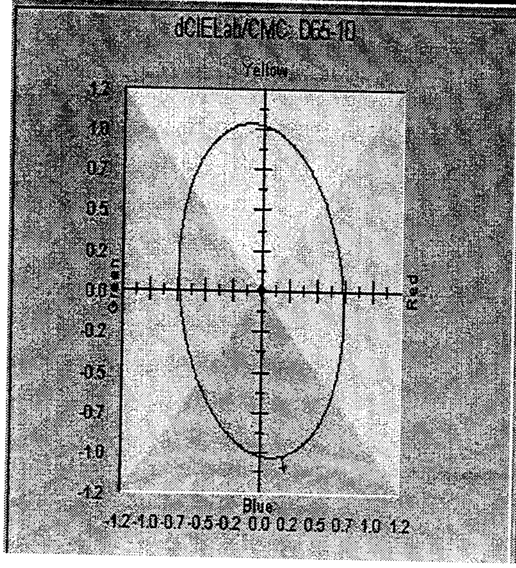


4.4.2. 1.5% Spandex

Standard Name	L*	a*	b*	C*	h°
1.5% spandex	23.32	1.28	-6.39	6.52	281.35

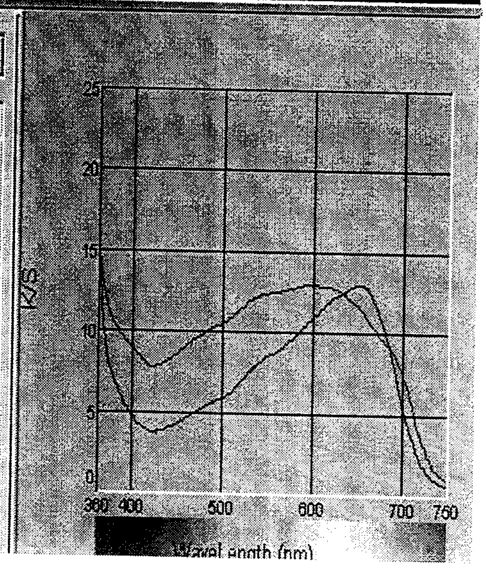
Trial Name	DL*	Da*	Db*	DC*	DH*	DEcmc	P/F DEcmc	%STR-WSU...	%STR-SUM
1.5% Spandex finished	4.91 L	-2.48 G	-7.67 B	7.60 B	-2.71 G	9.12	Failed	67.72	74.90



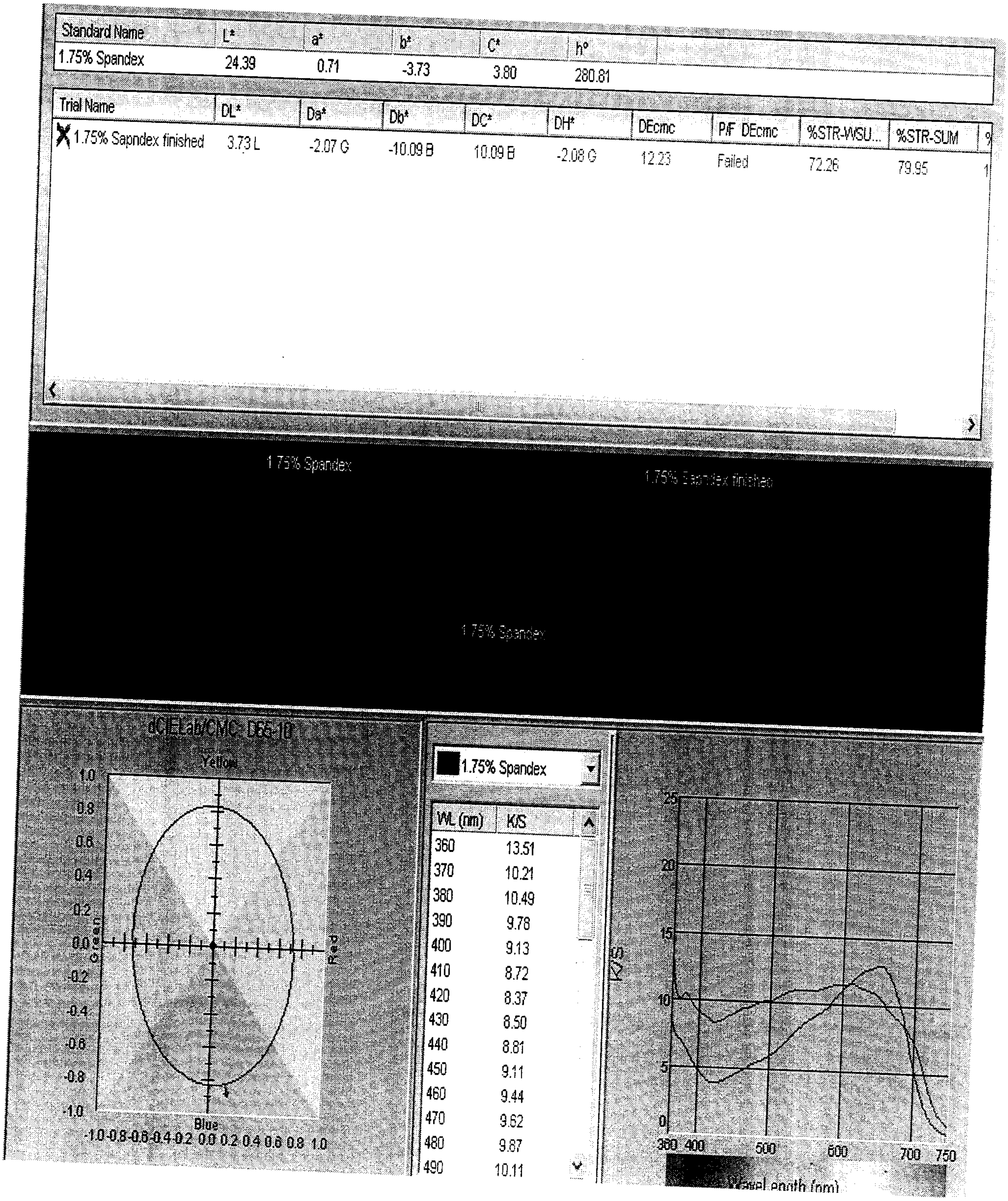


1.5% spandex

WL (nm)	K/S
360	14.89
370	11.74
380	10.36
390	9.55
400	8.97
410	8.32
420	7.83
430	7.94
440	8.29
450	8.68
460	9.19
470	9.57
480	9.96
490	10.31



4.5.3. 1.75% Spandex:

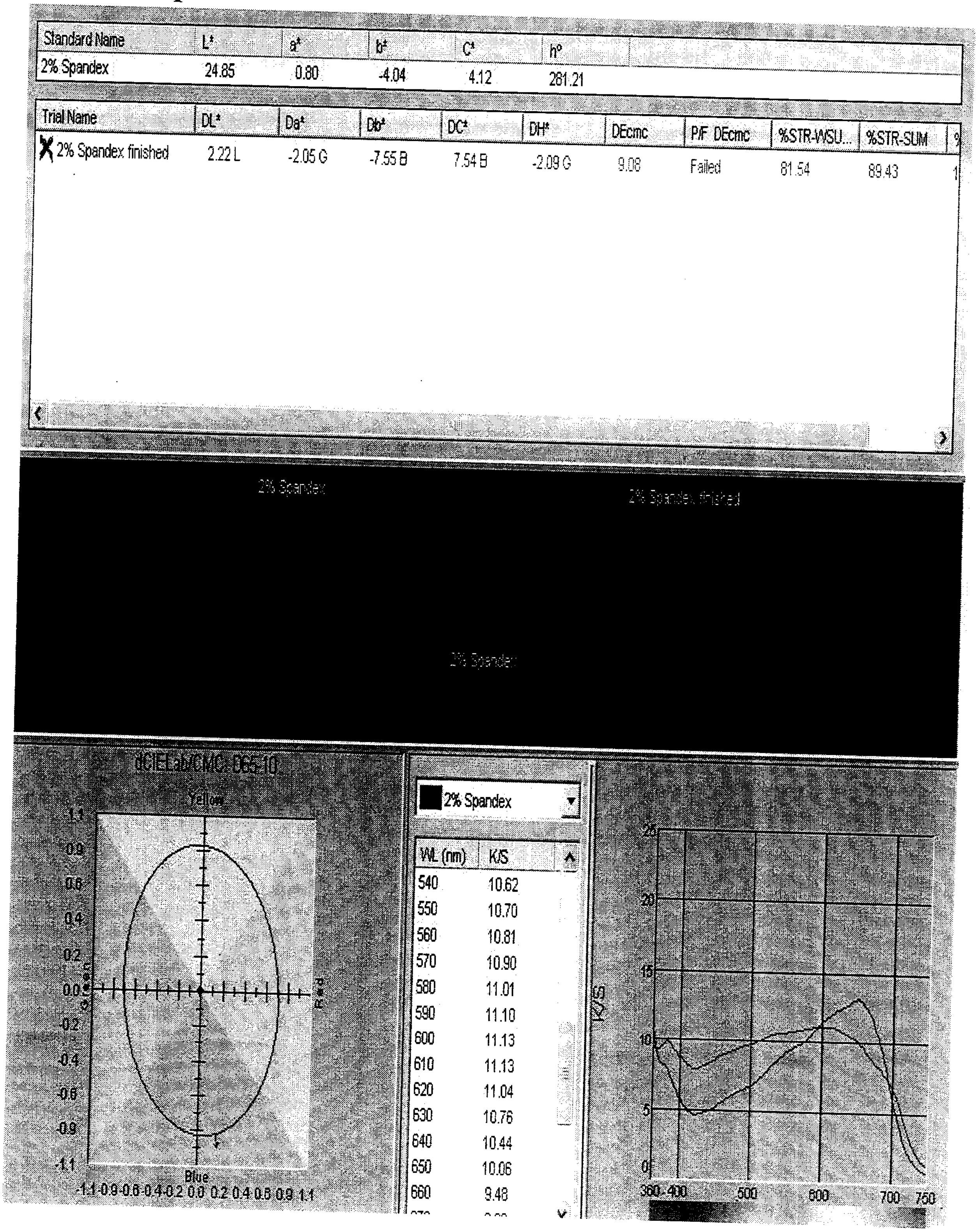


Standard Name	L*	a*	b*	C*	h°
1.75% Spandex	24.39	0.71	-3.73	3.80	280.81

Trial Name	DL*	Da*	Db*	DC*	DH*	DEcmc	P/F DEcmc	%STR-WSU...	%STR-SUM
1.75% Sapndex finished	3.73 L	-2.07 G	-10.09 B	10.09 B	-2.08 G	12.23	Failed	72.26	79.95

WL (nm)	K/S
360	13.51
370	10.21
380	10.49
390	9.78
400	9.13
410	8.72
420	8.37
430	8.50
440	8.81
450	9.11
460	9.44
470	9.62
480	9.67
490	10.11

4.4.4.2%Spandex



Standard Name	L*	a*	b*	C*	h°
2% Spandex	24.85	0.80	-4.04	4.12	281.21

Trial Name	DL*	Da*	Db*	DC*	DH*	DEcmc	P/F DEcmc	%STR-WSU...	%STR-SUM
2% Spandex finished	2.22 L	-2.05 G	-7.55 B	7.54 B	-2.09 G	9.08	Failed	81.54	89.43

4.5.5. COLOUR CHARACTERISTICS VALUE:

The colour difference, K/S value and colour strength values are shown in the below table 4.4.5.1

Table. 4.5.5.1.

S.No	Sample	Colour difference	K/S Value		Colour Strength	
1	A	9.6	20.29		77.51	81.26
2	B	9.12	14.89		67.72	71.82
3	C	12.23	13.51		72.26	80.64
4	D	9.08	11.13		81.54	87.43

The overall increase in colour difference value results in the fadeness of the denim. The resistance of the dye decreases due to the reduction in colour strength. The highest K/S value occurs in the wavelength of 360nm for the first three samples A,B& C whereas for sample D it occurs in the wavelength of 600nm.

4.6. VISUAL ASSESSMENT:

S.no	Finished samples		Criteria analyzed													
			General appearance			Color			Evenness		Texture			Lustre		
			Good	Medium	Fair	Bright	Medium	Dull	Even	Uneven	Smooth	Medium	Coarse	High	Medium	Low
1	A	Be	20	60	20	80	10	10	10	90	20	50	30	10	20	70
2		Af	70	15	15	15	75	10	5	95	80	20	0	10	20	70
3	B	Be	30	50	20	70	20	10	6	94	30	60	10	7	23	70
4		Af	92	5	3	15	80	5	4	96	95	5	0	9	11	80
5	C	Be	33	55	12	72	18	10	7	93	42	45	13	15	23	62
6		Af	90	5	5	15	75	10	5	95	85	10	5	8	12	80
7	D	Be	20	54	26	76	20	4	6	94	35	55	10	12	30	58
8		Af	89	7	4	20	75	5	8	92	90	7	3	10	25	65

The results of the survey are shown in the table no.4.6. The above results shows that all the four fabrics have better results after peach finish. It shows that 92% of the people felt that the general appearance of the fabric was good for sample B after peach finish, 95% of the people felt that the texture of the fabric was good for sample B after peach finish. Colour , lusture and evenness does not make any significant difference among the four samples.

5. CONCLUSION

Denim is best known for its use in the manufacture of jeans; however, it can be made into just about anything, depending on its weight. Even formal wear designers turn to denim for inspiration occasionally! Denim fabric seems to have been reserved for work clothes, when both durability and comfort were needed. Denim has made a comeback in recent years and in every possible form. Today, denim has many faces. It can be printed, striped, brushed, napped and stonewashed, and the indigo blue yarns can be replaced with different colors to create coloured denim.

Stretch denim is made by combining elastane fiber with cotton. Spandex and Lycra are two of the most commonly used elastics. This is what gives the denim its stretch. Stretch denim jeans have the ability to conform to your body's shape each time you put them on. With most denim, it takes time to "wear in" a pair of jeans so they fit perfectly. The elastane fibre makes the jeans stretch, so they can fit right every time.

5.1. OBJECTIVES OF THE STUDY:

The study was undertaken to serve both the consumer and industry preferences with the following objectives.

1. Development of denim material with different spandex content.
2. Optimization of the peach finish.
3. Testing (physical, mechanical and comfort properties) of the fabric before and after the finish.
4. Development of apparel with the peach finished fabric.
5. Assessment of the garment for comfort properties.

5.2. FINDINGS OF THE STUDY:

- EPI and PPI of stretch denim were observed after peach finish, which shows that there is decrease in values for all the four samples A,B,C&D by 7% and 8% respectively.
- Thickness and cover factor were observed after peach finish, which shows that there is decrease in values for all the four samples A,B,C&D by 9% and 13% respectively. Observed values reveal that sample B has least thickness than their counter parts resulting in better flexibility.
- The property of wicking in stretch denim is observed for warp direction which has marginal increase in sample A,B,C&D by 36%,18%,12% and 7% respectively .There is also marginal increase in weft samples A,B,C.&D by 41%,16%.12% and 12% respectively.

- Thermal conductivity of stretch denim was observed for the samples A,B,C&D which shows increase in values by 17%,23.4%,23.1% and 15% respectively. The observed values reveal that the sample B has better conductivity when compared to other samples.
- Water vapour permeability of stretch denim shows that there is an increase in values by 9%,11%,3% and 8% respectively. The above values reveal that the sample B has the highest value than their counter parts.
- Drape of the stretch denim was observed that there is decrease in values for all the samples which results in better drapeability.
- Abrasion resistance was found to be increased for the samples A,B,C&D by 2%,6%,20% and 13%, which leads to better resistance to tear.
- Crease recovery of stretch denim was observed in warp direction which has decrease in samples A,B,C&D by 12%,14%,13% and 16% respectively. It was also observed in weft direction which has decrease in samples A,B,C&D by 6%,11%,12% and 15% respectively. By comparing all the above values sample D has better recovery.
- Flexural rigidity was calculated for warp direction which shows that there is decrease in values for all the samples by 33%,30%,25% and 26%. There is significant difference in weft samples by 19%,17%,16% and 12% respectively. The above result reveal that the samples have better flexibility.

5.3.CONCLUSION:

From the above study it is concluded that the peach finish process gives an overall improvement to the denim fabric in terms of comfort, colour characteristics and texture. Of the samples studied with different spandex combinations, it was found that the best results were observed in the stretch denim samples with 1.5% spandex content

Peach finishing is a dry, eco-friendly proces and does not use any chemicals like enzyme finish. It is viable for decolourization and fading which is a common feature in denim garments. Decolourization of denim is commonly undertaken as an emery rubbing process which may be mechanical or manual in localised areas of the garment. This causes lot of pollution problems and leads to a lung disease called sclerosis which ultimately leads to the death of the operator. The peach finish process is implied on large scale because it is cost effective, water saving and also eliminates the risk of pollution.

5.4. LIMITATION OF THE STUDY:

- The degradation of the indigo dye on the denim fabric.
- The dimensional stability of the fabric changes because the fabric is passed under high pressure rollers in the peach finish machine.

6. RECOMMENDATIONS

- Comparative study between enzyme peach finish and emerized peach finish.
- The environmental effects of enzymatic peach finish on denim

4. www.jeansinfo.org/jeans-washing.html

6. http://ezinearticles.com/?Stonewash-Finish-for-Denim&id=388273

7. Daria, Irene, "Stonewashed Jean Revival Seen Hot for Spring", Women's Wear Daily Magazine (WWD), November 5, 1986.
8. Lockwood, Lisa, "Makers Bet on Stonewashed Jeans". WWD. January 14, 198

9. Jeans and Accessories. http://www.jeans-and-accessories.com/vintage-jeans.html

10. Lee Cooper, 2008. http://www.leecooper-id.com/lc08/lcdata/denima2z/eee.html

11. Turkish Denim, 2006-2008. Organicdenim.com
http://www.turkishdenim.com/index.php?inframe=8193938935242496969623939491848292
81777
8878286237688862474877423898189408287768674828738827678918284248276789182844
728
582929315847493827738263215748593847493827738283l

12. Wise Geek, 2003-2008. S. E. Smith.
http://www.wisegeek.com/what-is-enzyme-washing.htm

13. Cotton Inc. Storm Denim™ Technology Release Date: Wednesday, February 20, 2008 (http://www.cottoninc.com/PressReleases/?articleID=453)

14. Denim Hunt: Alexander Wang Storm Denim™ Part II Release Date: Thursday, July 24, 2008 (http://denimhunt.typepad.com/denimhunt/2008/07/alexander-wang.html)

15. http://www.textileglossary.com/terms/core-spun-yarn.html-
16.http://www.textileschool.com/School/Spinning/RingSpinning.aspx-

17.http://www.textileschool.com/School/Spinning/RotorSpinning.aspx-

18.http://encyclopedia2.thefreedictionary.com/Yarn-Yarn

19.http://www.textileschool.com/School/Weaving/DraftingPlans/TwillWeaves.aspx-
20.http://en.wikipedia.org/wiki/Loom-

21.http://en.wikipedia.org/wiki/units of textile measurement

8. APPENDIX