ISSN (Online) : 2455 - 3662
SJIF Impact Factor :5.148

EPRA International Journal of

Multidisciplinary Research

Monthly Peer Reviewed & Indexed International Online Journal

Volume: 5 Issue: 1 January 2019

Published By :EPRA Publishing

Volume: 5 | Issue: 1 | January 2019 || SJIF Impact Factor: 5.148 ISSN (Online): 2455-3662

EPRA International Journal of
Multidisciplinary Research (IJMR) *Peer Reviewed Journal*

STUDY ON EFFECT OF DENIM FINISH IN KNITTED FABRIC

D. Anita Rachel[1]
[1]Assistant Professor, Department of Apparel Manufacturing and Merchandising,
NIFT Tea College of Knitwear Fashion and Research Scholar Department of Rural Industries and Management ,
Gandhigram Rural Institute-Deemed University,
Gandhigram- Dindigul, Tamil Nadu, India

M.Thirumoorhy[2]
[2](1626P0049) B.Sc(AMM)NIFT- Tea College Of Knitwear Fashion, Tirupur, Tamil Nadu, India

ABSTRACT

This study was to investigate the physical properties and the external characteristics of denim fabrics(100% cotton non-spun denim, 98% cotton/2% polyurethane spun denim) such as tensile strength, thickness and weight, flex stiffness, surface color and shrinkage. The results of the study were as follows. After examining the change of external characteristics of before and after washing finishing for denim fabrics, denim with bio washing had increased pliability compared to denim without washing finishing but the pliability of the denim did not increase according to the intensity or frequency of washing. The luminance change according to washing finishing was high in the order of bio stone bleach washing, bio stone washing, bio washing and denim without washing finishing and the surface color became brighter in accordance with the increase of intensity and frequency of washing finishing.

The use of technology and knowledge has made it possible to mimic and imitate the same appearance and properties in different products. Knitting technology and weaving technology are two different branches in fabric manufacturing technology, that can be now imitated in most cases to produce different types of fabrics. In the same way, knitting technology can now produce knit denim fabric with the same properties and appearance as that of woven denim fabric. This paper, explores the field of creating knit denim fabric for diversified uses as well as fulfilling the purpose of woven denim. Research was carried out using single jersey circular knitting machine to create denim effect with knit and tuck loop separately. Two fabrics of GSM 290 and 270 were produced with excellent fabric quality.

KEYWORDS: ***Knit, Denim, Denim Effect Knit loops, Knitting technology, Finishes***

1. INTRODUCTION

Jeans made of denim have consistently been fashionable in worldwide culture and also have changed style significantly throughout the years. Denim was traditionally colored blue with "Indigo dye" to make blue "Jeans", though jeans denoted a different, lighter cotton textile. Knitted fabric has certain special characteristics that make it suitable for creating a wide range of garments and accessories like tights, glues, underwear and other close fitting garments. Fashioning mark and fully-fashioned are two important features of knitted fabric, which can be related to fashion.

The traditional denim is hard- wearing, high-density fabrics with a high mass per unit area with a 3/1 or 2/1- twill weave and 1/1 chambrey construction.

Besides classic indigo blue, denim is also dyed in other fashion shades and colors, the most popular being black denim. Denim is comfortable, fashionable, affordable and durable and popular in all age group.

Denim is conventionally made by a tatting method to create random knotting feature on surface and special color fading feature; features which make the denim garments popular all over the world. However the tatted denim is not as soft in texture and comfortable as fabrics made by a knitting techniques. Therefore due to the rigidity of the tatted denim, its application is limited in fashion design. The knitting method improves the softness and comfort ability of the fabrics and if indigo dyed yarn is used, color-fading feature is achieved on the denim.

The present paper relates to the method of manufacturing denim, more precisely a method for knitting denim that has random knots and even twilling pattern in appearance.

2. KNIT DENIM PRODUCTION METHODS

Both principal techniques, weaving and knitting are used to produce denim fabrics/denim effects on fabrics. Woven denim is conventional and vastly used by valued consumers while knit denim is novice but substantially preferable due to flexibility, user-friendliness and comforts.

One of the research showed that “denim” effect on knitted fabric could be made from three types of technologies. [1] They are:

- Float plated technology
- Thread fleece
- Interlock plaited jacquard

The structure using knit and float, using knit cams and sinker cams as well as sinkers to do a knit on one side of the fabric and a very tight float on the other where the float gives the woven effects. Depending on the cylinder cam arrangement, the machine generates the ability to do one-, two- and three-needle floats.

3. OBJECTIVES

Denim washing is the aesthetic finish given to the denim garment to enhance its appeal and provide strength. The emphasis is on comfort and softness. Fashion trends favour the broken-in look and worn/faded seams that can only be achieved through garment processing. Much of the appeal of dry denim lies in the fact that with time the fabric will fade in a manner similar to that which artificially distressed denim attempts to replicate.

3.4 Types of denim finishing

Denim acid wash.
Denim bleaching.
Denim stone wash.
Ozone wash

DENIM ACID WASH

Acid-washed denim (a misnomer since no acid is actually used in the process), is washed with pumice stones and chlorine until it is bleached almost white. California surfers and members of the 1960s counterculture prized Levi 501s and other jeans that had been bleached by the salt water due to their authentic, "lived in" appearance.As natural wear took weeks, or even months, it was not uncommon to hang a few new pairs of jeans to fade in the sun, then turn them over to fade the other side. For many surfers, this process simply took too long, so they sped up the process by soaking the jeans in diluted bleach and some beach sand. Simple chlorine bleach and muriatic acid were readily available at the time (and still are), as they were used to sterilize swimming pools.

DENIM BLEACHING

Lightening or completely bleaching out your denim fabric gives them a lived-in, worn look. Because of the complex dyeing process of denim, however, lightening or bleaching it involves more than simply placing your jeans in your washing machine's bleach cycle. For best results, combine a few different methods to remove as much of the color from your jeans as possible before you try to bleach them.

DENIM STONE WASH

Stone washing is a textile manufacturing process used to give a newly manufactured cloth garment a worn-in (or worn-out) appearance. Stone-washing also helps to increase the softness and flexibility of otherwise stiff and rigid fabrics such as canvas and denim.

The process uses large stones to roughen up the fabric being processed. The garments are placed in a large horizontal industrial clothes washer that is also filled with large stones. As the wash cylinder rotates, the cloth fibers are repeatedly pounded and beaten as the tumbling stones ride up the paddles inside the drum and fall back down onto the fabric.

A number of people and organizations have claimed to have invented stone-washing. According to Levi Strauss & Co., Donald Freeland, an employee of the Great Western Garment Company (later acquired by Levi's), invented "stone-washing" denim in the 1950s. Inventor Claude Blankiet has also been credited with having invented the technique in the 1970s.The jeans company Edwin claims to have invented the technique in the 1980s.It is commonly accepted that French stylists Marithé + François Girbaud are inventors of industrialization of stone washing

OZONE WASH

Ozone technology harnesses the natural bleaching capabilities of ozone gas to give a range of overall and specialty bleach effects with substantially reduced environmental impact. Ozone can be used to clean pocket backstaining from normal washing processes, or

to bleach denim to a lighter shade.5 The photograph on the following page shows the range of bleachdown achievable by varying ozone concentration and exposure time. Individual brands are also creating unique specialty looks with the power of ozone.

Ozone does not eliminate water use in jeans finishing. However, it substantially reduces consumption of water as well as energy, chemicals, enzymes and stones. Ozone offers important advantages over traditional wet finishing.Oxygen (O2) is converted to ozone gas (O3), jeans are dampened, exposed to the ozone, and rinsed; the ozone is reconverted to ordinary oxygen before release into the environment. While chemical bleaching or stonewashing uses six to seven washes and rinses, ozone finishing requires two to three. A production manager I spoke with reported more than 50 percent reductions in water, chemicals and pumice stone consumption when using ozone finishing in sequence with reduced traditional wet finishing methods.Ozone finishing reduces energy consumption by reducing the amount of water that must be heated for wet finishing, and the temperature required. Furthermore, replacing some traditional finishing with ozone reduces effluent, including the sludge pumice stones create.Ozone bleaches more quickly than chemicals and stonewashing. Ozone can clean back stains in three seconds. At optimum concentrations, it bleaches denim in 15 minutes to levels commonly desired by fashion today, versus 30 to 45 minutes with traditional methods. Ozone increases production per shift.Ozone technology reduces environmental impact, processing costs and processing times while achieving desirable fashion looks.

4. MATERIALS, MACHINES AND METHODS

4.1 Raw Materials

100% cotton combed yarn of 24/1s count and IPI value of 29.8 is used as raw materials and circular knitting machine as instrument is used in this experiment.

4.2 Knitting Machine Specification:

- **Machine type** : Single jersey Circular knitting machine
- **Brand** : Well Run
- **Model** : SHS-90
- **Cylinder Diameter** : 32″
- **Needle gauge** : 24 G
- **Number of feeder** : 96
- **Number of needle** : 2412
- **Rotation** :Anticlockwise

4.3 Method for creating knitted denim

The 1st step of the method involves dyeing the yarn with a dyestuff to obtain dyed yarn. Indigo dyeing as well as other dyeing i.e. reactive dyeing and sulphur dyeing can also be used for yarn dyeing of the fabric. The 2nd step involves knitting the foundation layer with grey/white yarn and front layer with dyed yarn to compose denim fabric. Here the front layer is tensely tautened in intermittence with a tensile force greater than the tensile force on the foundation layer to make the foundation layer have random knots. The next step involves washing of denim for creating fading effect if yarn dyeing is carried out using indigo and sulphur dye. Subsequently processes involved in finishing section like drying, compacting etc is carried out to achieve the best quality product.Piece dyeing, cheese dyeing and rope dyeing are the conventional methods used for dyeing denim. One of the dyeing methods involved for the present experiment is rope-dyeing method for dyeing knitting yarn to improve fastness and even dispersion of the dyestuff. The rope dyeing is used to drench the knitting yarn into a tank for sopping dyestuff and then the excess dyestuff is removed by passing the knitting yarn through paired rollers as the excess dyestuff gets squeezed out and the process of drenching ad squeezing of yarn is repeated several times until the dyestuff gets properly attached to the knitting yarn. In case of indigo dyeing using rope-dyeing method each strand of yarn is dyed around the surface and thereby living the yarn with a white core. The strands of dyed yarn are evenly dispersed and wound onto a bobbin so as to avoid transversal or any discreteness in color during knitting and producing fabric.

In this experiment a circular weft knitting machine i.e a single jersey machine using the usual knit, tuck and miss cam is used to construct even twilling pattern on the fabric and perform a dual – plied denim including a foundation layer and a front layer on the fabric. The foundation layer is loosely knitted with variable tension/tensile force and a different stitch length than that of the front layer by adjusting the circular weft-knitting machine. Cam arrangements are set for creating terry twill effect and only twill effect on the fabric. The front layer is compactly constructed with high tension/ tensile force by adjusting the machine to a high-density program.

After tightening the front layer, the foundation layer is shrunk to create multiple knots on the foundation layer and thus denim is obtained. When the denim is used, the foundation layer having multiple knots serves as an outer surface to reveal the random knots in appearance. Correspondingly, the front layer serves as an inner surface. This pattern can also be achieved by using lycra yarn (acting in the front layer) along with the colored yarn so as to produce a compact structure by shrinking the inner layer thereby knitted denim is obtained.

5. TESTING OF PHYSICAL PROPERTIES OF DEVELOPED FABRIC

The fabric's physical properties like GSM, shrinkage and spirality as well as some chemical

properties like color fastness to wash, color fastness to staining and color fastness to rubbing were measured for knit denim and tuck denim dyed with reactive dye.The resistance to the loss of color of any dyed or printed material during washing is referred to as its color fastness to wash. If dye molecule have not penetrated inside the inter polymer chain space of fiber with strong attractive force poor color fastness to wash result is found. For color fastness to wash test ISO 105 C06 (C2S) method was followed. [2] Color fastness to rubbing /crocking was designed to determine the degree of color which may be transferred to a specific pressure applied by crock meter. This test was done in both dry and wet state. The crocking cloth against which the test sample would be rubbed was a white, unbleached, undyed cotton fabric. In crocking cloth, 100% pick-up was maintained for wet rubbing. Color fastness to rubbing was tested by Crock meter in ISO105 X12: 1992 method. [2]

Every sample when undergoes washing most of the cases they change their dimension. In general sense the changes in length or width of a fabric specimen subjected to specify condition is known as dimensional changes. The dimensional changes resulting in an increase of length or width is called stretched condition if the dimensional changes result in decrease of length or width is called shrinkage. [3]

At first all the samples were conditioned for 4 hours in a standard temperature & RH% and the length and width of the samples were measured before washing. After wash, again the length and width of the samples were measured for identify the stretch or shrinkage%. Both the fabric showed same shrinkage during fabric testing.Spirality is a serious problem for plain knitted fabrics due to asymmetric loops. Spirality is described by the size of the angle made between the wales and a line drawn perpendicular to the courses. Spirality in a fabric is caused by the relaxation of torsion forces in the yarn which causes the individual fibres twisted round each other during spinning, to try and returns to their original untwisted state. It is known that a fabric knitted with a highly twisted yarn will have higher spirality. [4]

Also spirality increases with increasing the number of feeders. AATCC 179 method was used for measuring spirality.

The term GSM of fabric means the weight of the fabric in grams per square meter (Weight per unit area). [3]

GSM is the most important parameter, which is maintained in the factory or industry. It is maintained in the all stages in the processing of knit fabric. It is also measured after dyeing, before dyeing and every stages of finishing process like stentering, compactingetc. GSM cutter measured GSM. Here grey GSM were measured in the knitting stages and finished GSM were measured after finishing for comparing them.

6. TECHNICAL DISCUSSION

Shrinkage % for both knit denim and tuck denim is same in both lengthwise as well as in widthwise direction whereas spirality for knit denim is slightly more than tuck denim.Good washing fastness is seen for both the knitted fabric as the dye used was reactive dye and reactive dye makes a covalent bond with the fiber rather than forming a coating like that of indigo dye in denim fabric.It should be stated that dyeing with indigo dye may result in moderate washing fastness. GSM for the denim constructed with tuck loop shows more GSM compared to the other fabric. Tuck loop increases a fabric's GSM or oz/yd2 than a knit loop does therefore GSM of the tuck denim is more compared to a knit denim fabric. Knit denim is also eco friendly for human being as our skin comes in contact with the inner surface made of grey yarn rather than the outside which is dyed with indigo,sulphur or any dyes considered harmul for our body.

7. CONCLUSION

The two fabrics that got developed during experimental works are softer and comfortable as well as less complicated to be produced. Though only two fabrics of same count were being produced during this project work, scope remains for developing the fabric further in the future. Polyester can be used in alternate to cotton yarn to minimize cost and show different characteristics. Further developments such as knitting with rotor yarn during the production of knit denim and tuck denim by using half of the creel loaded with rotor yarn and feeding it to those feeders that undergoes less knitting action can surely open a new doorway for rotor yarn to be used in knitting. Slub yarn, neppy yarn, fancy yarn can also be used to make knit denim fabric of different appearance, feel and diversified usage. Knit denim is the fabric of the future, a future that we must understand and adapt so as to survive in this competitive market.

8. REFERENCES

1. *Denim Effect On Knitted Fabric By Dr N Gokarneshan, M Krishna Kumar, P Devan, K Dinesh, A Pradeepkumar, G Saranya And K Subhash.*
2. *Yarn And Knitting Parameters Affecting Fly During Weft Knitting Of Staple Yarns By C.A. Lawrence And S.A. Mohamed*
3. *"Dyeing And Chemical Technology Of Textile Fibres", E.R. Trotman ; London: Charles Griffin And Company Ltd., 1975, Pp, 616-626*
4. *"Principles Of Textile Testing", J.E. Booth; India: Cbs Publishers And Distributors, 1996, Pp.209-23*
5. *Knitting Technology By Vasant R Kothari*
6. *www.Denim Science.Com*
7. *www.Denim Trend.Com*