International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 05 | May - 2023 SJIF 2023: 8.176 ISSN: 2582-3930

Various Decorative Knitted Fabrics and Comparison of Eyelet Vests & Single Jersey Vests

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Abstract - The fashion has entered to all fields in the world. Knitting industry is having orders for variety of new products. Various products such as tuck, ruched knitting, pin tucks, ridges, sculptured forms, partial knitting cables, lace & ladderinal insertions, weaving, pleats, embroidery & surface decoration, tassels, fringing were done over the knitted fabrics. The eyelet fabric is one among the decoration on garments. Various eyelet designs are durable lacoste, single lacoste, mock rib, polopique, single cross tuck, cross miss, Bird's eye, popcorn design, crepe design, twill effect, weft lockknit and fleece. The production of eyelet fabrics in four track single jersey knitting machines were given. The rib eyelet fabric production is also collected. The inner garments does not require full coverage and hence eyelet fabrics can be used. The eyelet fabrics were collected from markets and it is tested for dimensional changes due to washing and drying behavior in atmospheric conditions. It is compared with single jersey knitted fabrics. It is found that eyelet fabrics exhibit greater cooling effect and dimensional changes are more. So eyelet fabrics can be used instead of single jersey fabrics, Eyelet fabrics have greater lengths compared to single jersey fabrics for same weights.

Key Words: Four track knitwear, Eyelet, Drop needle technique, single jersey, decorative

1.INTRODUCTION

The practice of knitting whether apply traditional techniques or new technology, covers huge field and a vast array of techniques and process from hand knitting through to seamless knitting technology. Circular knitting machines are available in a wide range, from those that are powered mechanically or electronically to those that are controlled by computer. All produce lengths of seamless tubular fabric in various gauges, including single to double jerseys, jacquards, ribbed fabrics, fleece, mesh, and double-faced fabrics for specific purposes, including hosiery, sports outerwear, and household and medical textiles.

Automatic, fully fashioned flat knitting machines are a development of the traditional flat knitting machine. They have an automatic fully fashioned function that is controlled by an imported computer and are relatively easy to program and use. The fabric design is created on the computer software and the information is then fed directly to the electronic flat bed machine, which knits the design.

2. Texture

All knitted stitches produce a textured surface, but the results depend on the type of yarn knitted, the tension, the stitch combination, and the performance of the yarn. Once you have a working knowledge of different yarn properties, and an understanding of how one stitch works with another, you will gain more flexibility in your work. Textures in knitting can be created using any of the following

- Particular yarns: boucles, slubs, crepes, chenille's, smooth silks, ribbons, tapes, faux fur, marled yarn, mercerized and specialty yarns
- Stitch formation: lace, tuck, weave, slip stitch, or a combination of techniques worked together
- Three-dimensional knitting, incorporating ridges, bobbles, knitted flaps, and cables
- Additional surface decoration worked into the knitting after completion, for example, embroidery, Swiss darning, appliqué, and smocking
- Combining with other crafts, including hand knitting with machine knitting, crocheting, or tatting

3. Surface Manipulation

The knitted surface can be manipulated by applying a variety of techniques, from tucking, pin tucks, partial knitting, and ruched effects to cable designs, each of which will add tactile qualities to your fabric. These techniques work well if a single color yarn is used, which will emphasize the textural effect. Alternatively, a range of colors can be used when combining techniques such as tuck and Fair Isle design.

4. Various decorations used in Knitted fabrics

Tuck stitch

Tuck stitch is easily recognized as it gives a sculptural, three dimensional surface effect, and adds distortion to the fabric. Tuck stitch is produced by putting selected needles into holding position. This can be worked manually or by using the needle selection cams on your knitting machine. The yarn then collects on these needles, producing a tuck, giving shape and movement to the fabric. One or more rows are then knitted on all needles returning to normal working position, before returning to the tuck needle position.

Ruched knitting

Another method of manipulating the surface is by ruching the fabric. Knit a length in the selected color way and stitch structure, picking up selected stitches with a transfer tool. This can either be worked with regular spacing or the stitches can be picked up randomly. Ruched knitting produces a three dimensional surface that combines particularly well with Fair Isle or jacquard designs.

Pin tucks, ridges, and sculptured forms

Pin tucks can be used to add texture in a series of small ridges. They look particularly effective when worked in contrasting colors and textures, adding weights to the fabric, and also providing a guideline for picking up. Rows of pin tucks, when pinched together and darned into position with contrasting yarn, create a smocked ridge effect.

You can also achieve sculptural effects by producing wide stripes of knitting in alternate colors on a loose tension. After pressing, manually ruche up the knitted fabric using French knots, working the embroidery in a contrasting color to create a simple yet effective design.

Partial knitting or short-row knitting

Partial knitting is an excellent method of shaping a garment. It can also be used to add a panel or flair and fullness to a skirt or dress, or a dart to a jacket or sleeve, or it can be used to create interest by adding a panel in a different stitch pattern or color into a flat piece of fabric, as well as three-dimensional bobbles, flaps, ruffles, and decorative edgings.

Cables

Cable knitting, whether worked by hand or machine, adds real depth and surface texture to a fabric, and can be worked in isolated areas, such as a design integrated into a ribbed cuff, or it can appear as an all over cable garment design. Many traditional hand-knitting cable patterns can be taken and adapted for machine knitting. Cable designs are described by needle arrangements, for example 2 x 2, 3 x 3, 4 x 4. A 2 x 2 arrangement indicates the crossing over of two stitches with the two adjacent stitches; 3 x 3 indicates the crossing over of three stitches with the adjacent three stitches, and so on, worked manually using machine transfer tools. The design will vary greatly depending on the number of stitches crossed over and the number of rows knitted between stitch transfers.

Cable designs can be worked in one color or combined with a multicolored jacquard pattern, or alternatively with a tuck pattern or combined with decorative lace knitting. Traditional cable designs can be used to great effect by playing with scale, enlarging the cables and joining several cables together.

Lace and laddering effects

Laddering or eyelet holes can be worked into a knitted structure to create extra interest. Eyelet holes are created by knitting two stitches together; ladders are produced by leaving one or more needles in a nonworking position on the knitting machine. Ladder effects can be used to great effect by careful positioning or, if used as a base fabric, to thread ribbon, tape, leather thonging, or cord through, adding to the textural quality of the fabric.

Lace knitting

Lace knitting has a long history and is derived from lace making. Lace making traditionally uses very fine threads and is very time consuming to produce, due to the complexity of technique and pattern. Knitted lace grew in popularity during the twentieth century and has become a very popular substitute. Lace knitting is formed by the transfer of stitches from one needle to another by either hand tooling or by using a lace carriage, making a hole or series of holes in the knitting.

Lace knitting can add a delicate textural quality to a fabric and is ideal for eveningwear and summer wear. Ribbons can be woven through it, and it can also be decorated with bead embroidery. One or more of these techniques can also be combined together. Lace knitting can be worked on knitting needles by hand or knitted using a punch card facility on a knitting machine. The manufacturer will usually provide a range of lace-knitting punch cards that can be tried and tested, adapted, and developed.

Insertions

Add interest to your knitting by adding insertions, which can be created by applying additional shapes to a knitted background. This is a time-consuming procedure, but the results can be impressive. Triangles, flaps, knots, plaited tube knitting, frills, and ruffles can be knitted in advance and then incorporated into your knitting while it is being worked, or applied to the knitted surface after completion. For example, the machine knitted lace sample opposite has been made using a silk slub yarn, incorporating a decorative vintage lace trim into the knitted fabric while working it by hooking the trim onto the needle bed and then knitting, adding delicacy to the fabric.

Weaving

Weaving is a technique in which the needles pull an additional yarn through into the work while knitting. The simplest method of weaving on a knitting machine is to employ a punch card design using the weaving brushes. This method has the advantage of having the right side of the fabric facing you while working, thereby making it far easier to create and develop your ideas, experimenting as you go. Highly textured yarns such as boucle, mohair, and ribbon can be woven in, adding textural qualities and surface structure to the design of the fabric. To add further texture these can be cut to give the surface a sumptuous fringed effect.

Pleats

Pleating fabric gives greater fullness and, as seen here, various pleat designs can be formed by careful needle selection when knitting, including knife, accordion, and box pleats.

Surface Manipulation

Surface decoration applied to knitwear is an easy and versatile way of producing individual garments. There are many different ways of doing this, including embroidery, tassels, beadwork, and fringing-both alone or in combination.

Embroidery and surface decoration

A personal touch can be added to a store bought knitted garment by adding embroidery to highlight a seam or enhance

a border design. For beginners, a dropped-sleeve, slashed-neck sweater or any similar-shaped garment can be transformed into an inspirational, individual design by embroidering stitches in well-selected contrasting or complementary colors around the neckline, hem, or cuffs, or on a pocket. For the more advanced knitter, embroidery can be used to highlight a design that needs only a small amount of color to highlight and strengthen a motif, picture knit, or design feature—on a pocket top or yoke, for example.
Embroidery can be used in knitwear to:

- Add color
- Add texture
- Emphasize a particular stitch or design
- Work in a small amount of color to highlight a design
- Highlight a seam or design feature on a garment, neckline, or button stand.

The following embroidery stitches work especially well when used as a decorative finish: chain stitch, cross stitch, French knots, blanket stitch (particularly for edgings and on hemlines), lazy daisy stitch, stem stitch, and Swiss darning. Any of these stitches can be used alone or worked in conjunction with one another.

Bead embroidery

There are two main methods of attaching beads and sequins to a garment. The first and easiest method is to position the beads or trims on the finished garment and then sew them on individually.

The second method is to incorporate the beads or sequins into your knitting while you work. In essence this is also a relatively simple method, but it can be time consuming and fiddly. When working this method, take a stitch off the needle and thread the bead onto it. Transfer the beaded stitch back onto the needle and continue to knit.

Decorative applied tube knitting

Tube knitting (also known as “rouleau knitting”) is a narrow strip of knitting that resembles French knitting, worked over three or four needles of the machine bed. Using the main tension dial to cast on with the appropriate yarn thickness, knit four rows holding the knitting firmly down, or hang on a claw weight. Set the machine to knit in one direction only and knit to the required length. As you knit, the row that slips will pull the yarn across the knitting, making the edges curl together to form a tube, hence the name. The length of tube knitting can then be sewn onto a garment, adding pattern, color, and texture. Tube knitting can also be used as an insertion, a garment drawstring, or an edging. The piece below has been produced by knitting lengths of tube knitting and then shaping and stitching them into flower motifs, which could be applied to a garment as a corsage or trim or stitched together to form a new piece of fabric. Tube knitting can also be plaited or woven into lace knitting.

Tassels

Tassels are easy to make from lengths of cut yarn. Bunch the lengths together and double them over. Tie a knot at the top of the loop, which will then hold all the yarn lengths in place, and then bind the tassel half an inch (15mm) from the top. Finish the binding by sewing the yarn under the binding and bringing the needle out at the top, then stitch neatly to secure. Tassels can be as simple or elaborate as your design requires.

Fringing

Fringing can be produced by machine or by hand. Manually produced fringing is very easy to make and is similar in technique to tassels. Cut your yarn into strands double the length of the finished tassel. Taking several strands to the thickness of the required tassel, fold over the yarn lengths and then, using a crochet hook, pull the strands of yarn through the knitting before hooking the yarn lengths up through the tassel loop to secure the tassel. Continue this process across a knitted edge to produce a thick fringed edging, which can be used to trim a hem or edging. Fringing can be enhanced by combining it with beadwork, sequins, embroidery, or knotting effects, depending on your individual design.

These are explained in Ref. knitwear designs.pdf[1].

5 Comparison of eyelet and single jersey vests

The various gauges used for knitting is given in Ref. Circular knitting module.pdf[5]. The pattern calculations are given in the circular knitting module. Using the methods the eyelet fabrics can be manufactured in four track machines. These are given by Ref. Ajgoankar.D.B[2]. The eyelet fabric by truck design is given Ref. David. J.Spencer[3]. Designs of eyelet fabric with rib needles are given by Ref. Dr. Samuel raz[4] using the Jacquard, variety of eyelet fabrics can be produced. How to Knit the eyelet fabric in hand knitting is given in Ref. blog-7b-easy stitches-and techniques-to-get- started with lace knitting[6]. So eyelet fabrics can be manufactured easily and eyelet fabrics vests are available in market.

The knitting done for inner garments are used for absorbing sweats and to protect the parts of the body. But the comfort of the garments is not there. Sweats dry lately and discomfort is there. Gases from body damage the structure of the garments. To solve the problem some eyelet fabrics produced from four track machine is tried for garments and testing is done for drying and dimensional changes and analyzed.

Hypothesis

1. Sweat from holes dry faster than the sweat over the fabric.
2. Escape of gases through holed fabrics are faster and does not damage the fabric.

Limitations

The production of the eyelet fabric is less and hence present set up for production to large volume of market can’t be done immediately. The machinery is costly and high skilled technicians are required to operate the machine. The cost of production may be high and its purchase by poor people will be less.

Comparing eyelet and single jersey vests

The cost of eyelet vests are ₹118/-per piece whereas single jersey vests are ₹70/-only. Eyelet vests are tighter in construction and hence it can withstand harder stresses. The yarn won’t break and hence it is behaving as woven fabric with knitting comfort. Knitted garments have life of few months (6months) to 5 years time. But the woven fabrics have

life of 10 to 20 years. So eyelet fabric vests can have more life compared to single jersey vests. Although it is costly and special machines are required to produce the fabrics, it is worth producing the eyelet fabric and using it for vests. Briefs can also be produced with eyelet fabrics because gases escape through holed fabrics. The cost of the machine for eyelet fabrics are high compared to single jersey machines. The production is low for eyelet fabric producing machines. But the benefits of long life and less yarn consumption will compensate the cost of the machine.

6 Materials and Methods

6.1 Materials

Quality particulars for eyelet and single jersey fabrics

The fabrics tested for courses /in.,wales/in.,structure, count and GSM are given below

Eyelet fabric

Courses /in.=38
Wales /in.=30
Count=30s
GSM=90g/m^2
Structure

The structure of eyelet fabric is given in Fig1.

Eyelet Fabric Structure

X	X	X	X	X	X	X
XX		X	X	X	X	X
XX		X	X	X	X	X
XX		X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	XX		X
X	X	X	X	XX		X
X	X	X	X	XX		X
X	X	X	X	X	X	X

x → Knit [ ] → Miss

xx → Two Yarn Knit

Fig1: Structure of Eyelet Fabric

Single jersey fabric

Courses /in.=38
Wales /in.=30
Count=30s
GSM=97g/m^2
Structure

The structure of single jersey fabric is given in Fig2.

Single Jersey

X •
Front Back

Knit Front X →

•

Knit Back →

Fig2: Structure of Single Jersey Fabric

6.2 Experimental setup

Drying behavior of eyelet and single jersey fabrics

The table1 shows the drying weight for every half an hour for eyelet and single jersey fabrics. The graph for single jersey and eyelet fabrics weight loss is drawn which is shown in Fig.3. It is seen from the graph that the eyelet fabrics hold more moisture than single jersey fabrics and dry at long time. This is due to the holding of water molecules over the eyelet gaps and hence eyelet fabrics can absorb more sweats. Also drying time is high and hence it can make body cool for longer time.

Multiple washing treatments for eyelet and single jersey fabrics.

The readings for multiple washings are given in table2. The graph for number of washes vs eyelet or single jersey is drawn which is shown in Fig4 and Fig5. The two types of fabrics are subjected to washing treatments. Upto 5 washings were given. The length and width changes occurring after washing treatments were noted down. The graph increase in length (cm) gives the actual increase after every wash. It is found that eyelet fabrics increase in length. This is due to the eyelet pores are covered with yarns and hence elongation of loops occurs and increase in length results. The increase in width (cm) gives the actual increase after every wash.It is found that eyelet fabrics width increases considerably. One size difference in width increase occurs. (2cm). This is due to the tight construction gets loosened after washing treatments.

7 Results & Discussions

7.1 Results

The results obtained from eyelet and single jersey fabrics drying time are given in table 1. The results obtained from eyelet and single jersey fabrics are given in table 2. The graphs drawn are given in Fig3, Fig4 and Fig5. The single jersey defects of hole on fabric is given in Fig6. Close up view of single jersey fabric is given in Fig7.close up view of eyelet fabric is given in Fig8.

Table -1 Eyelet and Single Jersey Drying Time

Fabrics	Eyelet (x)	Single Jersey (y)
Dry	101.25	101.35
0	270.15	263.35
0.30	267.75	248.65
1	261.25	233.96
1.3	242.5	212.45
2	217.05	190.8
2.30	203.85	174.15
3	181.35	141.75

3.30	163.85	130.95
4	127.5	102.15
4.3	110.45	101.95
5	101.5	100.1

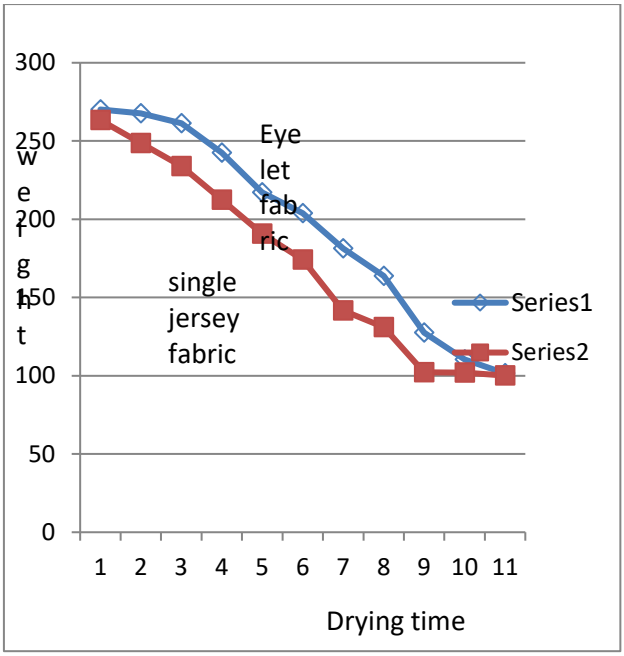

Fig3: weight vs drying time

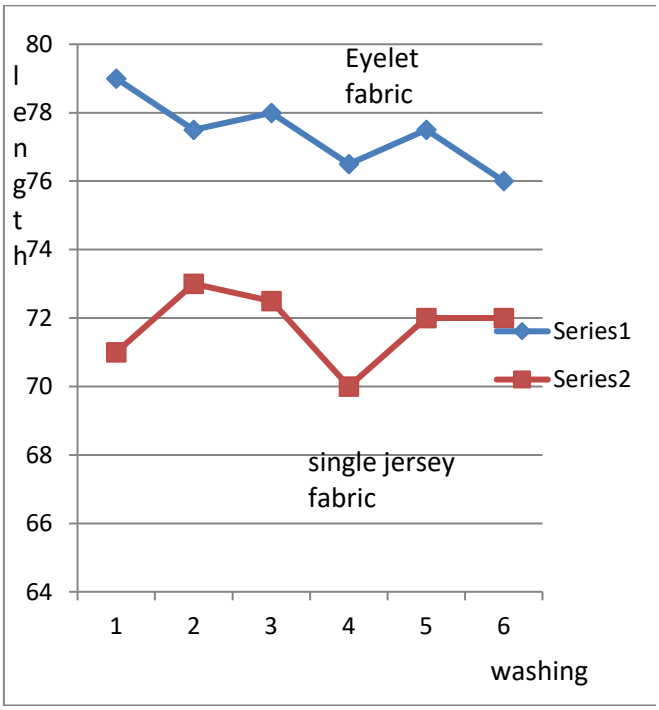

Fig4: length vs washing

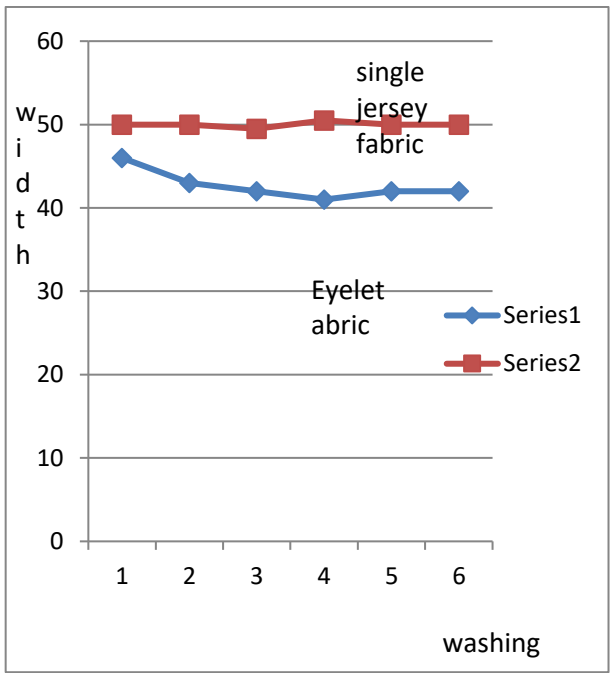

Fig5: width vs washing

Table - 2 Eyelet and Single Jersey Dimensional Changes

Fabrics / Washings	Eyelet (x)		Single Jersey (y)	
	Length (cm)	Width (cm)	Length (cm)	Width (cm)
0	79	46	71	50
1	77.5	43	73	50
2	78	42	72.5	49.5
3	76.5	41	70	50.5
4	77.5	42	72	50
5	76	42	72	50

Fig6: Hole on Single Jersey Knitted Fabric

Fig7: Single Jersey Vest close up view

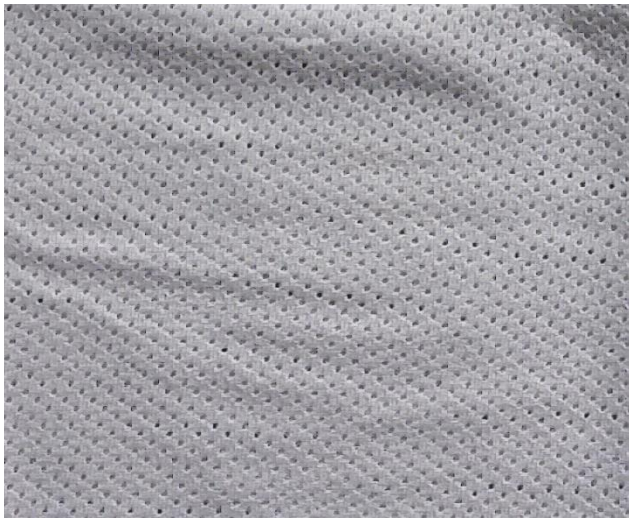

Fig8: Eyelet fabric close up view

7.2 Statistical quality control

Correlation co-efficient

The correlation coefficient is given by the formula

$$r = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{(\Sigma(x_i - \bar{x})^2 \Sigma(y_i - \bar{y})^2)}}$$

These are given in Ref. correlation calculator.html[7]. The correlation between eyelet fabric (x) and single jersey fabric (y) for drying in atmospheric condition is 0.9816. This shows positive correlation between the two types of fabrics. So the two fabrics behave similarly with drying conditions. The coreelation between eyelet fabric (x) and single jersey fabric (y) for dimensional change lengthwise is 0.1079. This shows that there is no much correlation between eyelet and single jersey fabric. They behave differently with respect to dimensional changes, but positive correlation exists. For width wise, the correlation coefficient is -0.1806. So there is no relationship between two types of fabrics and negative correlation exists. When the increase in width is observed in eyelet, the decrease in width is observed in single jersey fabrics.

7.3 Discussions

The eyelet fabrics can be produced in modern four track single jersey knitting machines by altering tuck and miss stitches. The various eyelet fabrics produced are double lacoste, single lacoste,mockrib,polo pique, single cross tuck, cross miss, bird's eye, popcorn design, crepe design, twill effect, weft lock knit, and fleece. Here cross miss sample of eyelet is collected and tested. The samples tested for water absorption shows positive results of correlation coefficient and hence sweat absorption is same. Eyelet fabrics absorbs more water and dries lately. So it has very cooling effect. The washing treatment shows increase in length for both eyelet and single jersey fabrics. But increase in width is observed in eyelet fabrics and no appreciable increase occurs in single jersey fabrics. This means that eyelet fabrics loops behave similarly for length and width. So the yarns don't break and relaxation occurs. In single jersey length increases and width is not increased and hence yarn break quickly. So eyelet fabrics are better in terms of life of garment. Obviously air passes early through eyelet fabrics and hence damage due to gases is less. Sweat can pass through holes and transmitted outwards for eyelet fabrics.

8.Conclusions

Various types of knitted fabrics are available in market. According to the application purpose the suitable fabrics can be selected, tested and usage is justifiable. Here eyelet fabrics are better than single jersey fabrics in vests & briefs.

ACKNOWLEDGEMENT

The Authors wish to Thank the Chairman and Correspondent of EIT Polytechnic College, Kavindapadi for permitting us to do the project work.

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