Introduction
Chapter 1

Introduction

The demand for knitted outerwear has significantly increased over the years in the domestic and export markets. One of the reasons for increasing demand for knits is that they provide outstanding comfort qualities. Their other classic characteristics are shape fitting properties, softer handle, wrinkle resistance, bulkier nature and high extension at low tension.

Knitted fabrics are formed by the interlocking of loops of yarn so that they tend to stretch and confirm to the shape of the wearer which make them very suitable for next to skin wear material. This stretch ability gives shape retention and drape property to apparels and garment.

Knitted fabrics are generally classified into two groups, warp knits and weft knits. In warp knits, a series of yarns form loops (wales) in lengthwise direction. Tricot, Milanese, Simplex and Rachel are commonly used stitches in warp knits. Weft knits are constructed with a single yarn that is formed into interlocking loops (course). There are three fundamental stitches in weft knitting: plain knit stitch, purl stitch and rib stitch. Loops may be loosely or closely constructed according to the purpose of the fabric.

A wide selection of knitted fabrics are available to consumers. Variety in knitted fabric is brought about by using yarn made of natural fiber, manmade fiber or their blends; by using simple yarn or textured yarn; spun yarn or filament yarn; and by using yarns of varying fineness.

Although knitted fabrics have many desirable and important properties, they suffer from some drawbacks such as pilling tendency and dimensional instability.

Pilling has been identified as the main consumer problem associated with knitwear irrespective of fiber composition. Pilling is the formation of small, tight balls of fibers on fabric surface. Natural mechanical agitation during wear and washing causes
some of the fibers in the knitted fabrics to move out of the structures and entangle on the surface causing pills. Loose structure of knit helps in migration of fibers.

The knitting industry frequently has to compromise between fabric handle and pilling performance because the tendency for low twist yarns and open structure to obtain a satisfactory soft handle increases pilling problem. Pills affect softness of handle, which is most desirable for knit wear.

As pills form due to migration of fibers from the yarn in the fabric, pilling can be reduced or prevented by reducing this migratory tendency. This is often corrected by finishing such as setting with resins, or by applying surface active agents such as silicone etc.

The dimensional stability, i.e., resistance to shrinkage or extension on washing has always been considered important for textile fabrics; it has become much critical in recent years with the increasing demand for dimensionally stable fabrics for dress materials, furnishing, upholsteries etc.

Dimensional problem of knitted fabric has been one of the most discussed subjects in the textile industry; particularly in India the user of knitted goods have had very bad impression about the dimensional stability in knitted product.

Consumer research has shown that knitwear articles, such as woolen and acrylic sweaters and cotton T-shirt tend to change unacceptably after a number of wash, and wear cycles. (MacKay, Bishop and Stanley, 1996)

Knitted fabrics are prone to stretching and mechanical deformations. This is due to the fact that knitted fabric is very elastic and sensitive to tension. It is, by and large, loosely constructed fabric, open and extensible in nature. Their structure can be very easily distorted in any direction during finishing and consumer usage.

Yarns are put under a high stress factor while the fabric is being produced and finished. These tension forces within the yarn are present when the fabric is taken off the machine and the fabric is left in highly distorted state. Knitted fabrics never fully recover
from these strains and have to withstand considerable wear and tear in everyday use and laundering.

One of the techniques to control shrinkage and thus impart dimensional stability is resin treatment of the fabric. Synthetic resins are used in finishing for modifying or altering fabric properties. Thermosetting and thermoplastic resins are two types of resins applied on textiles. Thermosetting resins are commonly used for cellulosic fiber and its blends, while thermoplastic are of more general in their application on wool and synthetics.


An attempt was made in this study to overcome drawbacks of pilling and dimensional instability in knitted fabric by application of three resin finishes, one thermosetting and two thermoplastics.

But resin treatment can affect the handle of knitted fabric i.e. softness and stretchability which are highly desirable in knitwear. Stretch and elastic recovery is of great importance in knitted fabric as these determine comfort and fitting property of garment. The distinctive feature of knit fabric is high extensibility in both length and width, which gives it the ability to take up the shape of the wearer and allows it to fit. Due to its construction, a knitted fabric always has a certain stretch and elasticity. Some are more stretchable than others depending upon yarn, fiber and specific pattern used.

The high extensibility of knitted fabric has both advantages as well as disadvantages. As the knitted fabric is not rigid, it is more comfortable when body movements are made. The semi permanent deformation of the knitted fabric gives comfort in wear. It permits greater freedom in body movement. But it may give rise to ‘Bagging’ at knees and elbows. The extensibility of knitted structures exists because of loop structure, when the fabric is extended the loops are distorted and stretched out.
Wadia and Acharya (2003) have reported that resin like urea formaldehyde type or melamine formaldehyde type, which crosslink with itself tend to stiffen the woven fabric, but improve the dimensional stability.

Finishing of knitted fabric for the purpose of reduction in pilling tendency and improvement in dimensional stability can also modify the drape of knitted fabrics which is one of the attributes of hand.

Drape is an important property that decides the gracefulness of a garment as it is related to aesthetics and appearance of garment. It describes the way in which fabric falls itself in specific shape according to its properties when part of it is supported by any surface and rest is unsupported. It is one of the visual components in the aesthetic assessment of fabrics. Drape is an important property of textile material as described by Chu et al., (1950) that allows a fabric to orient itself into graceful folds or pleats as a result of force of gravity.

Knitted fabrics are considerably softer than woven fabrics of same weight. Both warp and weft knits have low bending length which is reflected in their typically soft drapes. The feel of fabric is related to flexural rigidity of the material. As knits have lower flexural rigidity than woven of same weight, knits feel soft and limp.

Drapability of a fabric is the combined effect of several factors such as stiffness, flexural rigidity, weight, thickness etc. Stiffness, an attribute of fabric hand is one of the most important factors determining draping quality of fabric e.g. soft fabric drapes closer to the body forming ripples whereas stiff fabric drapes away from the body. Stiffness of fabric itself depends upon geometrical parameters of the fabric.

Garment drape has received major attention of researchers and designers since the beginning. The drape in a style and in a pattern of garment is considered in designing. Different techniques are used to add flare and fullness so as to create different drape effects according to changing fashion trends and changing demand of consumers.

Drape in a garment is induced by stitch craft. Flare and fullness in garment can be obtained by pleats, gathers or tucks. Another type of drape can be obtained by seam flare.
Extra width is added to the sweep of skirt which depends upon the intensity of seam angle. Angular panels can be used for this purpose, the drape effect depending upon the factors like angle of panels, their position, and level of placement/length.

In addition to stitch craft, finishing agents are also used to alter fabric hand and change draping quality. Traditional materials for modifying hand of fabric are starch, glue and gum. Resins can also modify hand of fabric and produce a variety of effects.

Pant (2004) found substantial increase in drape coefficient of fabrics, finished with acrylic and polyvinyl acetate finishes as a result of increase in stiffness. In case of silicone finish, drape coefficient decreased slightly.

Change in stiffness and drape of knit fabrics can be utilized to modify drape of garment like skirt. An endeavor was made in this study to alter drape characteristics of garment viz. knitted skirts by application of resins.

A skirt is a good example of draped garment. A skirt is a tube or cone shaped garment which hangs from the waist and covers all or part of the legs. As mentioned before, the fullness in skirt is introduced by means of tucks, pleats, gathers or angular panels (godets) or seam flare.

In this study angular panels were added for achieving flare or modifying the drape. In addition, seam flare was also used to study drape in knitted skirt. Later on resin finishes were applied for further modifying drape properties in garment.