STUDIES ON THE PROPERTIES AND PERFORMANCE OF WOVEN VELOUR PRINTED TERRY FABRICS-AN OVERVIEW

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ABSTRACT

The purpose of this article is to understand the history of preparation and structure of woven velour printed terry fabrics. This study analyses the structural properties related to performance and the application area of these fabrics. Woven velour printed terry fabrics are distinguished by their absorbency, good colorfastness washability, soft hand, and hypoallergenic, appearance and design stuff to optimizing the key factors for excellent performance. The sentence "Woven velour printed terry fabrics are distinguished by their" incomplete. Please check and edit as necessary.

KEYWORDS: Velour, Terry, Absorbency, Colour Fastness, Washability, Appearance, Texture & Design

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1. INTRODUCTION

Constantinople, the Turkey, is the origin of Turkish towels or terry (commonly), where these fabrics were woven in handlooms. In the mid-19th century this technique of weaving towels was further introduced in the European countries and later it was transformed into power-driven looms (Hobson 1990). Fundamentally terry fabrics are derived from a group of pile fabrics, in which an additional yarn is placed in a manner that it forms a loop that is, called a pile, to give a distinctive impression. Terry fabrics can be manufactured either by weaving or by knitting. Among these two methods, woven terry fabric was invented first and is still used in major countries (Kienbaum 1978). The quality of knitted fabrics cannot be compared to that of woven terry fabrics. Apart from these other factors such as uses of fibers, frameworks of yarn, frameworks of weaving and procedures of chemical processing also play a significant role in determining the quality of terry towels (Swani et al 1984; Teli et al 2000).

Victor Hobson (1990) illustrated various mechanisms of terry looms being developed at the initial stage, wherein, like other fabrics, handlooms were used to produce terry towels and to form loops, and it is important to fill the long rods in the same direction as that of weft insertion. The thickness of the rods depends on the length and size of the loop. By the invention of power looms, the wires were inserted and withdrawn mechanically, but this was not used in the manufacturing unit due to its complexity in operating it. According to Hobson (1990), by the end of 19th century all the fundamental process for pile formation such as loose reed, shifting of cloth fell, variable fall back controlled by a pattern chain for sculptured effects, etc..., were invented.

A class of wrap pile structure in which significant wrap ends to form loops on the surface of the fabric is called terry fabric. This fabric consists of a number of weft threads and two series of warp threads, the ground, and the pile. The ground and pile threads are distinctly beamed and tightened, the earlier productions with the weft from which the loops were formed by pile warps and projected. The loops may be on either side or on both sides of

the cloth. The performance and characteristics of terry fabric are firm because of the loop arrangement, loop construction and loop density formed on the fabric. Loop warped pile fabrics are used as bath towels, door mats, in automobiles, as gloves and as bed covers etc., and are mostly made of cotton yarns. Terry fabrics are widely used in making a variety of bath and sauna products.

Reliable and economic methods are required to measure the functional and aesthetic texture of the fabric so that can be used in product engineering, product development, and quality control program. This research is intended to investigate the trustability of the processing techniques to analyze the texture of terry fabric. It is also investigated how the yarn and fabric frameworks affect the texture, appearance and after wash performance of the terry fabric. These results help and guide the manufacturer to manufacture quality fabric with best texture and appearance. In this context of the discussion, this research would focus on the objective of evaluation of pile fabric with respect to fabric geometry, surface characteristics, low -stress mechanical behavior, absorbency, aesthetic characteristics, and workability.

Sustainability of a product depends on its quality, pricing, and sale. A fabric loses its attractive appearance then it is declared as non-workable and it may rupture sooner than getting worn out. Researchers conducted studies on the effect of fabric softeners on water absorbency of terry fabric. Apart from water absorbency, other properties such as texture, appearance, compression, friction, etc., are the requirements of current users. Water absorbency, water retaining the capacity of the fabric is disturbed due to repeated washing. Other properties like appearance, texture, compression, friction etc., of the fabric, is also disturbed due to home laundering.

In India, the fast -growing and challenging subsector of the textile industry is the printed woven velour terry fabrics. The main products of terry are hand towels, bathrobes, kitchen towel, and so on. Globally there is an exponential increase in demand for these products, with a significant rate in the local market. In America, an average of \$7 is paid for bath towels. With the tremendous increase in global demand, in the last decades, there has been an enormously increasing importance of this sector. India is one of the major exporting countries for terry products.

This study's focus is on the objective evaluation of pile fabric regarding fabric geometry, surface characteristics, mechanical comfort, absorbency, aesthetic properties and serviceability of woven terry velour printed towel.

2. PRODUCTION PROCESS INVOLVED IN WOVEN VELOUR PRINTED TERRY FABRICS

2.1 Process Chart: for Terry Towel Manufacturing, the Mill Uses the Following Flow Chart

2.2 Methodology of Terry Weave

For terry fabric production, two sheets of warp threads are run simultaneously, wherein one is maintained under normal tension and other under loose tension (Kienbaum 1978, Ramaswamy 1992). The threads of normal tension warp sheet are for ground and threads of loose tension warp sheet are for a pile. The sequences of operations during weaving pile are as follows.

Formation in 3-Pick Terry is Given Below

- Insert of the first pick with loose beating per the design
- Allow a predetermined gap near the feel of cloth
- Insert of the second pick following the first pick with loose beating
- Insert the third pick with heavy beating and bring all the three picks to the fall of the cloth

According to Ramaswamy (1992), the 4-pick terry fabrics are heavy in structure and are of better quality than the 3-pick fabrics.

2.3 Pile Formation

Apart from its water absorbency and other properties, the pile of the woven terry fabrics plays a major role in a towel. According to the requirement, the length of the loop is decided by the quality, weight and so on. Better quality yarn like zero twisted yarns, combed, compact, and so on are used by terry fabric producers. Piles are made by Different high-value and superior quality fibers like cotton suvin, giza, pima, bamboo, modal and so on are used in piles to achieve better absorbency and lint characters. Relatively rough fibers are used in OE and 2-ply option in ground yarn to obtain better strength and compactness. For both pile and ground yarns, the warping is done in a similar manner.

Sizing, and drawing-in. Designing, bleaching, mercerizing, dyeing, printing and finishing Are the processes involved in terry fabric making, which are similar to other textile products shirting, suiting, sheeting fabrics, terry fabrics.

2.4 Parts of a Conventional Terry

A woven towel consists of five parts as listed as follows.

- Pile area
- Fringes
- Beginning and an End part
- Selvage, and
- Border

It is not necessary to have all the 5 parts for every towel. For a towel, the pile area is considered key. At the beginning and the end edges of a towel, the pile warps are left unwoven. Fringes maybe tied or untied for ground warps, and the tightly woven areas of a towel are the beginning and end sections, which are just before or after the pile fabric part, preventing unraveling of this pile area. For a flat weave construction, these are woven without pile loops. Compared to the pile area, the selvage contains a fewer number of warp ends, that is, 4000 (instead of 90) total warp ends woven as a flat weave

without pile, serving to reinforce the sides of a towel. The parts shown in the above image are known by various names, that is, side hem is called as selvage, cross hem as top and bottom hem, borders as dobby and terry bar as Cuff. In the market, a wide variety of towel styles are available, and one towel may not comprise all the above-mentioned towel parts.

2.5 Fibers that are used in Woven Velour Printed Terry Fabric

According to Acar, the following are the required characteristics of yarns used in terry fabrics:

- High Absorbency
- High Wet Strength
- Ability to dye well
- Good Color-fastness and Wash-ability
- Soft Hand
- Hypo-allergenic
- Low cost and Ease of availability.

Cotton fiber yarns are capable of providing these characteristics most effectively and efficiently.

More woven velour printed terry fabrics are being produced from fibers such as Modal®, bamboo, seaweed, Lyocel® and now Soybean, corn and another Tri-blend bamboo, silk and cotton blend.

Because of its softness, luster, antibacterial properties and greater absorbency, bamboos are now used in towels, especially in Egyptian Pima and Supima qualities.

Like cotton, flax is also one of the natural hydrophilic fibers of cellulose, which is known for better dry strength than cotton; and when wet, it becomes 25% stronger. When more moisture is absorbed, it wicks, and it is well known for its long, smoother, and more lustrous characteristics.

Since it is less abundant, it is generally not used in woven velour printed terry fabrics. Converting flax into a yarn involves a long processing and intense labor, hence it is expensive.

2.6 Yarns Used in Terry Towel

The following four yarns are used in terry towel:

- Pile warp
- Ground warp
- Weft (filling)&
- Border weft (optional).

Pile Warp

Pile warp is 100% cotton yarns that are carded or combed, and mostly used sizes are 10/1, 12/1, 14/1, 16/1, 20/1 Ne counts, with 12-20 turns/inch twist.

As 100% cotton gives a more pleasing appearance, there is diminished use of cotton-rayon blends.

To achieve high quality, two or more ply yarns are used, increasing the absorbency, and the fabric gains resistance to pile lay.

There is increased use of two-ply yarns mainly due to its improved visual appearance, making the fabric more appealing. In classic terry, to achieve upright loops piled yarns are of great use. In fashion terry, that is, milled or full goods, spiral loops are obtained using single yarns.

Ground warp

For ground, warp ends carded yarns of 20/2, or 24/2, 100E.120E Ne count with 9 -12 turns/inch twist, and 100% cotton are commonly used.

As the ground warps end possess the highest tension during weaving, two-ply yarns are generally preferred.

For greater strength, a blend of cotton/polyester yarn is used. For ground warps, rotor spun yarns are also used.

Weft

For weft or filling picks, carded yarns of 10/1, 12/1, 14/1, 16/1, or 20/1 Ne counts with 12-20 turns/inch twist, 100% cotton is used usually. Rotor spun yarns are also used in wefts.

Border Weft (Optional)

Complex borders with fancy weaves • are used with premium or high-end hand towels, which are made using a very wide range of filling yarns. Decorative, shiny and bulky yarns of rayon, viscose, polyester, chenille, or mercerized cotton are used at different yarn sizes to minimize the differential shrinkage and increasing aesthetic properties.

2.7 Velour/Shearing of Woven Terry Fabrics

“Vellus”, the Latin word, meaning hair, deriving the word “velour”, meaning toweling with cut loops, that is, a shearing machine is to cut the pile (or the yarn) on a fabric surface, at a constant level of height. A wide range of fabrics and a wide range of applications use this operation.

Cutting the pile loop from one side of the fabric is referred to as shearing. Shearing gives a velour effect to the terry fabric. For certain fabric quality, the shearing is adapted to cut the protruding fibers from the loop, removing the lint from the surface of the terry fabric. That is the reason for some hand towels having one side with the traditional terry loop, and the other side shorn to give the velour effect.

2.7.1 The Shearing Machine

Similar to a giant cylindrical lawn mover, shearing comprises a cylinder with blades, which is used to obtain pile fabric. To remove the cut bits of fiber, the velour fabric is then brushed with bristles fixed in a cylinder, thus leaving the surface fiber to be in one direction and taking care to maintain all the fabrics in the same batch to be laid out in the same direction, else it will cause light to reflect various pieces differently. The figure shows a simplified diagram of the shearing process. The pile fabric is guided across the shearing table and shared between the sharing blades mounted on a cylinder and a fixed blade.

Figure

2.7.2 The Working of a Shearing Machine

The shearing machine's functioning is based on a shearing unit, comprising two sharpened elements working in a similar manner to a scissor.

Of the two sharpened elements, the primary element is a roller with a certain number of blades (usually from 10 to 24 but can be less or more) fixed helical on the roller. This roller is rolled on a flat blade; the cutting function is enabled by the contact between the helical blades and the ledger blade.

A continuous cutting effect is achieved by the rotation of the shearing roller on the flat blade. Cutting point is the junction where the flat blade and the helical blades meet.

During the cutting operation, the fibers are removed periodically by a vacuum system composed of a suction box placed in the back of the shearing roller. The following image shows the cutting operation

According to the type of fabric to be processed, the cutting stand may be of different shapes.

Shearing height is the distance between the cutting point and the cutting stand. After shearing, the height is considered the ensemble of fabric and pile.

The desired height of the pile is arrived at to understand the fabric thickness.

The position of these components with each other indicates the good functioning and the optimal result of the shearing operation:

- The shearing roller and the ledger blade,
- The shearing unit (shearing roller and ledger blade) with the cutting stand.

To do this, all the reference positions of the various components are fixed by equipping the shearing unit with a series of hand wheels and adjusting screws.

For a good pair of scissors, the two blades of a scissor should be well sharpened and in contact with each other.

On the contrary, it is little more complicated in the case of a shearing unit, that is, it should possess much higher cut efficiency, ensuring that the contact between the two blades is constant throughout the width of the blades, with a perfect contact between the flat blade and the shearing roller.

The contact point between these two elements gets worn due to the shearing process, causing deterioration in shearing quality. To avoid this, the following process can be adopted:

- Set the shearing unit
- Perform sharpening of the blades.

To make the loops straight, the fabric has to be steamed, which is performed prior to the shearing process. Therefore, loops are straightened for better shearing quality.

Producing figure or patterns on the terry fabric is achieved by printing. Those days, the prints were made on the plain portion of the terry fabric such as the border of the terry towels. However, nowadays, the designs are printed on the entire surface of the fabrics. Printing is only for decorative purpose.

2.8. PROCESSING AND PRINTING OF WOVEN VELOUR PRINTED FABRICS

2.8.1. Chemical Processing

Several unwanted matters in the grey terry towels, such as contents of size recipe, natural wax and coloring matters, fragmented seed coats, leaves, stems etc., need to be removed, so that desired functional and aesthetic properties in terms of softness, water absorbency, whiteness etc. are retained, because these impurities are embedded in yarn strongly interlaced in fabric, and whose removal involves a complex job. Treating the fabrics with appropriate chemical combinations at the required temperature and pressure for a specified duration helps in dissolving the deeply embedded impurities, while mechanical treatment in the form of stirring, and rinsing, enables in separating out the dissolved impurities from the fabric/yarn (Shenai 1981). Because of the presence of piles/loops, these fabrics should be processed in a gentle manner so that the desired pile configuration is maintained. Tendulkar et al (1995) studied the practices prevailing in bleaching process of terry towels and found process flow as listed below:

- Enzyme/acid treatment for de sizing
- Washing
- Neutralization with acetic acid
- Bleaching in H₂O₂, Caustic and Soda Ash
- Washing
- Softening
- Drying

For de-sizing and bleaching fabrics, kiers, winches, open tubes, and so on are used conventionally. These equipment do not have specific arrangement installed for the treatment of delicate fabrics like terry towels. Surveys (Gujar et al 1992, Patel 1998, Gangopadhyay et al 1999) of decentralized sector revealed that raw methods are still in use. The invention of the soft flow machine led to increased effectiveness of chemical processing with regard to both cost and quality. In addition, development of continuous dyeing range enhanced significantly the productivity and quality of terry fabrics and tubular knits (Omez 1980). Mahaleetal (1990) determined the quality of terry structure in terms of loop density, height, and the tightness of the weave. The absorbency of various terry fabrics is assessed using the parameters sinking time, water uptake, and wick up methods. Except for the fabrics with loops on only one side, other terry weaves were found suitable for wear quality and absorbency. Patel (1998) investigated the methods of dyeing the terry towels, including

such processes as side hemming grey fabric, bleaching, drying in open width, dyeing, washing, wet on wet finishing, weft straightening, and final drying and batch -wise dyeing in rope form which involves scouring, bleaching and dyeing in soft flow machine and final drying with pile lifting. Advantages of weft straightening during pad batch dyeing include no batch variations, little fabric shrinkage and lower water and steam consumption. Advantages of soft flow system include lower investment costs, softer towels, lower dyeing cost, shorter process time and low labor cost. Teli et al (2000, 2002) investigated the effect of different kinds of softeners and process of softening on functional properties of terry fabrics. Researchers evaluated four softeners, that is, fabric softness as well as other properties such as water uptake, sinking time, bending length, wicking height, whiteness, and hand feel. According to researchers, 40°C is considered optimum processing temperature. The terry soft 478softener exhibited the best overall performance. For processing woven velour terry fabrics, soft flow is used widely.

2.8.1. Printing of Woven Velour-Printed Terry Fabrics

Technically, textile printing is the reproduction of a decoration by applying a tool loaded with coloring material on a textile support. In earlier days, textile printing was based on stencil work, highly developed by Japanese artists, and block printing. Nowadays, a block of wood, copper, or other material bearing a design in intaglio (or relief) with the dye paste is applied to the surface and is pressed on the fabric and struck with a mallet. To ensure accurate repeating of the pattern, a separate block is used for each color, and the hitch pins at the corners guide the placing of the blocks.

In Nuremberg, Germany, gold or silver dust is applied on still wet fabric to achieve fabric printing, which is an inexpensive way for lesser monasteries and churches instead of copying the expensive brocades from the near and Far East. Often these silk routes started in Italy, that is, Venice, in particular, which traveled over both land and sea. To economize and reduce the number of blocks needed, further in the copying process, the color was often filled in areas with a brush. Velvet effect was accomplished by spreading powdered wool on the gummed ink pattern. The document found in Nuremberg gave specific directions for duplicating the flowers and animals from the brocades. These procedures could only be used on tapestries, church vestments, and table furnishings because the colors weren't fast. These ornate fabrics were not used for clothing as they couldn't be washed.

Printing a fabric involves 5 basic steps:

- Preparation of the print paste.
- Printing the fabric.
- Drying the printed fabric.
- Fixation of the printed dye or pigment.
- After washing.

Starting with step #2, printing the fabric, a decorative pattern or design is usually applied to the constructed fabric by roller, flat screen, or rotary screen methods. Two types of printing are used for terry fabric printing.

Discharge Printing

For printing the designs on the border i.e. the nonterry portion of the fabric, discharge printing is used.

Screen Printing

Today, screen printing is by far the most popularly used technology, which consists of three elements: the screen which is the image carrier; the squeegee; and the ink. In screen printing, a porous mesh is used, which is stretched tightly over a frame made of wood or metal. The mesh is made of porous fabric or stainless steel. For accurate color registration, proper tension is essential. Either manually or photochemically, a stencil is produced on the screen, defining the image to be printed. However, In other printing technologies, this is known as the image plate[AQ: Please approve edits to the sentence.

An automated version of the older hand-operated silk screen printing is the flatbed screen printing. A separate screen must be constructed or engraved for each color in the print design.

From BBC, Bitesize, Design & Technology, Printing

Depending on the number of colors used, the number of screens will have to be considered for engraving, that is, the number of colors is directly proportional to the screen numbers. Used mostly in printing terry towels, the modern flat-bed screen-printing machine involves a semi-continuous, start-stop operation, comprising an in-feed device, a glue trough, a rotating continuous flat rubber blanket, flat-bed print table harnesses to lift and lower the flat screens, and a double-blade squeegee trough, wherein the in-feed device enables precise straight feeding of the textile fabric onto the rubber blanket. During the printing process, when the cloth is fed into the machine, the cloth is lightly glued to the blanket so that shifting of fabric or distortion is prevented. The blanket carries the fabric under the screens, which are in the raised position. Once under the screens, the fabric stops, the screens are lowered, and an automatic squeegee trough moves across each screen, pushing print paste through the design or open areas of the screens. As mentioned previously, there is one screen for each color in the pattern. The screens are raised, the blanket precisely moves the fabric to the next color, and the process is repeated. Once all the required colors are applied, the fabric is removed from the blanket to be processed through the required fixation process. Before rotating it back to the fabric in-feed area, the rubber blanket is continuously washed and dried.

The quality of the impression made by the squeegee is determined by various factors such as composition, size and form, angle, pressure, and speed of the blade (squeegee). Earlier, the blades had the tendency to warp and distort and were prone to wear and edge nicks as most blades were made of rubber such as neoprene. Now, most are made from polyurethane which has the capacity to produce as many as 25,000 impressions without significant image degradation.

With production speeds in the range of 15-25 yards per minute, the flat-bed screen-printing is rather slow, with obvious design limits. The width and length dimension of the flat screen is limited by the design repeat size. Another demerit of this method is that no continuous patterns such as linear stripes are possible. However, this method possesses several advantages. To accommodate fabrics such as sheets, blankets, bedspreads, carpets, or upholstery, this method provides very wide machines. Large amounts of print paste can be applied to penetrate terry fabrics such as blankets or towels as this method enables multiple passes or strokes of the squeegee. Currently, flat-bed screen machines are used worldwide in fabric printing (approximately 15-18%).

Rotary screen printing has derived its name based on the use of a cylindrical screen that rotates in a fixed position rather than a flat screen that is raised and lowered to the same print location. Rotary presses place the squeegee within the screen. For roll-to-roll printing on fabric ranging from narrow to wide-format textiles, these machines are used.

Especially for terry products, Zimmer monoprint is the only digital printing system. In this system, the jets inject the dye deep into the terry fabric, achieving the desired penetration. Zimmer monoprint is a well-proven technology now adapted to print terry products. All dyestuff groups can be used in Zimmer monoprint.

In the current market, Magnoprint is considered the most versatile flat screen printing machine. Length of squeegee stroke, number of squeegee strokes and speed of squeegee stroke are less step adjustable. For magnetic roll rod and magnetic squeegee printing in the warp direction, the Original Zimmer Magnet System Plus method is used. According to the requirements, the magnet bars are available as standard magnet bar, with stronger magnet force (e.g. for towel printing), and with extra strong magnet force (e.g. for acrylic blanket printing).

For printing blanket with digital synchronization, Magnoprint flat screen printing machine is used with the Original Zimmer Magnet System Plus, computer-controlled electronic drive system and individual direct drive for each magnet bar, whose repeat range less step adjustable from 60 to 600cm.

Airbag Blanket Support System

Printing blanket speed of up to 120 m/min results in speeds higher than 30 m/min.

With step-less repeat adjustment and upto 24 printing stations the printing table length can be chosen from 8 up to 60m. Available printing widths are 165, 185, 225, 250, 285, 305, 330cm

Figure

Figure

Block Diagram of the Screen Printing of Woven Velour Terry Fabrics

3.0 STRUCTURE, CHARACTERISTICS, AND PERFORMANCE

3.1 Structure

Terry fabrics are woven as 2, 3, 4, 5 or more pick terry weaves, the most common being 3-pick terry toweling. As in Figure 3, the cross-section of a toweling through the warps are divided into two systems, pile warps, and ground warps, whereas the wefts consist of only one system. In basic Turkish Toweling, front side and back side pile warps and 1st and 2nd ground warp end to form a 2/1 rib weave with each other. The rib weaves formed by the pile warps are one pick ahead of the rib weave formed by the ground warp ends. Warps are ordered throughout the fabric width as 1:1 or 2:2 piles and ground warps. In 1:1 warp order, each ground warp end is followed by a pile warp end; while in 2:2 warp order, each two ground warp ends are followed by two pile warp ends. In Figures 3a and 3b, the weave notation of 3 weft pile basic Turkish toweling is given in 1:1 and 2:2 warp orders. The of the ground warp shedding is not synchronized with that of the pile warps, as seen from the weave diagrams of Figures a & b. The number of interlacing throughout the warp increases, giving more strength to the fabric. As mentioned previously, terry towels may have pile loops on one or both faces.

The weft count of between 10 and 25 picks/cm is used for toweling, and the warp count is between 20 and 30 ends/cm. During border weaving, the weft count is increased 3 to 6 times the density of the pile areas. Pile/ground ratio is described as the length of pile warp per unit length of fabric in the warp direction. This ratio is calculated by measuring a 10-cm toweling length in the warp direction, followed by cutting the pile warp from either end of the measured length and measuring the total length of the removed pile end per 10 cm length of the fabric. Pile warp length per 10cm fabric is generally between 20 and 100cm. This ratio has a direct influence on the fabric weight and thickness. The weight and the thickness of the terry fabric increase as there is an increase in the ratio.

Figure

3.2 Characteristics

Absorbency: By increasing the surface area with pile yarns along with using cotton yarns having twists lower than the ground warps, absorbency can be increased with a towel.

Heat Insulation: The fabric can be made thicker with a high level of heat insulation using pile yarns. Moreover, naturally convoluted and bulked cotton fibers are used in towels, serving to trap air within the fabric structure, contributing to heat insulation. The air contained between fibers enables thermal insulation. These convolutions plus the tapered fiber ends also hold the fabric away from the skin, increasing the amount of air trapped.

Crease Resistance: the fabric obtaining the third dimension using pile yarns makes the fabric nearly increasable.

Dullness: A very rough textured surface is due to the pile loops, thus giving the fabric a dull appeal, which is common in forum sheared toweling. Velour toweling is even brighter than a traditional fabric. The cut pile forms a very smooth surface and reflects light evenly, giving an appealing look.

Final Finishing of Terry Towels

The finishing treatments are applied to the fabric after dyeing and printing and can be divided into two: chemical (or wet) treatment and mechanical (or decorative) treatment.

Chemical Treatment involves softening, hydrophilic and antimicrobial treatments of terry towels.

In order to obtain a hydrophilic character and for a soft feel and touch, silicones are added to the towel. The three basic types of softeners are used on towels:

- cationic softeners,
- non-ionic (neutral) softeners, and
- silicones

Since the cationic softeners provide good softness but also some yellowish appearance, it is used only for the

colored batch of towels.

Due to the colorlessness of the chemicals used in non-ionic softeners, it does not leave any color and has the less softening effect.

The best and the most expensive softeners are silicones. As the name goes hydrophilic silicones also affect the hydrophilicity of the towel. Apart from this, cellulose are also used in softening.

Antimicrobial Treatment

Antimicrobials are also used to treat towels to prevent mold and mildew and reduce odor and minimize the spread of harmful organisms. Finishes are of two types: antibacterial and deodorant. Antibacterial finish happens during fiber-forming process, whereas the other happens during the finishing process, which is more versatile and widely adopted. Antibacterial attributes including fungicides and bactericides are imparted by chemical entities. Obtaining antimicrobial properties are achieved by anchoring the antimicrobial agent in the fiber. Trevira Bioactive (R) is used in towels, thereby proving its ability to fully retain its antimicrobial effect after 100 domestic or 50 commercial wash cycles.

Mechanical Treatments

Fuller volume and dimensional stability and dryness of the towels are the main aims of dry treatments.

3.3 PERFORMANCE

Justification For the Use Of Reactive Dyes in Printing Woven Velour Terry Fabrics

It is over thirty years since reactive dyes for cellulose were introduced, now accounting for about 25% of the total dye consumption on that fiber. This was understood based on the results of the work on the mechanisms of organic reactions and thus their development was characterized by the study and application of reaction mechanisms involved in the dye-fiber reaction. Handsome dividends were obtained for this factor. The work continues, increasingly gaining cost-effectiveness by enhancing reaction mechanisms, such as polymerization, and this work has reported having little success, but the simple nucleophilic substitution and addition mechanism of dye fixation has become successful and hence dominant. In flat screen printing using reactive dye on woven velour terry fabric printing is the most modern technology.

The usage of reactive dyes printing bright shades has been justified using the below-mentioned factors: Good fastness properties easy application, moderate cost eco -friendliness with increasing production by Zimmer flat screen printing machine on woven velour terry fabrics.

Color Fastness is defined as “the resistance of a material to change in any of its color characteristics, to transfer its colorant(s) to adjacent materials, or both, as a result of the exposure of the material to any environment that might be encountered during the processing, testing, storage, or use of the material.”

Wash Fastness

Textile materials colored with reactive dyes have very good wash fastness properties, whose rating is about 3.5-5. This is attributed to the very stable covalent bond that exists between the dye molecule and the fiber.

Light Fastness

Textile materials colored with reactive dyes have very good lightfastness rating being about 4. These dyes have a very stable electron arrangement and provide very good resistance to the degrading effect of the UV component of sunlight. Some reactive dyes possess only fair lightfastness.

Bleaching fastness

The reactive dyes are stable to peroxide bleaching and so are suitable for dyeing cotton yarns used as effect threads. Chromogens are destroyed using strong reducing agents and chlorine.

Easy application

Reactive dyes became very popular for its great flexibility in application methods with a wide choice of equipment and process sequences.

WOVEN VELOUR PRINTED TERRY FABRICS IS JUST LIKE “HOT CAKE” IN RECENT TEXTILE BUSINESS.

Moderate cost

For the colorist to realize the print idea, there are various printing types like direct printing, discharge printing and resist printing and techniques like roller printing and full -screen printing, but for woven terry fabrics it is very costly and products derived are of low quality.

Many consumers also appreciate the eco-friendliness of fiber reactive dyes. Some companies printing the dyes with natural ingredients and materials focus on creating a product with a minimum harmful waste. Since the dyes are colorfast, they do not bleed into the water, leading to a reduction in dye-laden water runoff, which can be an environmental hazard.

After a satisfactory performance of clothing fabric, consumers seek better quality, that is, more comfortable fabrics. An essential requirement is the performance of fabricant relation to ‘better fitting to the human body’. Textile producers and consumers evaluated this fabric performance based on the mechanical-comfort viewpoint and also through a subjective method called handle judgment. For the engineering design of the fabric performance with regard to fabric handle, this subjective method must be analyzed to explain what the fabric the feels while handling and how it is judged. In this paper, recent developments in the analysis and standardization of fabric, mainly used by experts in textile mills, are first introduced, and then the development of the objective-evaluation system of fabric based on fundamental fabric mechanical properties is described. This is a type of expert system, and the translation software from the fabric mechanical data to handle has been extracted. A third aspect of fabric performance is in apparel manufacturer. With the change in the apparel-production system from a manual system to a line-production system, the interrelationship between fabric mechanical properties and fabric process-ability in tailoring and ease of making up suits has become important. The final part of the paper reviews the latest developments in this field.

4. APPLICATION AND USES

The construction, configuration and density of loops formed on the fabric determine the properties and performance of terry fabric. Cotton yarns are used for making looped warp pile fabrics, which are used for towels, bath

mats, bed covers, dressing gowns, automobiles, and gloves, etc. Terry fabrics are the most widely used fabrics in the home textiles – the assortment of bath and sauna products.

A reliable and objective method is required for the fabric manufacturers to measure the functional and aesthetic appearance of terry fabrics, which can be used for product engineering, product development, and quality control program. Hence, it is necessary to investigate the suitability of image processing techniques for the objective evaluation of the appearance of terry fabric. It is also necessary to investigate how the yarn and fabric parameters affect the appearance and after wash performance of terry fabric. These findings may help the manufacturer to predict and produce the fabric with the best appearance and appearance value. In the light of above discussion, this research would focus on an objective evaluation of pile fabric with respect to fabric geometry, surface characteristics, low -stress mechanical behavior, absorbency, aesthetic properties, and serviceability.

Life of any product plays a crucial role in its quality, costing and sale. A fabric becomes unusable if it loses its aesthetic appeal. Rather than becoming worn out, a fabric may be ruptured out. Many researchers studied the effect of different fabric softeners on water absorbency of terry fabric. Its water absorbing and retaining capacity are affected by repeated washing. Other properties such as appearance, appearance, compression, friction etc. of terry fabric are affected by home laundering. Though home laundering has never got much attention due to the monopoly of absorbency, other properties have got their importance in the current changing scenario. Therefore, it is essential to investigate the effect of home laundering on all the properties of terry fabric so that manufacturer can understand the key structural and material parameters to be altered, improving their performance.

Based on the above discussion, it is necessary to focus on the objective evaluation of pile fabric with respect to fabric geometry, surface characteristics, mechanical comfort, absorbency, aesthetic properties and serviceability of woven terry velour printed towel.

The most important parameters include pile height, a density of pile, thickness, yarn quality, twist and the processing parameters and these govern the properties and performance of woven velour printed terry fabrics. The aim of this research work can be achieved by fulfilling the following objectives:

- The factors affecting absorbency behavior of woven velour printed terry fabrics.
- The factors affecting washing behavior of woven velour printed terry fabrics.
- The factors affecting appearance and design of woven velour printed terry fabrics.
- Optimizing the key factors for high-quality woven velour printed terry fabrics.

The outcome of this research work will be a high-quality, low-cost woven velour printed terry fabrics having enhanced properties.

5. CONCLUSIONS

This paper involves a detailed study of the properties and performance of woven velour terry fabrics. The demand for woven velour printed terry fabrics is increasing day by day. To fulfill the increasing demand, modified manufacturing and special printing processes are adopted, on woven printed terry fabrics. These processes influence the functional properties of fabrics. All the methods and techniques help in enhancing the functional or aesthetic properties of fabrics.

However, it is observed that characteristics of pile warp yarn play a greater role in determining the softness, water absorbency and good velour pile appearance of printed terry fabrics. Softness, absorbency and washability performance of velour printed terry fabrics go hand in hand with the soft pile warp yarn and chemical finishing during the process of printing. Softer and better water absorbent towels are produced using low-twist yarn in pile warp.

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