COMPARISON OF RING, ROTOR AND AIR JET YARN (SAME COUNT) ON THE ABSORBTION BEHAVIOR OF TERRY TOWELS.

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ABSTRACT

Terry towel plays major role in the textile industry as well as in the society. In these way there is a comparative study on absorbtions behavior of the terry towel with different types of yarn on same count. To Influence ring, rotor and air jet yarn in a same count. To weave Terry towels in the loom To Influence ring, rotor and air jet yarn in a same count. To weave Terry towels in the loom. The main objective of this work is to study the factors influencing the moisture absorption characteristics of terry towel fabrics based on 100% cotton fibres. Different moisture absorption properties studied in this research work are water absorption, absorption time, absorption rate (static absorption), dynamic, and vertical wicking. The results showed that the moisture absorption related behaviour of the terry towel fabrics were based on their fabric weight, thickness and pile yarn twist.in these way there is detailed study on the terry towel and well known knowledge on absorbtion terry towel.

Keyword – *cotton , terry fabric, absorbtion behavior, count, etc….*

1. INTRODUCTION

A terry towel is a textile product which is made with pile loops on one or both sides covering the entire ground surface or forming pile strips, pile checks, or other pile patterns (with hemming end or with firm selvedges). Turkish Toweling fabrics structures form a class of warp pile termed terry pile in which certain warp threads form loops or curls on the face of the cloth. We may use one weft and two series of warp threads placed on two warp beams are necessary for the production of this cloth.

Fig -1 Terry Towel

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The main objective of this study is to understand the factors influencing the various absorption (water) related properties of terry fabrics and develop a novel terry structure with improved moisture absorption properties with respect to various applications area. Initially, five different types of yarns on cotton terry fabrics were used to study their water absorption, immersion time, absorption rate (static absorption), dynamic absorption and vertical wicking according to the standard procedures.

1.1 Terry towels

Terry towel is a fabric with loops on the surface either one or two sides of the fabric that can absorb huge amount of water compared to conventional structure (planar woven fabric with warp and weft yarns). Terry fabric or fabric with loop piles can be produced using both weaving and knitting technology. Generally, three different yarn components are involved in the production of pile fabrics namely weft, ground and pile warp yarns.Terry towel fabric is one of the main consumer goods being used by people globally. Terry towels are used in various places including bathroom, sports, swimming pool, kitchen, beach, etc. with different water absorption characteristics. The absorptive capacity of terry fabrics predominantly depends upon the material (fibre type, yarn type, yarn twist, etc.) and structural parameters (pile height and warp-weft density). Among various natural fibres, cotton fibre is the most widespread material used for the production of terry fabrics due to its characteristics such as high absorbency, hypoallergenic properties, etc..

1.2 Vertical wicking test

A test apparatus based on electrical conduction principle was designed and manufactured to overcome some difficulties and deficiencies in vertical wicking measurements of fabrics, which is one of the test methods used to determine liquid moisture transmission performance of fabrics. In order to test effectiveness of the apparatus, capillary time with regard to height was measured for woven shirting fabrics, which have different raw material, weave type and weft density. It was found that twill weave type and fabric looseness improved the wickability of fabrics. It was also revealed that raw material was an important factor for vertical wicking. The wicking rate of fabrics obtained from the new test apparatus correlated well with DIN 53924. Consequently, the test apparatus clearly demonstrated differences between the fabrics used in the study, and can be used to determine vertical wicking behaviour of fabrics.

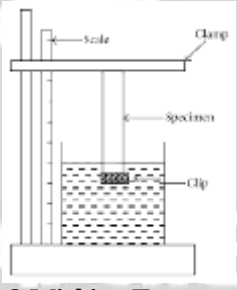

Fig -2 Wicking Test

2. RAW MATERIALS

The raw material for this study is the 40s count yarns in ring spun yarns, rotor spun yarns and air jet spun yarns on cotton fibres .and finally the terry fabric is prepared by these types of yarns and the research can be processed under these yarns.

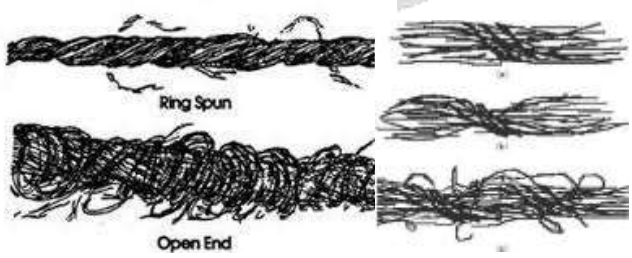

Fig -3 Yarn from ring rotor and air jet spinning

2.1 Ring Spun Yarns

The processing of a cotton ring spun yarn must go through a carding machine. If it is desired, the fiber may also be combed which would be in addition to the carding. A carded cotton ring spun yarn begins with a bale lay-down. Figure 3 shows the flow of cotton staple fiber from the bale laydown through ring spinning. There are multiple bales in the lay-downs. A lay-down is a grouping of bales of fiber based on fiber properties to meet the specifications of a particular yarn. Each lay-down feeds into a series of opening and cleaning equipment. Bales are then placed in an individual lay-down according to fiber strength, fiber length, fiber micronaire (thickness of the cotton fiber), and color. Cotton from different growth regions may be in different laydowns or in the same lay-down. A lay-down of cotton fibers would be in a separate area from a lay-down of another fiber type such as polyester. Small tufts of fibers are plucked from the bales by a top-feeder which automatically moves up and down the lay-down. The bales are normally computer selected so that lay-downs are controlled according to important properties of the fibers assuring consistency from lay-down to lay-down. The fiber tufts are then processed through various types of opening and cleaning machinery in order to open or separate the fibers which also aids in cleaning or removal of trash particles mixed in with the fiber. The trash is composed of cotton plant materials such as leaf trash and seed hull fragments.

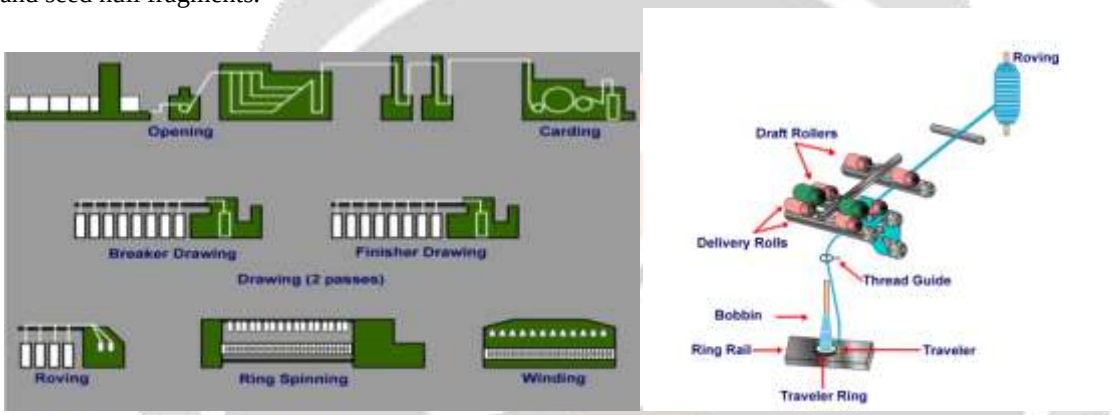

Fig -4 Ring spinning process

2.2 Rotor spun yarns

Open end spun yarn (sometimes called rotor spun yarn) is produced with fewer processes as seen in Figure 17 and more automation compared to ring spinning. Therefore it is less labor intensive. The productivity is generally 8-10 times higher compared to ring spinning. Because no roving is necessary for open end spinning, typically single-processed or double-processed drawing sliver is fed into the machine. No separate winding operation is needed in open end spinning since the yarn packages are formed on the machine as the yarn is delivered from the rotor. Also, open end spun yarns offer better evenness and less skew than ring spun and air jet yarns.

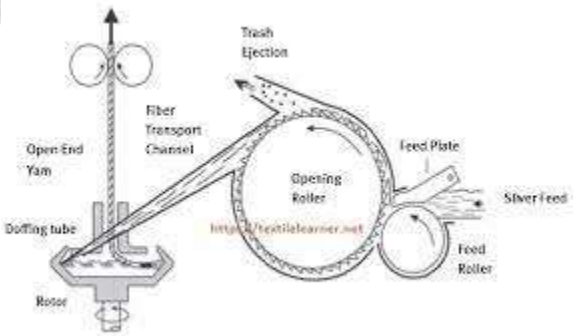

Fig -5 Rotor spinning process

2.2 Air jet spun yarns

Conventional air jet spinning is referred to as the MJS (Murata Jet Spinning) system since Muratec, a Japanese company, is the only supplier of the technology., air jet spinning also does not use the roving process and does not need a separate winding operation. The productivity is 20 to 22 times higher than ring spinning and approximately twice that of open end spinning. Air jet spinning has automation similar to open end spinning. Conventional air jet spinning is restricted to the use of 100% manmade fibers and blends of cotton and manmade fibers. Yarns containing 100% cotton are too weak for normal end uses. Air jet yarns have a parallel core of fibers which are held together by a narrow band or ribbon of fibers that are spirally wrapped around the yarn surface. The tightness of the wrapping of the ribbon fibers is controlled by an air nozzle. Tighter wrapping leads to stronger but stiffer yarn. These yarns have a reputation of producing less pilling in fabrics. shows MJS air jet nozzle N1 and N2.

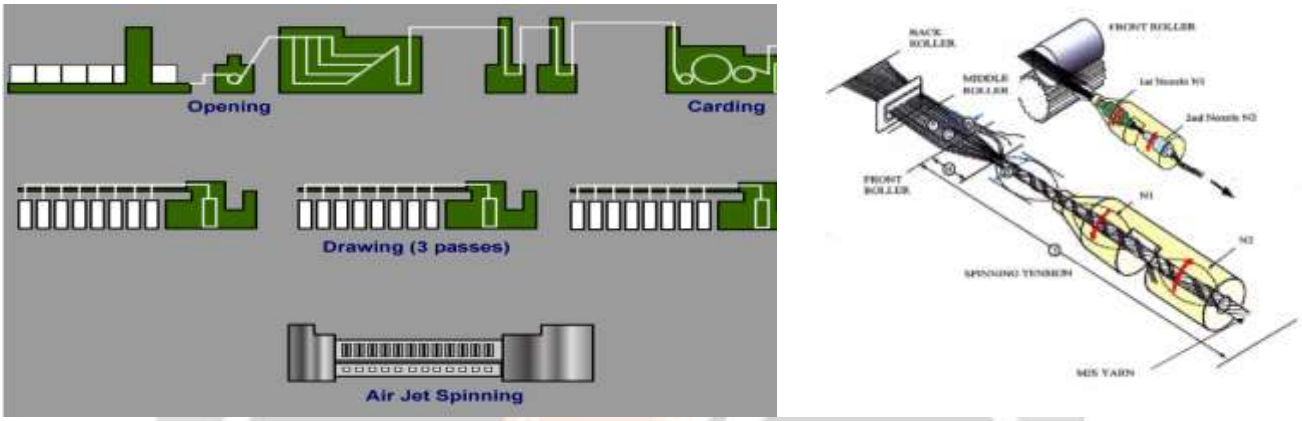

Fig -6 AirJet spinning process

3.Terry towel weaving

For the terry towel manufacturing process, yarn is woven on the loom and then dyeing of the woven terry fabric is done. This weaving is done on a machine with a width ranging from 220 to 380 cm. While weaving many towels are woven together parallel to each other. For example, four bath towels of 60 cm width or six hand towels of 40 cm width may be possible on same size of loom. These parallel woven towels are split in a cut and sew process by using continuous cutting machines after completing dyeing or any wet processing required in rope form. Further stitching or hemming of the edges which are cut prevents unravelling of the threads.

Cutting and hemming appears to be a simpler process than weaving and processing, but since the cut and sew process is the last process before goods are presented to the customer, it becomes very important to pack the right quality at the right time. In order to control piece flow in the cut and sew department, management of the operation is very important, so that all pieces are checked and packed to a suitable quality grade without being stopped in inventory.

Historically, the cutting operation was a manual one where scissors were used to cut the pieces and hemming on the end and side was done on manual machines. As the scale of operations increased, automation took place and now each of the process from cutting, hemming, folding and packing is possible with automatic high-speed machines.

Fig -7 Terry towel Weaving process

4.Comparison study

Spinners are always trying to produce better quality yarn with low cost. But with the increase of quality cost also increase. Another important parameter is production time. Rotor is the cheapest technique and produced yarn evenness is also better than ring yarn. It is also a fast process. But limitation of rotor yarn is less strength of the produced yarn. If it is possible to increase rotor yarn strength then the yarn will be the best one. So researchers should give emphasize on rotor spinning process. As most of the time we consider yarn strength, almost all the yarns are produced in ring spinning machine as it gives strong yarn. Another reason for greater acceptance of ring yarn is that a wide range of count can be produced by ring spinning system.

Parameters	Ring spinning	Rotor spinning	Air-jet spinning
Fiber type	100% cotton (CIS Uzbekistan)	100% cotton (CIS Uzbekistan)	100% cotton (CIS Uzbekistan)
Staple length	28 mm	21mm	28mm
Fiber fineness	4.1 Mic	4.1 Mic	4.1
Drawn Sliver Hank	70 grain/yard	70 grain/yard	70 grain/yard
Roving Hank	0.78 Ne	-	-
T.M.	4.7	4.7	4.7

5. CONCLUSIONS

In this work, cotton terry towel fabrics with different pile yarn structures, i.e. double yarn pile loops, zero-twist yarn pile loops and single yarn pile loops were tested and analysed. Terry fabrics and yarns (taken from the fabrics) properties were analysed and reported. In addition, various water absorption related properties were studied for these fabrics according to standard procedures and analysed. Terry towel fabric produced with zero-twist yarns for pile loops exhibited higher water absorption and highest absorption rate. This is due to the higher thickness (fabric), fine, bulk and more open structure of zerotwist pile yarns. Conversely, the terry sample showed better results in the case of immersion time (least time) and high vertical wicking level (in cm). This was due to least fabric weight (GSM) among other samples. The samples showed high dynamic absorption at warp direction. In conclusion, the results showed that the moisture absorption related properties of the terry fabrics studied in this work mainly depends up on the fabric weight, thickness and type of pile yarns used (e.g. single, plied or zero-twist). Based on the comparative ring spun yarn are the best on absoption and it would be more effective when compared to the other types of spinning.

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