Quality Improvement of Yarn by Automatic Waste Removal

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Abstract – Spinning is the process of conversion of fibre into yarn. The spinning process includes various operations such as cotton mixing, carding, combing, drawing, winding. Winding is the final process in spinning mill where the yarn of small quantity is wound into a big package known as cones. The important aspect in winding is removal of defects or faults in yarn produced. In manual winding when there is discontinuity of thread, during removal of faults, the knot is made by a human. This reduces the quality of yarn. As we know there are different solutions are available on yarn removal and all have its drawbacks also, still different methods and solution are developed to remove yarn. This is because the resale value of wastes is much less than the price of the cotton or the yarn. The control of yarn realization is thus as important to a mill as the control of cotton and mixing cost. And yet in most mills, the approach to the control of yarn realization is half-hearted, and depends on records of dubious accuracy.

Index Terms – Assessment of Yarn Realization, Invisible Loss, Product Waste, Process.

1. INTRODUCTION

The archaeological surveys and studies have found that the people of Harrapan civilization knew weaving and the spinning of cotton four thousand years ago. Reference to weaving and spinning materials is found in the Vedic Literature. There was textile trade in India during the early centuries. A block printed and resist-dyed fabrics, whose origin is from Gujarat is found in tombs of Fostat, Egypt. This proves that Indian export of cotton textiles to the Egypt or the Nile Civilization in medieval times were to a large extent. Large quantity of north Indian silk were traded through the silk route in China [5] to the western countries. The Indian silk were often exchanged with the western countries for their spices in the barter system. During the late 17th and 18th century there were large export of the Indian cotton to the western countries to meet the need of the European industries during industrial revolution. Consequently, there was development of nationalist movement like the famous Swadeshi movement which was headed by the Aurobindo Ghosh.

Fig.1 Waste yarn in Bobbins

In the manufacture of rayon, when yarn is unwound from' the bobbins a few of the innermost layers are left because they have imperfections which would lower the quality of the finished product when it is sold. The usual method of removing the waste is manually cutting it off by means of a knife, but this method is slow and therefore expensive from a standpoint of production costs. Moreover, the manual cutting operation

involves the risk of marring the surfaces of the lacquered bobbins, because it is impossible to regulate with sufficient precision the path of the knife as it passes over the surface of the bobbin.

"Roving frame is known as necessary evil". The problem is that this machine has many complications, creating faults which have no solution, increasing production costs, its finished product is sensitive while using in winding and unwinding operations. From the early ages of history, the production of yarn has been done by spindles. During the last centuries many spinning machines came out but no one has been able to replace the ring spinning machine. The process starts from the output of simplex machine which is called "roving". Roving is wound on roving bobbins.

2. RELATED WORK

Natural fibers cotton, flax, silk, and wool represent the major fibers available to ancient civilizations. The earliest known samples of yarn and fabric of any kind were found near Robenhausen, Switzerland, where bundles of flax fibers and yarns and fragments of plain-weave linen fabric, were estimated to be about 7,000 years old. Cotton has also been cultivated and used to make fabric for at least 7,000 years. It may have existed in Egypt as early as 12,000 B.C. Fragments of cotton fabrics have been found by archeologists in Mexico (from 3500 B.C.)., in India (3000 B.C.), in Peru (2500 B.C.), and in the southwestern united States (500 B.C.).Cotton did not achieve commercial importance in Europe until after the colonization of the new World. Silk culture remained a specialty of the Chinese from its beginnings (2600 B.C.) until the sixth century, when silkworms were first raised in the Byzantine Empire.[23,24] Synthetic fibers did not appear until much later.

The first synthetic, rayon, made from cotton or wood fibers, was developed in 1891, but not commercially produced until 1911. Almost a half a century later, nylon was invented, followed by the various forms of polyester. Synthetic fibers reduced the world demand for natural fibers and expanded applications. Until about 1300, yarn was spun on the spindle and whorl. A spindle is a rounded stick with tapered ends to which the fibers are attached and twisted; a whorl is a weight attached to the spindle that acts as a flywheel to keep the spindle rotating. The fibers were pulled by hand from a bundle of carded fibers tied to a stick called a distaff. In hand carding, fibers are placed between two boards covered with leather, through which protrude fine wire hooks that catch the fibers as one board is pulled gently across the other.

The spindle, which hangs from the fibers, twists the fibers as it rotates downward, and spins a length of yarn as it pulls away from the fiber bundle. When the spindle reaches the floor, the spinner winds the yarn around the spindle to secure it and then starts the process again. This is continued until all of the fiber is spun or until the spindle is full. A major improvement was the spinning wheel, invented in India between 500 and 1000 A.D. and first used in Europe during the middle Ages. A horizontally mounted spindle is connected to a large, hand-driven wheel by a circular band. The distaff is mounted at one end of the spinning wheel and the fiber is fed by hand to the spindle, which turns as the wheel turns. A component called the flyer twists the thread just before it is wound on a bobbin. The spindle and bobbin are attached to the wheel by separate parts, so that the bobbin turn more slowly than does the spindle. Thus, thread can be twisted and wound at the same time.

About 150 years later, the Saxon wheel was introduced. Operated by a foot pedal, the Saxon wheel allowed both hands the freedom to work the fibers. A number of developments during the eighteenth century further mechanized the spinning process. In 1733, the flying shuttle was invented by John Kay, followed by Hargreaves' spinning jenny in 1766. The jenny featured a series of spindles set in a row, enabling one operator to produce large quantities of yarn. Several years later Richard Arkwright patented the spinning frame, a machine that used a series of rotating rollers to draw out the fibers. A decade later Samule Cromptons' mule machine was invented, which could spin any type of yarn in one continuous operation. The ring frame was invented in 1828 by the American John Thorp and is still widely used today. This system involves hundreds of spindles mounted vertically inside a metal ring. Many natural fibers are now spun by the open-end system, where the fibers are draw by air into a rapidly rotating cup and pulled out on the other side as a finished yarn.

3. PORPOSED MODELLING

3.1 Yarn Spinning

Spun yarn is produced after spinning the raw fiber, filament yarn excepted. Filament yarn is not spun and is directly used or used after some twists as input for weaving fabrics or other textile goods. There are various systems on which spun yarn could be produced. One is cotton spinning system and other is worsted spinning system. Silk yarn is spun on a different kind of spinning system. The wool yarn and wool/acrylic blends are: generally spun on worsted system. However, the dominating system of spinning in India and in most parts of the world is the cotton spinning system. This chapter deals with production, productivity and technology changes in cotton spinning system. Yarn consists of several strands of material twisted together. Each strand is, in turn, made of fibers, all shorter than the piece of yarn that they form. These short fibers are spun into longer filaments to make the yarn. Long continuous strands may only require additional twisting to make them into yarns. Sometimes they are put through an additional process called texturing. The characteristic of spun yarn depend, in part, on the amount of twist given to the fibers during spinning. A fairly high degree of twist produces strong yarn; a low twist produces softer, more lustrous yarn; and a very tight twist

produces crepe yarn. Yarns are also classified by their number of parts. A single yarn is made from a group of filament or staple fibers twisted together. Ply yarns are made by twisting two or more single yarns. Cord yarns are made by twisting together two or more ply yarns.

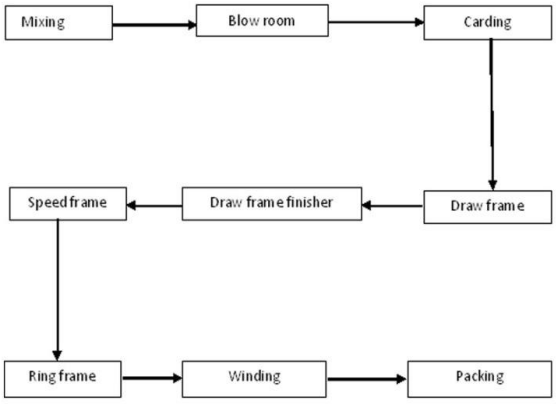

Fig.2 Yarn manufacturing process

3.1 Manual Removal of waste yarn from Bobbins

Now days there are no of ways are found to remove yarn from bobbins. But in India some yarn mill remove waste yarn manually at time of production. This removing of yarn may effect on worker who are remove yarn at time of production. When worker remove yarn from bobbins by blade or cutter their may be cutting of hand and blooding occur. Workers have to do that work continuously by sitting so they suffered for long time at only one position shown in fig (4.1)

Fig.4.1 Labour removes waste yarn from bobbins

When yarn is unwound from' the bobbins a 'few of the innermost layers are left because they have imperfections which would lower the quality of the finished product when it is sold. The usual method of removing the waste is manually cutting it off by means of a knife, but this method is slow and therefore expensive from a standpoint of production costs. Moreover, the manual cutting operation involves the risk of marring the surfaces of the lacquered bobbins, because it is impossible to regulate with sufficient precision the path of the knife as it passes over the surface of the bobbin.

4. RESULTS AND DISCUSSIONS

4.1 Effect on Yarn Production by Yarn Realization:

Yarn realization denote the percentage of yarn produced from a given weight of bale material. The rest is the waste which has much less worth compared to fresh fiber or yarn. In last decade the Indian mill have become actually aware of this aspect and have introduced effective control and monitoring mechanism. The wastes are directly of two type.

a) The process waste taken out in the blow room card and combers which account for nearly 80% of total waste losses in cotton spinning and 50% in manmade and blend spinning the process waste is decided by arriving at minimum level required two achieved the desired yarn quality.

b) The product waste which are incurred of each stage of processing. The control over product wastes has to be exercised through floor supervision.

The level should also be guided by the 51% arrived at by research association. It is reduction in yarn realization has almost some economic impact on mills profit as increase of 1% the record required to be maintained for waste losses and yarn realization are outlined have norms for waste losses and yarns realization also given.

4.2 Cost for Removal of Waste Yarn:

- Per Day Wages of Labour:

Labour is a most important part of any industry. Each industry has to pay wages to the labour which are working there. In yarn mill, there are number of lobour are required for removal of yarn from bobbin due to this wages of labour increased as number of labour increases and it causes effect on production cost of product. Nowadays wages of labour is as shown in (table 3.1).

Sr. No.	Labour Type	Per Day Wages (Rs.)
1	Skilled Labour	275 -300
2	Semi-Skilled Labour	175 -200
3	Unskilled Labour	150 -175

Table 1 Per day wages of labour

5. CONCLUSION

We have presented a detailed description of fabrication of waste removal yarn from bobbins. In this we concluded that the modern methods for waste yarn removal having better efficiency as compare to old methods because of using the machines and better material and it also reduces the man power. As yarn is a base material for textile manufacturing we concentrated on improving the quality of yarn. By removing the accumulated waste automatically for a periodic interval of time, working efficiency of suction motor is improved.

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