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BRIEF OVERVIEW OF THE AUTOMATION PROCESS IN SPEED FRAME MACHINE

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ABSTRACT

The roving process is an intermediate step in converting stretched cotton fibers into low-twist cotton fibers, called roving. This article discusses speed frame tasks / speed frame functions and their control parameters such as roving twist, roving twist, roving tension, etc. to improve yarn quality. It also includes the objectives of the roving process, its importance in yarn production, and various aspects related to the process control parameters

Keywords: Roving, Speed Frame, Yarn, Fibre, Twist, Hank, Tension.

I. INTRODUCTION

Speed frame is a machine in which the tape goes through one or more thinning processes. The fine chip receives a small amount of twist and is wound onto a suitable coil tube for the next process. Roaming is the output product of speed frames. The fine fiber bundles used in the search process are prepared for spinning. They are slightly twisted fiber bundles. Pull out the draw frame belt to reduce the weight per unit length, insert a small amount of twist in the roving and wind the twisted roving on the spool. The exit of the draw frame is too thick, and the unfolded strands are prone to hairy and fly. The draft required to convert it into yarn is 300,500. The speed frame process minimizes the weight of the sliver to an appropriate size for spinning the yarn and inserting the twist, thus maintaining the integrity of the drawn strand. Due to the limited drawing capacity of the ring spinning machine, the tape cannot be fed to the ring spinning machine for yarn production. Therefore, the fine twist roving is suitable for this purpose. The second reason behind the importance of the speed frame is related to the transportation and space limitations of the ring frame. Processing may represent the worst method of transportation and feeding to the ring spinning machine. The parameters used in the roving directly affect the quality and performance of the spinning

II. VARIOUS PARAMETERS IN SPEED FRAME MACHINE

The draw frame output is fed to the roving frame (also known as "speed frame"), where the linear density of silver decreases due to the number of operations. The process on the Speed Frame machine can be divided into several operations, each of which is almost independent of other operations. Processes and process control parameters in the speed framework are discussed below

2.1 PROCESSES

2.1.1 Creeling:

Creel is located at the back of the machine and is used to feed the raw material into the drafting zone. The best creel tension should be selected to control the sag or stretch in the draw frame. The roving coil obtained from the simplex process is used as the feed in the ring frame. These roving spools are mounted on the creel spool support. The creel is installed on the top of the ring frame machine. The roving now passes through the guide rod into the stretching system. The creel is equipped with an automatic roving breaking device. When a roving break occurs on any spindle during processing, the stop action starts immediately and stops work on that particular spindle.

2.1.2 Drafting:

Drafting is generally carried out by a double deck drawing system, which can handle incoming yarn counts of 0.12024 Ne and delivered roving counts of 0.27-3 Ne. The throw range given during the roving process is between 4 and 20 and can process fibers up to 60mm long. The stretch arrangement directly affects the economy of the machine by affecting the final break rate and indirectly affects the economy of the machine through the maximum possible pull. If the stretching device can use a higher shooting speed, you can use a thicker roving as the feed material. This leads to higher productivity of the roving frame, thus reducing the number of rovings, space, personnel, etc. required. In fact, increasing the current will affect the yarn quality beyond a certain limit. Within this range, some studies have shown that increasing drafting can improve yarn quality

2.1.3 Twisting:

It is a very important factor that generates force in the roving, and the torque is inserted through the hand wheel. When the flywheel rotates, the fragments will twist. The level of turn depends on the speed of the steering wheel and the speed of delivery. The traveler imparts twist to the yarn. The guide and the spindle together help to wind the thread around the bobbin. The length of the coil corresponds to the difference between the peripheral speed of the main shaft and the carriage. The speed difference must correspond to the length conveyed to the front roller. Because the traveler itself has no propulsion, it is pulled by the axle. If the traveler's speed exceeds the normal level, the traveler's heat stress limit will be exceeded; the wear characteristics of the steel ring and traveler will change dramatically. As the adhesion between the ring and the traveler increases considerably, entanglement occurs between the two. These convulsions not only cause great damage to the travelers, but they also cause great damage to the ring. Due to this unstable behavior of the ring and slide system, the wear is at least an order of magnitude greater than in the stable phase. The temperature of the traveler reaches 400-500 degrees Celsius and the risk of the traveler failing in annealing is very high.

2.1.4 Laying:

Laying refers to the arrangement of any given number of layers of roving wound on the coil. The unit of measurement for twist is "bobbins per inch", which means the number of bobbins wound per inch of the bobbin parallel to the bobbin axis. The purpose of the laying operation is to place successive roving rolls side by side in an evenly spaced arrangement. This regular and uniform arrangement is achieved by moving the spools of each layer up and down at a uniform speed.

2.1.5 Winding:

Winding is the process of pulling the roving from the front roller through the flywheel onto the coil. The yarn produced in the ring spinning process is continuously wound on the ring at the same time. This work is done by the speed difference between the spindle and the traveler. The traveller is dragged with the spindle with the help of additional threads. The traveler rotates at a slower speed than the shaft. The thread is wound on the loop spool. The traveler imparts twist to the thread. Together, the traveler and the spindle help to wind the thread on the bobbin. The length wound on the coil corresponds to the difference in the peripheral speed of the spindle and the carriage.

The speed difference should correspond to the transport length of the front stretch roller. Since the traveler does not have its own propulsion, the spindle will drag it. The cross thread guide is installed on the movable ring rail. The cross guide carries the yarn up and down during the pack formation process. The cross guide rail and the movable ring rail move up and down. The winding height of the ring rail is also less than the total winding height of the empty ring reel. Therefore, after each layer is wound, the ring rail should be slightly raised (lateral offset). The tall balloon will cause the coil diameter to be large, which can cause space problems. Larger balloons will create more air resistance on the threads. Therefore, higher yarn tension acts on the yarn, resulting in more broken ends during the processing of the ring structure. To avoid this problem, a balloon control ring is used. Divide the balloon into two smaller sub-balloons. Despite the high overall height, the double balloon created in this way is completely stable even under relatively low thread tension. Therefore, the Globe control ring helps to run the machine with long spindles (longer lift) and high spindle speeds, but with lower wire tension.

2.1.6 Building:

The build movement is controlled by the constant up and down movement of the coil track containing the coil and shaft. has a dead weight. At one end of the mechanism that rotates the vertical axis. They are connected by chains. There is a rack drive wheel connected to the vertical shaft. The frame is located behind the drive wheels of the frame. The movement of the vertical axis rotates the rack drive wheel. If the louver wheel rotates clockwise, the louver will move to the left. The cone is connected to the frame through a connecting rod. The

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movement on the left side of the grid moves the belt to the left, reducing the speed of the coil as the diameter increases. The rack drive wheel moves counterclockwise and the rack moves to the right, causing the belt to move to the right. The rotation of the vertical axis is controlled by a ratchet. Due to its own weight, the movement of the vertical axis can be continuous. But the ratchet controls its movement. The ratchet wheel makes a 0.5-inch movement after winding a layer of roving on the spool. Since the vertical shaft is connected to the ratchet, it cannot move continuously. Similarly, the amount of belt movement depends on the thickness of the roving, that is, the number of rovings. The amount of belt replacement is controlled by replacing the gear shift wheel and the ratchet wheel. When the coil is completely wound, the tape should return to its starting point. Today, it is usually done automatically.

2.1.7 Doffing:

After rolls the required length into the package, replace the entire package with an empty package by moving operation. Molting is a process in which the thread fully winds a bobbin and other winding device.

When new machines are equipped with automatic doffing systems, these systems are almost always fixed. In any case, the mobile system is used almost exclusively in existing ring spinning mills. Unlike the fixed system, all the policemen in a machine are removed at the same time, whereas the mobile system usually presents an individual change and can usually also do it in groups

2.2 PROCESS PARAMETERS

2.2.1 Roving hank:

It is the linear density (weight per unit length or length per unit weight) of roving. Generally, the number of hanks of 840 yards in a pound is called roving hank

- 36 inch = 3 Feet = 1 Yard;
- 1 Meter = 1.0936 Yards;
- 1 Pound(lb) = 453.6 Gram = 16 Ounce (Oz);
- 1 Lea = 120 Yards;
- 840 Yard = 7 Lea = 1 Hank;
- 1 Pound (lb) = 7000 Grains;
- 1 Meter = 39.37 Inch;
- 1 Kg = 2.205 Pound (lb)
- Count means the number of 840 yards length that weight exactly 1 pound (lb).

$$\text{Roving Hank} = \frac{\text{Length of hanks of 840 yards}}{\text{Weight inwards 1 lbs}}$$

Equation: 2.1

2.2.2 Roving tension:

Roving tension is a major factor affecting single machine production and quality performance. Three types of itinerant stresses appear during the simplex process. The roving tension at the start point of the roving winding is affected by the diameter of the empty spool and the starting position of the tapered drum mechanism drive belt. The tension of the bit during the construction movement depends on the specifications of the ratchet and the lifting wheels. The difference between the peripheral speed of the flywheel and the reel remains unchanged. It is slightly higher than the length provided by the front stretch roll. Use the correct ratchet to control the core tension during the reversal of the spool direction. This depends on the proper movement of the ratchet. If the movement is not adjusted correctly, the roving tension during the reverse movement will change. In modern simplex machines, the coil speed, coil orbit speed and flywheel speed are adjusted and determined by numerically controlled electronic equipment. All necessary configuration parameters are programmed into the computer.

2.2.3 Drafting arrangement:

The drafting system is inclined at an angle of 150 degree. This inclination of drafting system helps to make smooth fibres flow from drafting rollers toward the roving bobbin.

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- **Break Draft:**

The important object of break draft in the simplex machine is to make fibres parallel and straight in the sliver. The value of employed break draft ranges from 1.13 to 1.35.

- **Main Draft:**

The draft acting in real drafting region (where actual drafting takes place) is called main draft.

- **Tension Draft:**

The main objective of the tension draft is to maintain better and adequate tension to the sliver. In this zone actually the finer count for the roving frame is already achieved but after coming out from front roller nip twist has to be inserted, for this it's important to keep good evenness throughout the sliver

2.2.4 Roller Setting In speed Frame:

In order to minimize the difficulty of stretching, the adjustment of the rollers needs to be optimized. The back zone roller setting should be slightly wider than the front zone setting. It should be noted that the selected front zone setting should not be wider than the recommended, because this may increase the appearance of long, thin and thick faults in the line. A fiber is sandwiched between two contact points of the roller. Then fiber breakage may occur, leading to more quality irregularities in the material. This adjustment is accurately performed according to the length of the short fiber to be processed. Complete the closest possible setup first. Then analyze the irregularities of the wick produced and make the corresponding corrections.

2.2.5 Top roller pressure and hardness:

The critical pressure and stiffness considerations of the upper rollers on the speed frame are similar to those on the draw frame. Excessive pressure on the upper rear roller will increase the resistance to the movement of the roller, thereby increasing the risk of torsional vibration. This interference will cause greater short-term roaming changes and irregularities. This can be offset by using a softer bracket to provide better speed frame performance. Usually 80-850 Shore hard rubber rollers are used, the front upper roller should use softer rubber rollers, and the rear upper roller should use medium hard rubber rollers.

2.2.6 Roving Twist:

Rotating a fiber bundle around its own axis so that the fibers are arranged in a spiral fashion and therefore combined with each other is known to be a known twisting process. The purpose of providing twist in the wick is to make the strands strong enough to withstand tension during unwinding at the creel from the ring frame. Use brochures to insert twists. The degree of distortion depends on the speed of the booklet and the transport speed of the speed frame. As the torque increases, the productivity of the machine decreases. Therefore, it is generally used in the narrowest possible range. The relationship between turning and the above factors is as follows:

$$\text{Twist} = \frac{\text{Flyer speed or spindle speed (RPM)}}{\text{Delivery speed (m/min)}}$$

Equation: 2.2

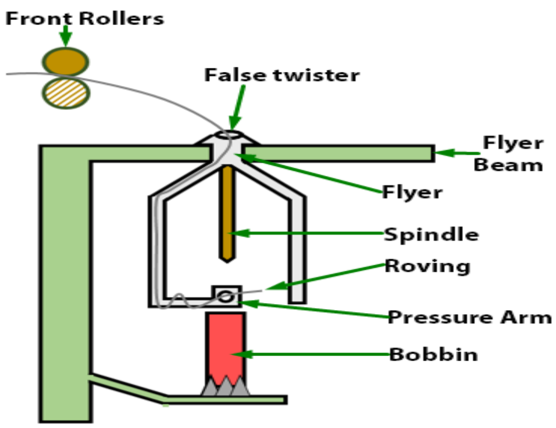

Figure 2.1: Roving Twist

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III. CONCLUSION

The textile industry is mainly concerned with the quality of the design, production and distribution of yarns, fabrics and clothing, which makes the role of process control parameters in this customer-influenced market more important. Therefore, a detailed understanding of process control is very important. The most important management. Upcoming challenges, such as rising raw material costs, shortage of raw materials, the impact of goods and services tax, compliance-environmental issues, labor shortages caused by large-scale recycling, etc.

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