

Utilization of cotton yarn system (Ring Spinning) in producing Fancy Yarn of blend cotton with poly acrylic

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Abstract:

Since the textile industry is one of the competitive industries that depend on innovative production with the best possible quality, and reduction of costs for competition to continue and increase the selling of goods. So one of the main consideration is to reduce cost and benefit from the theory of capillary migration, the difference in the theory of capillary migration as interference or change in the location of capillaries can create the possibility of producing a thread on the spinning machine of acrylic and cotton as twins with different proportions, where the final product has the competitive ability that makes it preferable to the consumer. It is necessary when performing mixed operations to choose the best mixtures in order to obtain good results in light of the required properties in the blended strands. From here, we can summarize **the research problem** in how to obtain the best thread specification as a result of mixing brominated cotton and acrylic. **To achieve this goal**, (9) samples were mixed between cotton and acrylic materials in the cotton system during the final spinning stage, in order to obtain threads with new properties. It was implemented on machines for spinning (tioda) with an amendment in the thread path. **The methodology of the research** is adopting the experimental and analytical approach and the link between both of them. **The study has yielded some results, the most important of which are:-**

1. The higher the thread count, the lower the tensile strength and the cutter load. When cotton mixing ratio increases, the tensile strength and the cutter load increase.
2. The higher the tigriss (English numbering), the lower the percentage of elongation, and when the percentage of cotton in the thread formation increases, the elongation ratio decreases.
3. The higher the thread, the more irregular the number of nodes and the notification.
4. The higher the proportion of cotton mixing in the resulting thread, the greater the uniformity and the fewer the number of nodes and hair.

Research problem:

The properties of mixed fabrics are greatly affected by the quality of the bristles used and the percentage of each material in the mixture, as there are many problems in producing a mixture

with functional or aesthetic properties that can commensurate with the nature of the use of these fabrics.

The main problem with mixing is the distribution of blended filaments in the thread and the extent to which the distribution of filaments in the thread is related to the physical and mechanical properties of the product, whether it is a thread or a fabric

Giving that the mixing processes in all yarns production systems are often carried out in the drawing stage where the raw materials are mixed in strips.

For this, the research suggestion differs from the predominant and usual form of mixing, and is confined in mixing on the annular spinning machine using poly acrylic fibers as it is spun along its lengths (100 mm) and then is being mixed with cotton (35 mm), thus it is possible to study the phenomenon of capillary migration and system of arranging and distributing filaments with threads produced by the cotton spinning system.

Research importance:

- 1 - Benefiting from mixing cotton with polyacrylic fibers on cotton spinning machines to study the behavior of hairiness and distributing them in the produced threads.
- 2 - Use different mixing ratios of cotton and acrylic to obtain innovative fancy yarns.
- 3 - Study the phenomenon of capillary migration to know the extent of its effect on the natural and mechanical properties of the products.

Research goals: -

- 1 - Production of fancy yarns with innovative aesthetic values, from mixing cotton and polyacrylic to the ring spinning machine .
- 2- Enriching the Arab library with references on the phenomenon of migration and production of fancy yarns with different materials and mixing ratios, while changing the mixing systems.

Research hypotheses:

- 1 - The capillary migration theory can be used to mix cotton fibers with polyacrylic fibers to produce decorative threads using the cotton spinning system.
2. The mix of (cotton, poly acrylic) on the ring spinning machine (cotton system) affects the physical and mechanical properties of the threads produced.
- 3- Mixing different materials (natural - synthetic) with different proportions on the cotton yarn spinning machine with cotton system that leads to the production of fancy yarns.

Research Methodology:

The research uses the experimental and analytical methodologies.

Literature Studies

Fancy yarns structure:

- 1 - The Core or Base Yarn.
- 2 - The Effect or Fancy Yarn.
- 3 - The Binder or Tie Yarn.

Types of fancy yarns: -

Slub Yarn

Flak (Flock) Yarns

Cloud Yarns

Knickerbockers Yarns

Flame Yarns
 Spiral Yarns
 Neb Yarns
 Metallic yarns
 Splash and Seed Yarns
 Loop (Boucle) Yarns
 Ratine Yarns
 Snarl Yarns
 Grandrelle Yarns
 Chenille Yarns

Identify the phenomenon of capillary migration:

Many researchers have tended to study the phenomenon of capillary migration during previously, and each one of them has defined this phenomenon according to how he studied it. The theories that have been assumed, used and have been tried to reach a sufficient number of studies on that phenomenon. Peire has considered that the migration of capillaries is the interference or change in the location of the capillaries, and this phenomenon was attributed to the random entanglement of the capillaries with a thread. While Hamilton has considered that the migration of capillaries is a term used to denote the movement of the fibers in the thread, compared to the axis of the thread, it was also found that mixing the unmatched fibers in the yarns may lead to the irregularity of the fibers through the cross-section of the yarns, as part of the capillary fragments gathered in the components of the mixture and move either to the yarn core or to the surface of the yarn . The results obtained from the research of (Townend) indicate that the migration is due to the largest surface area contact, and therefore in mixtures consisting of long and short fibers, or thin and thick fibers during the process of drawing on the ring spinning machine, long or thin fibers will be strained higher than shorter fibers or thicker fibers, therefore long or thin fibers that are being pulled forward by the front cylinders will migrate to the middle part of the drawn brominated to move to a less stressful state, and therefore they pick the shortest path in the bromine during the clouds formed in the final spinning .

Experimental Work :

Specifications of Giza 86 cotton yarns used in the experiments:

M	The statement	the value	M	The statement	the value
1	Filament length / mm	33,2	5	IPL%	86
2	Coefficient of the filament length%	5,5	6	Capillary elongation rate%	6.4
3	IPL Durability / Presley	9.38	7	Humidity rate %	7.5
4	Capillary accuracy / micronaire	4.6			

Fiber specifications polyurethane acrylic used in the experiments:

M	The statement	the value
1	Average length of acrylic filament	From 80 to 120 mm
2	Precision of acrylic filament	2.7 detex
3	Durability g / tx	2 : 3.1
4	Roving count	1.2 meters

Results and discussion:**Yarn test results:**

The sample number	Thread floss numbering (E)	Brominated mixing ratio (Acrylic: Cotton)	Tensile strength kg	Elongation ratio%	RKM N / km	Irregularity %	Neps/1000 M	Hairiness %
1	7/1	1:1	111.7	10.68	12.1	16.4	280	16.5
2	7/1	2:1	1168.8	9.8	14.1	13.7	185	16.1
3	7/1	3:1	1208.5	9.06	15.1	12.8	175	14.1
4	10/1	1:1	614.4	9.52	10.2	17.4	550	15.1
5	10/1	2:1	690.8	9.37	13.4	14.2	325	12.6
6	10/1	3:1	745.1	8.05	14.9	13.7	240	12.5
7	14/1	1:1	432.3	8.79	9.5	19.8	695	12.3
8	14/1	2:1	509.3	7.47	13.1	15.5	535	11.3
9	14/1	3:1	611.4	7.3	13.8	14.2	520	11.1

The relationship among the yarn count, the different mixing ratio of yarns and the average tensile strength of the produced threads: -

It becomes clear to us that the higher yarn count (English numbering), the less the tensile strength, as we find that the yarn count of the thread 7/1 has recorded the highest readings of the tensile strength, due to the fact that the greater the yarn count the fewer fibers that make up the cross-section of the thread, which negatively affects the tensile strength, that's when we find that the greater the percentage of polyacrylic in the formation of the thread, the higher the tensile strength, and that makes sense, as polyacrylic filament are used with lengths of 100 mm, which increases the common areas between the filament composites of the thread, which reflects positively on the strength of the tension of the resulting thread.

The relationship among the yarn count, the different mixing ratio of yarns and the elongation ratio of the produced yarns:

It becomes clear that the higher the count (the English numbering), the lower the percentage of elongation, where we find that the 7/1 thread number has recorded the highest readings, due to the fact that the higher the number of yarns, the lower the number of fibers making up

the cross-section of the thread, which negatively affects the percentage of elongation. While we find that the more the percentage of polyacrylic increases in the composition of the thread, the greater the elongation percentage, and that makes sense as polyacrylic filament are used with lengths of 100 mm, which increases the common spaces between the yarn filaments, which reflects positively on the elongation ratio of the resulting thread, as well as increasing the elongation of the poly acrylic material.

The relationship among the yarn count, the different mixing ratio of the strands and the average categorical load of the produced strands: -

It becomes clear that the more the count (English numbering), the less the tensile strength, as we find that the count of the thread 7/1 has recorded the highest readings of the tensile strength, due to the fact that the more the count the fewer fibers that make up the cross section of the thread, which negatively affects the tensile strength, that's when we find that the greater the percentage of polyacrylic in the formation of the thread, the higher the tensile strength, and that makes sense, as polyacrylic filament are used with lengths of 100 mm, which increases the common areas between the filament composites of the thread, which reflects positively on the strength of the tension of the resulting thread.

The relationship among the yarn count, the different mixing ratio of the strands and the irregularity% of the produced strands:

It becomes clear that the greater the effect of the thread, the less uniformity produced and vice versa, the greater the thickness of the thread, the greater the uniformity of the thread, because the thicker tiger uses higher clouds values with a ring spinning machine, which leads to an increase in capillary disturbance and sometimes random movement of short fibers (clouds ripples), which negatively affects the uniformity of the thread.

Also, the thread that consists of 3 twined cotton + polyacrylic brominated increases by the proportion of relatively short cotton fibers than the polyacrylic filament, which leads to lack of uniformity in the resulting thread, while strings consisting of one twined cotton + polyacrylic brominated contain a smaller number of cotton fibers in the cross section of the thread increases the uniformity of the resulting thread.

The relationship among the yarn count, the different mixing ratio of the strands and the average number of nebs of the strings produced:

It becomes clear that the greater the effect of the thread, the more the number of nebs in the resulting thread and vice versa, the greater the thickness of the thread, the lower the number of nebs in the thread, because the thicker tiger uses higher pull values with a ring spinning machine, which leads to an increase in capillary disturbance and sometimes random movement of short fibers (clouds ripples), which negatively affects the number of nebs in the thread. The relationship between the number of nebs and the ratio of cotton to acrylic is illogical. The logic is consistent with uniformity, not the opposite, for example, by evidence. The filaments consisting of 3 twined cotton + poly acrylic increase by the percentage of relatively short cotton fibers than the polyacrylic filament, which leads to a decrease in the number of nebs in the resulting thread, while the filament consisting of one cotton twined + poly acrylic fabric contains a number less than Cotton fibers in the cross section of the flap increase the uniformity of the resulting floss.

The relationship among the yarn count, the different mixing ratio of strands, and the average filing of strings:

It becomes clear that the greater the effect of the thread, the more the threading feels and vice versa, the greater the thickness of the thread, the less the threading of the thread, because the thicker count uses higher pull values with a ring spinning machine, which leads to an increase in capillary disturbance and sometimes random movement of short hairs (clouds ripples), which negatively affects the hairiness of the thread. Also the thread that consists of 3 twined cotton + polyacrylic brominated increases by the percentage of relatively short cotton fibers than the polyacrylic filament, which leads to an increase in the resulting threading, while the strands consisting of one twined cotton + polyacrylic brominated contain a smaller number of cotton fibers in The cross-section of the thread, thereby reducing the resulting threading.

Summary of the results:

1. There is an inverse relationship among the amount of thread count, the increase in the proportion of cotton mixing, the tensile strength, the elongation readings and the perception of the load and the definite load, which have the same operational specifications.
2. The existence of a direct relationship among the amount of thread count, the increase in the proportion of cotton mixing, irregularity and the number of nebs, which are the same as the operational specifications.
3. The more the thread of the thread, the lower the tensile strength, and this relationship is constant at the different mixing ratio.

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