European Journal of Emerging Technology and Discoveries
ISSN (E): 2938-3617
Volume 1, Issue 3, June, 2023.

ANALYSIS OF STUDIES ON THE ISSUE OF IMPROVING THE TECHNOLOGY OF DOUBLE TORSION

Yakubov Nosirjon Jurayevich
Senior lecturer, Department of Light Industrial Technologies and Equipment, Fergana Polytechnic Institute, Fergana, Uzbekistan

Abstract
The article obtained an analytical dependence of the tension of the wound thread on the filling parameters of the winding-unwinding device. The influence of the design features of the capsular tensioner on the thread tension in the production of twisted thread is determined. The possibility of performing backup winding on turns, the role of an automatic compensator for fluctuations in the thread tension between the main zones of the turn, caused by thread defects, has been established.

Keywords: textile materials, light industry, technological processes, high-quality yarn, double twist.

Introduction

The development and implementation of new techniques and technologies in the production of textile materials is an advanced aspect of the light industry. To achieve this goal, several projects are being developed by the international community, academia, scientists and industry experts, and large-scale studies are being carried out. The main objective of the above activities is to increase the range of products, improve quality, and reduce the share of manual labour. Although the development of engineering and technology in the field of production of machinery and equipment for the light industry has reached a high level, theoretical studies and analyses of technological processes and transitions remain relevant.

Spinning and twisting sections in terms of the labour intensity of production occupy a leading place in the production of twisted combed yarn, therefore their technical equipment is of paramount importance for increasing the volume of production, improving its quality, reducing the cost of fabrics and knitwear [1].

Prospects for the development of twisting equipment are associated with the use of such methods of twisting, which are characterized by the separation of the processes of twisting and winding, carried out by various independent working bodies of the machine.

One of the most progressive ways of obtaining twisted threads, which has gained great popularity in the world, is the double-twisting method [2].

Currently, twisted yarn is produced using double-twisting machines in combination with cane machines. For these purposes, enterprises use imported equipment. The set of equipment includes a winding machine, reeding machine and double twisting machine [3].

The work carried out combines theoretical and experimental research methods. For an analytical study of the thread tension in different parts of the double-torsion spindle, a method

has been developed for determining the tension, taking into account the forces of inertia. When processing experimental data, methods of mathematical statistics were used.

Theoretical Analysis

In recent years, due to the introduction of new equipment and advanced technologies, most spinning mills have achieved higher indicators in terms of the quality of their products. Along with this, the needs of the population for a variety of high-quality yarn have increased. These needs have set before scientists, engineers and scientific institutions the task of introducing and developing high-tech equipment. One of the most effective ways to increase production, expand the range and improve the quality of textile products is to increase the use of the twisting process in spinning mills processing natural fibres. There are many studies on double-twisting, both in the CIS countries and abroad, in which the features of this process are considered depending on the design of the equipment used.

We conducted the study using patent and technical documentation, GOSTs, TUs, dissertations, and scientific and specialized articles from Russia, America, Great Britain, China, Italy, Turkey, Japan, Germany, and the CIS countries.

According to the results of research in the Russian National Library and the Fundamental Library of St. Petersburg State University of Applied Arts, more than 50 sources of information were found, including dissertations and abstracts.

A review of specialized articles and abstracts shows that many scientists and industry experts have made a great contribution to the development of the theory and practice of the process of twisting yarn and thread. Significant work in these areas is being carried out by employees of several institutes and scientific institutions of the CIS countries, in particular, IGTA, MSTU, SPbGUTD, KSTU, Sovetskaya Zvezda OJSC, TsNIISherst, TITLP and others.

There are many works on improving the technique and technology of twisting yarn and creating laboratory stands for studying the quality indicators of yarn.

In particular, Yu. K. Barkhotkin introduced a new twisting device to increase the productivity of ring-spinning and twisting machines. According to the author, there are only two ways to increase productivity on ring spinning and twisting machines with a free balloon: either by creating a hard-to-wear material for the runner and ring, or by changing the nature of friction between the runner and ring. The author preferred the second method. Based on a new twisting device, the author studied the dynamic stability of the slider and the tension of the thread [5].

P. G. Shlyakhtenko and P. A. Sukharev proposed a non-hardware method for controlling the direction of the twist of a textile thread and the values of its geometric parameters based on a spatial two-dimensional analysis of computer microimages of its surface [6].

The work of G.I. Chistobrodov and V.A. Avrelkin conducted a study of the forces acting between the fibres of a twisted product in the process of drawing, these results allow us to determine the trend in stress changes in the layers of the product [7].

A.A. Polushkin, A.M. Chelyshev, V.A. Chaikin, and P.A. Dyatlova researched the torsion of complex threads, based on which formulas were obtained that determine the increase in thickness and decrease in the strength of threads with an increasing twist. Analytical dependences between the parameters of the thread were also identified, the condition for the

absence of twists on the thread during its manufacture was indicated, and the critical twist of the thread, composed of two strands, was determined [8].

The work of V.A. Usenko and S.A. Silnova is devoted to the use of twisting machines with double-twisting spindles for the production of yarn from chemical fibres. A comparative analysis between the spinning and twisting machine PK - 100 M3 and twisting machines with double twist spindles VTS 07/2 is given. The authors concluded that it is expedient to produce twisted yarn from chemical fibres on machines with double-twisting spindles. The performance of twisters with double-torsion spindles VTS 07/2 is two times higher than the performance of ring and spinning-twisting machines [9].

V.P. Shcherbakov and I.P. Tsyganov V.A. worked on the issues of contact interaction of twisted threads. Zavaruev from MSTU. The authors proposed new solutions for the contact interaction of two threads twisted together, and the resistance, tension, bending and torsion can be different [10].

In the work of G.I. Tolubeev, N.K. Romanycheva and V.L. Makhover, developed a calculation method, an algorithm and software for determining the strength characteristics of twisted yarn [11].

A.G. Sevastyanova and K. Boev carried out mathematical modelling of the process of twisting two threads. The proposed method allows visual observation and qualitative assessment of the resulting effect and can be used in the study of various methods of the twisting process [12].

The issues of optimizing the parameters of double torsion machines were dealt with by several scientists and industry experts. In particular, I.P. Mazyar, A.P. Kuzmicheva, S.P. Zimin, N.A. Korobov determined the optimal filling parameters of double-twisting machines of the brand VTS - 07-2. When producing a twisted yarn from pneumomechanical spinning yarn with a linear density of 16.5X2 tex on a double twisting machine VTS-07, the primary twist of a single yarn should be 1300 - 1350 kr / m, the secondary twist of the twisted thread 850 - 900 kr / m and the ratio X2 / X1 = 0.63 - 0.64 [13].

Also, B.N. Streltsov and O.K. Kolesnikov, in order to reduce yarn breakage during double-twisting, found the optimal mode for threading a PDS 240/175 machine from Sauer Alma [14].

The main characteristic of the quality index of a twisted thread is the uniform tension along the axis of the twisted yarn. Many industry experts have developed a theoretical and experimental method for determining thread tension in different areas of machines. Including E. D. Efremov, T. Yu. Nikolaeva, S. A. Shutova investigated the thread tension in the “reel-unwinder” zone, in the “upper part of the hollow spindle” and in the “unwinder-spindle” zone. They paid special attention to the factors affecting the amount of tension in different zones of double-twisting machines [15].

A lot of work in this direction was also carried out by Ph.D. G.E. Lagushkin, received several copyright certificates for the design of spindles and devices [16].

Beginning in 1947, a team of NIILTEKMASH designers headed by Ph.D. V.V. Chistoserdov. As a result of the creative collaboration of TsNIHBI and NIILTEKMASH, in 1956, an experimental batch of double-twisting spindles of the KDK-260 brand for medium-sized cotton yarn was tested [17].

ISSN (E): 2938-3617
Volume 1, Issue 3, June, 2023.

Joint work of NIILTEKMASH with the team of TsNIIShelka under the guidance of Dr V.A.Usenko completed the creation of a whole series of spindles for processing viscose silk of high numbers: DB-26-SHL, DK-24-SHL, DB-ZO-SHL [18].

Somewhat later, the KD-280-I spindle with an individual electric drive was created. It should be noted that despite great efforts, it was not possible to create designs that could be launched into an industrial series.

Nevertheless, during this period, new constructive and technological solutions have appeared, and the theory of the issue has expanded and deepened. General scientific and technological progress contributed to the emergence of new structural materials and metalworking machines. All this created the base and the necessary conditions that made it possible to create modern high-quality equipment of this type. Renewed interest in this type of equipment was also facilitated by the situation in the world economy, characterized by an increase in the cost of labour. Textile engineering firms, which have currently achieved the greatest success in creating double-twisting machines, have been developing them especially intensively and fruitfully over the past 60–65 years [19].

For example, the Saurer-Alma company (Germany) has been developing and manufacturing double-twisting machines for about 70 years. The first machine produced by Volkmann (Germany) was created in 1954 [20].

Since then, this company has launched more than 60,000 double-twisted spindles on the world market. Many countries, including the Czech Republic (Eliteks firm) and the Republic of Bulgaria (Yantra firm), are organizing the production of double-torsion machines under the licenses of these firms, which are currently equipping many factories in Russia and the CIS countries with these equipment. In addition to these firms, such well-known firms as Savio (Italy), Verdol (France), Hamel (Switzerland), Agtex (Turkey) and others are engaged in the production of machines with double torsion spindles [21].

Table 1 shows the characteristics of the double-twisting machines currently installed in the factories.

Table 1. Technical characteristics of double torsion machines

A country	Italy	Czech	Japan	Bulgaria
Firm	Savio	Elitex	Machinery	Янтра
Model	TDS 228/L	VTS -07/1	No.368-II	PDS-240/175
Line Density yarn, tex	240-20	125-15	400-20	240-8
Number of spindles on the machine	310	120	112-200	120
in section	70-20	10	10	10
Distance between spindles, mm	228	245	205, 228, 254	240
Spindle speed, min-1 package, kg	13000	11000	14000	13000
Winding diameter, mm	275	250	250	250
Twist, cr/m	73-2653	50-1100	190-1400	230-2500

Conclusion

Progressive methods of yarn twisting are characterized by the separation of the process of twisting and winding, which can significantly increase the productivity of labour and equipment compared to ring twisting by reducing yarn breakage, increasing the mass of feed and output packages, increasing the efficiency of the machine, etc. Currently in Russia and countries CIS, the most progressive way of making twisted yarn from cotton, wool, chemical fibres and their mixtures is the double twisting method. An analysis of the design features of spindles of various types showed that the most developed system of double torsion is a vertical-type spindle with magnetic stabilization of the feed unit.

References

1. Корицкий К.И Совершенствование техники крутильного производство. - Текстильная промышленность – 1992, № 11, С. 31-33.
2. Мороков А.А. «Исследование натяжение нити и разработка метода его регулирования на веретенах двойного кручения». – Диссертация на соискание ученной степени канд. техн. наук. – Л.:1982 - 154 с.
3. Фролов В.Д., Г.В. Башкова, А.П. Башков. Технология и оборудование текстильного производства. Ч. I Производство пряжи и нитей: учебное пособие. - Иваново: ИГТА, 2006. – 436с.
4. Yahyokhonovich, K. B., & Dilnavoz, B. (2022). National fabrics, methods of preparation, types of fabrics, traditions and modernity. (On the example of the Fergana Valley). Thematics Journal of Arts and Culture, 6(1).
5. Sunnatovich, K. S., Murtozaevna, I. N., & Nuriddin, M. (2021). Investigation Of Indicators Of Resistance To Friction Of Warp And Weft Threads Prepared For Silk Carpets. Nveo-natural volatiles & essential oils Journal| NVEO, 4858-4870.
6. Abdusattorovna, M. G. (2023). Theoretical justification for improving the design of special clothing to optimize its design. Open Access Repository, 4(03), 246-251.
7. Raxmatovna, M. S. (2021). The description of perspective fashion trends in men's clothing. Innovative Technologica: Methodical Research Journal, 2(10), 15-20.
8. Raxmatovna, M. S. (2022). Research on the development of norms of time spent on the technological process of sewing and knitting production; basic raw materials, their composition and properties. Innovative Technologica: Methodical Research Journal, 3(03), 28-32.
9. Бердиева, З. М., Жахонов, Ж., & Мирзаев, А. (2023). Анализ растительного полифенола. Scientific aspects and trends in the field of scientific research, 1(8), 284-287.
10. Турдиев, М. (2020). Новая технология подготовки нитей основы к ткачеству при выработке тканей крепдешин New technology of preparing of basis threads for weaving in the production of crepe fabric. In Научная Конференция (p. 147).
11. Мухаммадиева, З. Б., & Бердиева, З. М. (2020). Пищевая безопасность CO2-экстрактов из растительного сырья. Universum: химия и биология, (4 (70)), 8-12.
12. Валиев, Г. Н., Орипов, Ж. И. О., & Турдиев, М. (2020). Новая технология подготовки нитей основы к ткачеству при выработке тканей крепдешин. In Сборник научных трудов Международной научной конференции, посвященной 110-летию со дня

рождения профессора АГ Севостьянова (pp. 147-151).
13. Хомидов, В. О., Валиев, Г. Н., & Турдиев, М. (2022). Многофакторная регрессионная модель образования баллона при переработке нити натурального шёлка. In Сборник научных трудов по итогам Международной научной конференции, посвященной 135-летию со дня рождения профессора ВЕ Зотикова (pp. 124-128).
14. Бердиева, З. М. (2022). Юқори таркибли транс-ресвератрол сақлаган қора тут табиий хомашё сифатида. Pedagogs jurnali, 22(2), 8-12.
15. Орипов, Ж. И. О., Валиев, Г. Н., & Турдиев, М. (2021). Исследование влияния способа производства шёлка-сырца на его качественные характеристики. In Сборник научных трудов Международной научной конференции, посвященной 150-летию со дня рождения профессора НА Васильева (pp. 63-67).
16. Саримсаков, О. Ш., Турдиев, М., Саттаров, Н. М. У., & Турғунов, Д. У. У. (2022). Ленточный питатель для подачи хлопка в пневмотранспорт. Universum: технические науки, (9-3 (102)), 11-14.
17. Zikirov, M. C., Qosimova, S. F., & Qosimov, L. M. (2021). Direction of modern design activities. Asian Journal of Multidimensional Research (AJMR), 10(2), 11-18.
18. Zikirov, M. S., & Matkarimov, N. K. O. (2022). Future concepts of neighborhoods and their development in our republic. Nazariy va amaliy tadqiqotlar xalqaro jurnali, 2(10), 50-55.
19. Jurayevich, Y. N. (2021). The unusual structures of the skirt of a wedding dress. Innovative Technologica: Methodical Research Journal, 2(11), 1-5.
20. Omonova, M. S., & Ibragimova, G. O. (2020). The rate of a chemical reaction and factors affecting it. EPRA International Journal of Research and Development, 5(8).
21. Obidovich, H. V., & Jurayevich, Y. N. (2021). The use of inexpensive non-woven materials as thermal insulators in the installation of floor heating units. Asian Journal of Multidimensional Research, 10(10), 138-142.