

ANALYSIS OF YARN PREPARATION TECHNOLOGIES FOR WEAVING IN THE PRODUCTION OF TOWEL FABRICS

B.B.Muminov

Fergana state technical university, PhD student.

Annotation: The article analyzes the results of scientific research conducted by local and foreign researchers on the technologies used in the production of towel fabrics.

Keywords: weft, warp, textiles, fabric, quality, towel fabric, fabric structure, weaving loom, shedding phase.

In the context of modern market relations, textile enterprises face intense competition in terms of the price, quality, and assortment of the fabrics they produce.

To expand the range of towel fabrics produced by textile enterprises and to improve their quality indicators and consumer properties, the structure, production technologies, composition of the fabrics, and the main influencing factors—especially the technological processes involved in preparing yarns for weaving—have been analyzed through a review of relevant literature.

The literature review primarily utilized textile technology journals, monographs, textbooks, and international scientific and technical databases.

Scientific research related to the dissertation topic—including available dissertations, dissertation abstracts, patents, and invention documents from national information-resource centers—was also analyzed. Furthermore, internet-based resources relevant to the field were examined [1].

The warping process is one of the most critical and responsible stages in preparing yarns for weaving. Based on the pre-formation of warp yarns before the warping process, a resource-efficient technology for preparing warp yarns for weaving has been developed. This plays a crucial role in the efficient use of raw materials in subsequent production stages.

To enhance the effectiveness of modern techniques and technologies in the production of towel fabrics, it is essential to scientifically justify their parameters. Among the key technological processes influencing warp yarn preparation are yarn rewinding, doubling, and heat-setting, all of which are considered highly significant. Determining the optimal parameters for these processes is essential for developing improved, resource-efficient technologies. This is especially important in today's market economy and increasingly competitive environment, where producing competitive products for the global market is a key priority.

Currently, scientists in the global textile industry are placing significant emphasis on the development of textile machinery and technologies, particularly on improving the technologies for producing fabrics from towel-grade yarns. This includes research on yarn processing, studying the properties of fabrics, developing new technologies, identifying the main factors affecting the technological process of yarn preparation for weaving, and investigating the technological processes of yarn rewinding, doubling, and heat-setting. Numerous international researchers have carried out scientific studies in these areas.

For example, V.V. Nikolayeva's candidate dissertation focuses on group warping, where she emphasizes the importance of improving the quality of warp beams and highlights the crucial role of proper warp formation [2]. In addition to analyzing the preparation of high-quality warp

yarns, the study also investigates how the warping process affects the productivity of weaving looms.

In the group warping process, certain shortcomings—such as splicing a broken yarn end to an adjacent yarn without properly removing the defect—have been observed to cause loom stoppages and reduce the loom's effective operating time coefficient.

According to V.A. Gordeyev, yarn breakages during warping are caused by the following factors [3]:

- defects in the bobbin winding – 44%,
- faults in the warping machine – 12%,
- raw material quality issues – 21%,
- improper adjustment of the distance between the bobbin and the yarn guide – 8%,
- and other miscellaneous reasons – 2.5%.

Splicing broken yarn ends plays a critical role in preparing warp yarns. The choice of splice type depends heavily on the physical properties of the yarn, and characteristics such as coefficient of friction, flexibility, and resistance to bending significantly influence the durability and effectiveness of the splice.

In his doctoral research, A.B. Brut-Burlyako focuses on improving technological processes in weaving by applying modern research methods and predicting the physical-mechanical properties of flax yarns [4]. He emphasizes the correlation between yarn tension and warping speed, and proposes a method to reduce uneven tension in the moving yarn during the warping process.

V.A. Gordeyev, in his works [3], also examines the dynamics of the elastic tensioning system of warp yarns in the production of both ordinary and special fabrics, and the mechanisms that influence it. He studies the dynamics of warp release mechanisms by considering the motion of the warp beam and the weaving bobbin system. According to the author, variations in yarn tension occur proportionally to variations in yarn deformation. To calculate the tension, Prof. Gordeyev proposes the use of trigonometric polynomials.

Foreign researchers have also paid significant attention to the specific characteristics of the weaving technological process.

They have investigated the movement of the weft yarn at the fabric edge during insertion by the reed, focusing on how the frictional resistance between the warp and weft yarns is overcome due to the tension in the weaving yarn. The result shows that during the weft insertion at the fabric edge, the relative slippage of the weaving yarn along the warp yarns decreases, while the collective movement of the weft with the warp yarns increases.

According to E.A. Mamtsev [11], research results indicate that to ensure minimal loss of performance characteristics during warp yarn processing, it is necessary to reduce tension fluctuations in the warp yarns during shed opening, especially when the weft is being inserted and the fabric is being beaten up. This contributes to optimal processing conditions for warp yarns.

A review of studies dedicated to yarn preparation technologies for towel fabric production reveals that certain aspects remain insufficiently explored. These include:

- the technology of warp yarn preparation for weaving,
- the physical-mechanical properties of warp yarns,
- their resistance to friction, single-cycle and multi-cycle deformation,

-the distribution of winding density along the axis of the heat-set bobbin,
-the quality of weft winding, and
-the technological processes and optimal parameters for preparing silk yarns for weaving.
In order to reduce yarn breakages, produce high-quality warps, and improve the productivity of warping machines, it is essential to develop resource-efficient technologies and identify the optimal parameters for warp yarn preparation.
An analysis of the aforementioned works indicates that the specific features of the technological process in towel fabric production require further study, particularly the development of rational parameters for preparing yarns for weaving.
Scientific literature analysis has shown that there is substantial experience in predicting fabric structural characteristics and production conditions on looms. However, despite the diversity of existing studies, the introduction of modern looms and technologies into production has raised many new questions that remain to be addressed.

References

1. Doniyorov B.B. Development of parameters for highly effective technology of yarn preparation for weaving (Development of parameters for highly effective technology of yarn preparation for weaving): Doctor of Philosophy (PhD) dissertation on technical sciences. - Tashkent: 2018. – 120 p
2. V.V. Nikolaeva Improvement of the quality of the yarn in participatory weaving. Autoref. diss. sugar tech. science - Ivanovo: 2006. p–25.
3. Gordeev V.A., Volkov P.V. Tkachestvo. - M.: "Legkaya industry". 1984 s- 14-15-76-115
4. Brut-Brulyako A.B., Suslova N.N., Barunova T.Yu. Influence of the angle of inclination of threads to a sliding rib on the tension of a deflected thread. // Izvestia VUZov. - Ivanovo, 1995. - No. 1. -P.41
5. Vlasov P.V., Shosland Ya., Nikolaev S.D. Technological forecasting process of weaving. Educational manual. M.: 1989-39 p.
6. Yamshchikov S.V. Study of vibration damping of weave and methods
Design of fabric forming mechanisms of vibration type. Abstract Dis. Ph.D. Kostroma, 1973 21 p.3. Abstract.
7. Kareva T. Yu. Optimization of parameters for the production and manufacture of fabrics with longitudinal and longitudinal stripes on shuttle weaving machines. Diss.kt.n. M. MTI, 1992. 152p.
8. Kuzmin V.V. Development of a method for designing loop fabrics using specified parameters // Abstract of a dissertation for a candidate of technical science / -M: 2000 g..

9. Romanov V. Yu. Development of optimal technological parameters for the production of loop fabric // Abstract of a dissertation for a candidate of technical science / -M: 2009 g.

10. Sinitsyn V.A. Development of theoretical bases for designing woven

fabrics with variable plot, technological means and manufacturing //

Abstract of dissertation on finding the learned step of a doctor of technical sciences / Ivanovo 1998.

11. Mamtsev E.A. Research on the mechanism of loading and feeding of the base of a woven

machine OTD // Abstract Dis. Ph.D. M.: MTI, 1966. -23 p.