American Journal Of Philological Sciences
(ISSN – 2771-2273)
VOLUME 04 ISSUE 12 PAGES: 130-134
OCLC – 1121105677

Publisher: Oscar Publishing Services

Research Article

ESTIMATION OF YARN DEFORMATION

Submission Date: December 15, 2024, Accepted Date: December 20, 2024,
Published Date: December 25, 2024
Crossref doi: https://doi.org/10.37547/ajps/Volume04Issue12-23

Akramov Abduvali Mamatkhanovich
Vice-Rector of Turan International University PhD, Republic of Uzbekistan, Namangan, Uzbekistan

ABSTRACT

This article describes a new method for assessing yarn deformation in the contact zone with a cylindrical surface that was studied in the possibility of obtaining yarn deformation properties in close conditions in simple conditions. In addition, the article highlights the analysis of the possibility of observing the pattern of deformation of the fibers of the surface layer of the yarn when changing its tension using a transparent cylindrical surface microscope.

KEYWORDS

Yarn, tension, deformation, weaving, cross-section, cylinder.

INTRODUCTION

The yarn, embracing a cylindrical surface, is pressed against it under the action of its tension. The greater the tension, the more the yarn is deformed in the contact zone (which is indicated by the increase in the contact area). Changes in the diameter of the yarn under the action of a compressive force have been little studied. Sommer measured the diameter of various yarns before and after their compression between plates, on the edges of which a square cutout was made with a diagonal directed along the line of action of the compressive load. W. Wegener and B. Schuler compressed yarns between two glasses; by the distance between them in the same compressive force, they judged the deformation of yarns of different twists [1-3].

The methods mentioned are unsuitable for studying changes in the diameter of a yarn when it contacts a cylindrical surface, since in this case there is a one-sided deformation at the points of their contact, developing

American Journal Of Philological Sciences
(ISSN – 2771-2273)
VOLUME 04 ISSUE 12 PAGES: 130-134
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

as a result of the fact that the yarn is pressed against this surface due to its tension. The methods used by Issum and Chamberlain and G.I. Selivanov also cannot be used, since they involve observing the change in the diameter of a simply stretched yarn, and not at the point of its contact with any surface [4-5].

Finally, it is generally accepted that the deformation features of textile materials are well reflected by single-cycle characteristics, which have been widely used in recent years in research practice. However, the components of the tensile deformation of yarns cannot be used to characterize the deformation of a yarn in the zone of its contact with a cylinder for two reasons. Firstly, obtaining the specified characteristics is associated with long-term tests in the "load-unload-rest" cycle, and in this case, it is of interest to estimate the magnitude of the deformation that has time to develop during an insignificant time of contact of the yarn with the cylindrical surface. Secondly, the nature of these two types of deformation of yarns is too different: when determining the components of deformation, the yarn is subjected to "pure" stretching, while in the case of interest to us, the yarn, pressing against the cylindrical surface, is crushed in the contact zone. Taking this into account, a new method is used to estimate the deformation of a yarn depending on the tension in the zone of its contact with a cylindrical surface. Pre-tension weights of 0.25 gf each are attached to the ends of the section of the yarn being tested, and the yarn is brought into contact with the cylindrical surface. Due to the pre-tension weights, which are unable to rotate or unwind the yarn, it adheres to the surface along the entire length of the girth. Using a horizontal microscope and an ocular scale, the diameter of the yarn above the top point of the roller is measured. After this, the ends of the yarn are loaded and the diameter is measured again. A color mark applied to the yarn helps to ensure that the measurements are taken in the same place on the yarn. In the process of practicing the method, it was found that the second measurement of the diameter can be made 5-7 seconds after the yarn is loaded. Therefore, the time the yarn remains under the load is 7 seconds (as in the method for assessing the contact area) [6-7].

The relative change in diameter is adopted as a characteristic of yarn deformation:

$$\delta = \frac{d_0 - d_1}{d_0} \qquad (1)$$

where, d_0- initial diameter size; d_1- the diameter of the yarn at the end of a given loading time. When

American Journal Of Philological Sciences
(ISSN – 2771-2273)
VOLUME 04 ISSUE 12 PAGES: 130-134
OCLC – 1121105677
Publisher: Oscar Publishing Services

measuring the diameters of twenty pieces of yarn, the coefficient of variation did not exceed 15% for complex yarns and 25% for yarn.

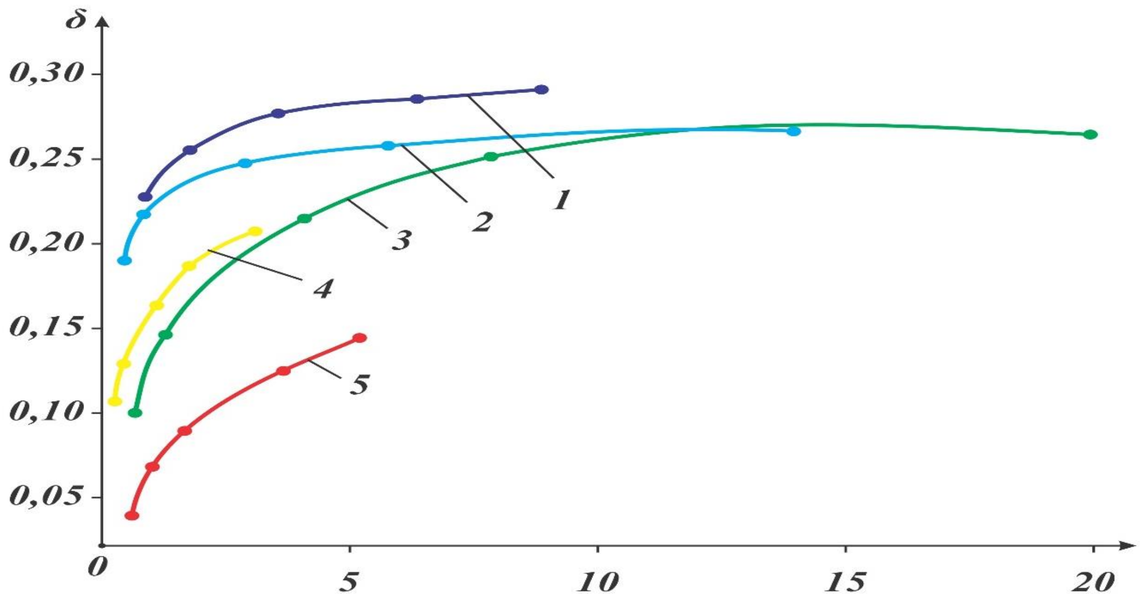

Fig.1. The deformation of the cross-section of various yarns.

Fig. 1 shows a graph of the dependence of the deformation of the cross-section of various yarns on their tension, where 1 is the curve for viscose yarn, 2 is for nylon, 3 is for cotton yarn, 4 is for wool, 5 is for viscose staple yarn.

American Journal Of Philological Sciences
(ISSN – 2771-2273)
VOLUME 04 ISSUE 12 PAGES: 130-134
OCLC – 1121105677
Publisher: Oscar Publishing Services

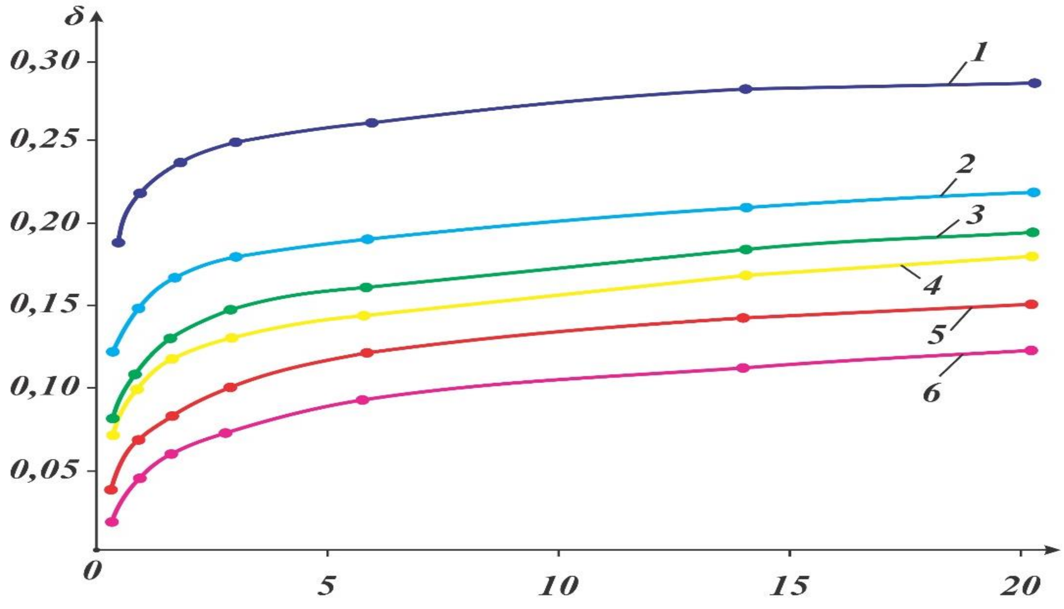

Fig.2. The deformation of the cross-section of nylon yarns of different twists.

In Fig. 2 changes in the deformation of the cross-section of nylon yarns of different twists from the magnitude of tension, where 1 is the curve for a nylon yarn

$$\alpha = 19,2 - \alpha = 34,3 - \alpha = 71,4 - \alpha = 98,5 - \alpha = 123,6 - \alpha = 143$$

The curves of these graphs for yarns of all types and twists studied have the same character. With increasing tension, the deformation increases. In the zone of small tensions, the curves rise quickly, and with further growth of tension, they become more gentle. The magnitude of the twist has a great influence on the deformation of the yarn. As the intensity of the twist of the yarn increases, the magnitude of its deformation decreases. The curves of the dependence of the relative deformation of nylon yarns of different twists on tension are regularly located one above the other, almost without changing their appearance.

If we observe the deformation of the yarn during its contact with the help of a microscope from the side and through a transparent cylindrical surface, we can see that the main type of deformation of the fibers is bending. During contact, being under tension, the yarn is pressed against the cylindrical body. The sections of

American Journal Of Philological Sciences
(ISSN – 2771-2273)
VOLUME 04 ISSUE 12 PAGES: 130-134
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

the fibers that are on the contact surface of the yarn, bending, are pressed somewhat inside the yarn, exerting pressure on the neighboring fibers, which, pressing against each other, thereby compact the structure of the yarn in the contact zone. The diameter is somewhat reduced. Naturally, yarns of a looser structure are deformed more strongly than yarns of a high twist, and with increasing tension, the process of compaction of the structure of the yarn slows down.

CONCLUSION

The conducted research and analysis of the obtained data allow us to draw the following conclusions.

The new method for assessing the deformation of a yarn in the zone of its contact with a cylindrical surface is simple and allows us to obtain the characteristics of the deformation of the yarn under conditions close to those often encountered in practice.

The use of a transparent cylindrical surface allows us to observe with a microscope the pattern of deformation of the fibers of the surface layer of the yarn when its tension changes (if necessary, the method of filming can also be used).

The magnitude of the deformation of the yarn in the transverse direction depends on its tension and twist. With increasing tension, the magnitude of the relative deformation increases and then gradually slows down. With an increase in twist, the deformation index of the yarn decreases.

REFERENCES

1. Efremov E.D., Akhunbaev O.F. "Increase in tension due to surf" // News of Higher Education Institutions: Text Technology. Prom. - 1985. No. 5, p. 2932
2. Gordeev V. A., Volkov P. V., Weaving: Textbook for universities. - 4th ed., revised and enlarged. - M.: Light and food industry, 1984, - 488 p.
3. Korochkin K.A., Koltunov M.A., Kravchuk A.S., Maiboroda V.P. "Applied Mechanics of a Deformable Solid Body". Moscow: Higher School, 1999.- 145 p.
4. Kuzina T.A., "Stress-strain state of yarns during interaction with irregular loading mechanisms." Abstract of the dissertation for the degree of candidate of technical sciences. Kostroma 2012.
5. Mikhlina L.P., "Factors influencing tissue structure". - P.: PTI, 2001.-25 p.
6. Nazarova M.V., Korotkova M.V. "Modern classification of products and equipment for the textile industry": Textbook / VolGTU, Volgograd, 2003. - 210 p.
7. Nikolaev S.D., Kovaleva O.V., Likucheva A.A. "Study of the stress-strain state of yarns on a weaving machine using a thermal imager". News of universities. Technological.