INVESTIGATION OF THE UNEVENNESS OF THE PILE HEIGHT LENGTH IN COMPLEX FABRICS

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Abstract. Objective. In this article, the unevenness of pile height length was analysed in complex fabrics. During the research, characteristics, structures, shapings and the piles of towel samples have studied. In this research, the advantages and disadvantages of the complex weavings were analyzed and some recommendations gave below. Methods. During the research, weaving samples were weaved on ITEMA 9500 machine and RF 505 Picanie machine. An unevenness of pile height length was measured by hand methods, and in this process, linear, tweezers and black flat table were used to get results. Results. In the research, three samples have taken for the experiment in one square metre of fabric. The piles of each sample were measured on both two sides: back and face. The length of the towel sample pile was different. Conclusion. The samples that were weaved on the ITEMA 9500 machine at the factory of “ARTSOFTTEX” were given the best results. Because the samples unevenness of the pile height had been more even than others. When we use more even threads and made the balance of tension for the weaving towels possibly, then we can get more even pile towels.

Introduction. Weaving is one of the oldest and most widely used methods of making a fabric [1, 2]. Simply put, weaving is the interlacement of two sets of threads; the warp threads run vertically through the length of the fabric and weft threads run horizontally across the width of the cloth [3]. An outline of warp drafting, and basic and derivative weave structures will illustrate how different patterns can be formed on a woven fabric [1, 4, 5]. How to design woven fabrics, including the use of colour in weaving, will be outlined. The standard documentation of weaving processes, which permits fabrics to be recreated, will be defined [1, 6].

Basic characteristics of pile weaving analysed during the research. Pile fabrics are characterised by the tufts or loops of fibres or yarns that stand up from the base fabric [1, 7, 8]. Pile fabrics exist in many forms such as velvet, terry towel, chenille and perhaps most commonly, pile carpets [1, 9, 10].

Woven terry fabrics play a dominant role in the market of towelling fabrics because of their superior mechanical and functional properties, like dimensional...
stability, compressibility and softness, water absorbency [11, 12]. The name “terry” is derived from the French word “trier”, which means “to out” and refers to the pile loops that are pulled out by hand to produce absorbent historic Turkish towelling. The Latin word “vellus” which means hair, has the derivation “velour”, which is the towelling with cut loops [11-19].

Methods. In terry fabrics, loops are formed on both sides of the fabric [14]. Another method of producing pile fabrics is face-to-face weaving in which a double fabric, one on top of the other, is made with vertical links provided by the extra set of warp yarns. The linking warp yarn is then cut to produce velvet piles. It is also possible to produce pile effects through knitting [15-26] or even from nonwoven fabrics. Pile yarn is traditionally a spun yarn, particularly from wool, but there is increasing use of bulked continuous filament yarns. In picture 1, 3-pick terry pile designation was taken during the research exposed below (Fig. 1.).

The towel which is in the picture one above weaved on ITEMA 9500 machine at the factory of “ARTSOFTTEX” terry products and on RF 505 Picanie machine at the factory of “CHASHMAI SAFED”.

Fig. 1. 3-pick terry pile designation which was weaved during the research

The terry pile is a warp pile structure that has loops on its surface that are formed by certain warp ends [27-34]. Terry piles are constructed by using one series of weft threads and two series of warp threads. The warp threads consisted of one for the ground and the other for the pile. The ground warp interlaces with the ground weft to form the ground cloth. This ground cloth holds the loops formed by the pile ends and allows the looped portion to project on the fabric surface [35-41].

In our research, the loops were double-sided: face and back. During the research, we measured each pile’s height and its length (Fig. 2).

There are some different terms in this research. For example, pile ratio, pile height, loop geometry etc.
Fig. 2. Cross-section of towel sample. PH-pile height

Pile height may be defined as the vertical height of the terry loop from the centre of the terry fabric. It gives an indication of the fabric quality, generally higher PH gives a fabric of better quality [42-47].

**Results.** Three samples have taken for the experiment in one square metre. The piles of each sample were measured on both two sides: back and face.

The following table 1 has shown the number of pile height length on two different machines (table 1).

**Table 1**

| №  | Results                        | Pile height length, mm |
|----|--------------------------------|------------------------|
|    |                                | 8 | 8,5 | 9 | 9,5 | 10 | 10,5 | 11 | 11,5 |
| 1  | Pile number at RF 505 Picanie machine | Face side | 6 | 43 | 109 | 223 | 244 | 69 | 26 | 0  |
|    |                                | Back side | 9 | 42 | 150 | 235 | 220 | 55 | 8 | 1  |
| 2  | Pile number at ITEMA 9500 machine | Face side | 5 | 57 | 361 | 440 | 200 | 17 | 0 | 5  |
|    |                                | Back side | 7 | 79 | 356 | 413 | 203 | 19 | 3 | 7  |

The diagrams were used for the assessing results of the above table 1.

**Fig. 3. RF 505 Picanie machine results**
In this diagram, the yellow line is the graph of the face side of the towel sample and also the green line is the graph of the backside of the towel sample. This diagram is shown that the length of towel sample piles was different each other, that, pile height length that was between 9,5 and 10 mm were increased in both side of towel samples. And also, if the diagram focuses on one vertical line, the pile height length of towels will be the same on the towel surface. These diagram results were taken on RF 505 Picanie machine at the factory of “CHASHMAI SAFED”.

![Diagram](image)

**Fig. 4. ITEMA 9500 machine results**

In this diagram also the yellow line is the graph of the face side of the towel sample and also the green line is the graph of the backside of the towel sample. And diagram results were taken on ITEMA 9500 machine [21] at the factory of “ARTSOFTTEX”. The results showed that the length of towel sample piles was different from than RF 505 Picanie machine. Because the numbers of pile height length were focused between 9 mm and 9,5 mm length.

**Discussion.** Furthermore, when we analysed the results, pile height lengths were between 8 mm and 11,5 mm. The woven terry fabric production is a complicated process only on special looms that are equipped with the terry mechanism. This process allows the interlacement of warp and weft yarns some distance away from the actual cloth fell. Two series of warp threads, one for ground fabric and the other for pile, and one series of weft threads were required for terry fabric production in this process. The warp threads for the ground are kept under high tension while the warp threads for the pile are kept under low tension. For the pile warp threads were kept low tension, pile length was different from each other.

**Conclusion.** The first reason for the unevenness of pile height length, the linear density of warp and weft threads were more uneven. Secondly, the tension of threads leded to pile unevenness. If we use more even threads and made the balance of tension for the weaving towels possibly, then we can get more even pile towels.

**References:**

[1] Sinclair, R. (Ed.). (2014). Textiles and fashion: materials, design and technology. Elsevier.
[2] Бобожанов, Х. Т., Холиков, К. М., Сидикжанов, Ж. С. У., & Назарова, М. А. К. (2019). Исследования трикотажных полотен, выработанных из компактной и обычной пряжи. Universum: технические науки, (3 (60)).
[3] Boymuratov B.X, Daminov A.D. (2015). To’quvchilik tekhnologiyasi, darslik, Toshkent.
[4] Korabayev, S. A., Matismailov, S. L., & Salohiddinov, J. Z. (2018). Investigation of the impact of the rotation frequency of the discretizing drum on the physical and mechanical properties of. Central Asian Problems of
Modern Science and Education, 3(4), 65-69.

[5] Alimbayev E.Sh. (2005). To’qima tuzilishi nazariyasi, darslik Aloqachi, Toshkent.

[6] Kandzhikova, G. D., & Germanova-Krasteva, D. S. (2016). Subjective evaluation of terry fabrics handle. The Journal of The Textile Institute, 107(3), 355-363.

[7] Sinclair, R. (Ed.). (2014). Textiles and fashion: materials, design and technology. Elsevier.

[8] Bryn, L., Nayfeh, S. A., Islam, M. A., Lowery Jr, W. L., & Harries III, H. D. (2005). U.S. Patent No. 6,892,766. Washington, DC: U.S. Patent and Trademark Office.

[9] Singh, J. P., & Verma, S. (2016). Woven Terry Fabrics: Manufacturing and Quality Management. Woodhead Publishing.

[10] Karahan, M. (2007). Experimental investigation of the effect of fabric construction on dynamic water absorption in terry fabrics. Fibres and Textiles in Eastern Europe, 15(3), 74.

[11] Horovitz, Z. (2000). U.S. Patent No. 6,086,968. Washington, DC: U.S. Patent and Trademark Office.

[12] Yilmaz, N. D., Powell, N. B., & Durur, G. (2005). The technology of terry towel production.

[13] Rock, M., & Lohmueller, K. (2001). U.S. Patent No. 6,199,410. Washington, DC: U.S. Patent and Trademark Office.

[14] Potluri, P., & Nawaz, S. (2011). Developments in braided fabrics. Specialist Yarn and Fabric Structures. Cambridge: Woodhead Publishing Limited, 333-355.

[15] Tyler, T. (2011). Developments in triaxial woven fabrics. Specialist Yarn and Fabric Structures: Developments and Applications, 141-163.

[16] Gordon, S., & Hsieh, Y. L. (Eds.). (2006). Cotton: Science and technology. Woodhead Publishing.

[17] Singh, J. P. (2013). Role of loop geometry on properties and performance of woven terry fabrics (Doctoral dissertation).

[18] Raximodjayev S.S, Qodirova D.N. (2018). To’qima loyihalashning zamonaviy usullari, darşilik Adabiyot uchqunlari, Toshkent.

[19] Korabayev, S. A., Matismailov, S. L., & Salohiddinov, J. Z. (2018). Investigation of the impact of the rotation frequency of the discretizing drum on the physical and mechanical properties of. Central Asian Problems of Modern Science and Education, 3(4), 65-69.

[20] Korabayev, S. A., Mordonovich, M. B., Lolashbayevich, M. S., & Xaydarovich, M. U. (2019). Determination of the Law of Motion of the Yarn in the Spin Intensifier. Engineering, 11(5), 300-306.

[21] Ahmadjanovich, K. S., Lolashbayevich, M. S., & Tursunbayevich, Y. A. (2020). Study Of Fiber Movement Outside The Crater Of Pnevmomechanical Spinning Machine. Solid State Technology, 63(6), 3460-3466.

[22] Erkinov, Z., Abduvaliyev, D., Izatillya, M., & Qorabayev, S. (2020). Theoretical studies on the definition of the law of motion and the equilibrium provision of the ball regulating the uniform distribution of the torque along the yarn. ACADEMICIA: An International Multidisciplinary Research Journal, 10(11), 2338-2347.

[23] Ahmadjanovich, K. S., Lolashbayevich, M. S., Gayratjonovich, M. A., & Erkinzon, S. D. (2021). Characteristics of yarn spun on different spinning machines. Збірник наукових праць ΛΟΓΟΣ.

[24] Ugli, I. M. M., & Ahmadjanovich, K. S. (2020). Experimental Studies Of Shirt Tissue Structure. The American Journal of Applied sciences, 2(11), 44-51.

[25] Mirzaboev, J., Jumaniyazov, Q., Mirzabaev, B., & Sadikov, M. (2020). Measures for the formation and use of fibrilar waste. Theoretical & Applied Science, (12), 177-179.

[26] Bobajonov, H. T., Yuldashev, J. K., Gafurov, J. K., & Gofurov, K. (2017, October). The arrangement of the fibers in the yarn and effect on its strength. In IOP Conference Series: Materials Science and Engineering (Vol. 254, No. 8, p. 082005). IOP Publishing.

[27] Gafurov, J. K., Mordonovich, B., Gofurov, K., Dushamov, O. S., Ergashev, O. O., & Bobajonov, H. T. (2018, December). Yarn Deformation with view of its structural structure. In IOP Conference Series: Materials Science and Engineering (Vol. 459, No. 1, p. 012042). IOP Publishing.

[28] Aripjanovich, S. R. Influence of Carding Machine Productivity on Yarn Quality. International Journal on Integrated Education, 3(8), 191-194.

[29] Turdialiyevich, T. S., & Khabibulla, P. (2020). The Influence Of Top Flat Speed Of Carding Mashine On The Sliver And Yarn Quality. European Journal of Molecular & Clinical Medicine, 7(7), 789-797.

[30] Turdialiyevich, T. S., & Khabibulla, P. (2020). The Influence Of Top Flat Speed Of Carding Mashine On The Sliver And Yarn Quality. European Journal of Molecular & Clinical Medicine, 7(7), 789-797.

[31] Tожимирзаев Санжар Турдиалиевич, Парпиев Дониер Хабибуллаевич, & Омонов Мухаммаджон (2020). Исследование изменений свойств волокон по переходам в процессе прядения. Universum: технические науки, (6-2 (75)), 50-56.

[32] Tожимирзаев, С. Т., Парпиев, Х., & Парпиев, Д. Х. (2020). Влияние скоростных режимов приемного
характеристик качества пряжи. Интернаука, (15-1), 95-101.

[33] Musohon, I. M., Shuxratjonovich, R. B., Avaz, J. G., & Baxromjon, B. M. (2021). Tools to determine the tension of selected yarns on knitting machines by experiment. Збірник наукових праць ΛΟΓΟΣ.

[34] Ergashev, J., Akhmedodjashev, K., Karimov, A., Kayumov, J., Ergasheva, R., & Mahsudov, S. (2019). Studying the Law of the Movement of Cotton Particle on a Saw Cylinder and the Interaction with Saw Teeth. Engineering, 11(10), 717.

[35] Ergashev, J. S., Rayimberdiyeva, D. K., Ergasheva, R. A., & Kenjayeva, V. K. (2020). Analysis of Selected Fabric Properties for Children’s Light Clothing. The American Journal of Engineering and Technology, 2(09), 42-48.

[36] Samatovich, E. J., Qizi, N. M. A., & Kizi, A. S. K. (2021). Research Of Physical And Mechanical Indicators Of Jensie And Knitted Fabrics Recommended For Children’s Combined Outerwear. The American Journal of Interdisciplinary Innovations and Research, 3(03), 37-44.

[37] Ergashev, J., Kayumov, J., Ismatullaev, N., & Parpiev, U. (2020). Theoretical Basis for Calculating the Determination of the Optimal Angle of Rotation of the Slit and Air Velocity.

[38] Rayimberdieva Dilrabo Khabibillaevna Ergashev Jamoliddin Samatovich, Umarova Venera Babakulova, Dadaboev Farhod Makhmudjanovich, Mamadalieva Samatovich, E. J., Babakulova, U. V., Makhmudjanovich, D. F., Boltaboevna, M. O., & Khabibillaevna, R. D. (2020). Analysis of forecasting of the assortment of children's footwears. ACADEMICA: An International Multidisciplinary Research Journal, 10(6), 577-584.

[39] Bobojanov, X. T., Holikov, K. M., Sidiqjanov, J. C. U., & Nazarova, M. A. K. (2019). Исследования трикотажных полотен, выработанных из компактной и обычной пряжи. Universum: технические науки, (3 (60)).

[40] Садиков, М., Омонов, М., Исаков, А., & Тожимирзаев, С. (2021). Анализ изменения свойств волокон в процессах разрыхления, очистки и чесания. Збірник наукових праць ΛΟΓΟΣ.

[41] Корабаев, Ш., Тожимирзаев, С., Жабборова, Г., & Бахромжонова, М. (2021). К определению радиуса зоны проскальзивания волокон, расположенных в пряже по винтовым линиям. Збірник наукових праць ΛΟГΟΣ.

[42] Абдиасилов, С. (2021). Изобразительное искусство узбекистана в патриотическом и эстетическом воспитании школьников. Збірник наукових праць ΛΟΓΟΣ.

[43] Musohon, I. M., Shuxratjonovich, R. B., Avaz, J. G., & Baxromjon, B. M. (2021). Tools to determine the tension of selected yarns on knitting machines by experiment. Збірник наукових праць ΛΟΓΟΣ.

[44] Эркинов, З. Э. У., Абдувалиев, Д. М. У., Изатиллаев, М. М. У., & Изатиллаевна, П. Ж. (2020). Исследование равномерного распределения крутики и показателя качества пряжи, выработанной на новом крутильном устройстве. Universum: технические науки, (6-2 (75)).

[45] Ashurovich, O. T., & Khasan To’lqin o’g, A. (2021). Evaluation of Physical and Mechanical Properties of Fabric Fabrics from Different Secondary Material Resources. Design Engineering, 171-180.

[46] Tursunbayevich, Y. A., & at all. (2021). Investigation of Influence of a New Twist Intensifier on the Properties of the Twisted Yarn. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(5), 1943-1949.

[47] Ochilov Tulkin Ashurovich, Khalmatov Davronbek Abdalimovich, Shumgorova Shamsiya Pulatovna, Usanov Mustafaqul Maxmud Ugli, Korabayev Sherzod Ahmadjanovich. (2021). Analysis of Quality Indicators of Mixed Spun Wool Yarns. Annals of the Romanian Society for Cell Biology, 779-786. Retrieved from http://annalsofscrb.ro/index.php/journal/article/view/2508