Scientific Study for the Internal Dynamic Friction between Warp and Weft Yarns of Woven Fabrics

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Abstract:

Fabrics are typically classified based on their weight, which may vary widely from light, medium to heavy-weight fabrics. On the other hand, weaving machines are also often classified into light, medium, and heavy according to the weight of the woven fabric on them. Although, this classification method of weaving machines may be incorrect in many cases, as there isn't necessarily a relationship between the weight of the woven fabric and the classification method for weaving machines in general. This is confirmed by the research in our hands. Where the research plan is based on the analysis of the internal friction forces between the warp and the wefts yarns, which are interlaced with each other within the fabric construction. Those internal friction forces have a significant impact on the force needed to beat up the wefts, based on Newton's third law "To every action, there is always opposed an equal reaction: or the mutual actions of two bodies upon each other are always equal and directed to contrary parts". According to the previous mechanical theory, it is expected that the required beating-up force values certainly depend on the number of interlacing rates within the woven construction repeat more than the fabric weight. The research paper revealed several important points, including determining a theoretical basis for calculating the internal friction values between warp and weft yarns within the woven fabric structure based on the warp yarns' tension during the weaving process. By determining the values of internal friction, it is possible to estimate the values of some mechanical properties of the fabrics. These calculation values can also be used to determine the appropriate machine for the weaving process with high precision.

References:

1- Peirce, F.T.: Geometry of cloth structure. Journal of the Textile Institute. Manchester, (1937). Vol. 28 No.3, pp.T45.

2- Peirce, F.T.: Geometrical Principles Applicable to the Design of Functional Fabrics. Textile Research Journal, (1947). Vol. 17, No. 3, pp.123.

3- Offermann, P. and Tausch-Marton, H.: Grundlagen der Maschenwarentechnologie. Braunschweig, Germany: Vieweg, 1978. – ISBN 3-528-04112-9

4- Badawi, Said : Development of the Weaving Machine and 3D Woven Spacer Fabric Structures for Lightweight Composites Materials. Germany: Vdm Verlag Dr. Müller, 2008. –ISBN 3-639-04114-3.

5- Usha Chowdhary:Textile Analysis, Quality Control & Innovative Uses. New York, USA: Linus Publication, 2010. – ISBN 1-60797-096-1

6- International Textile Manufacturers Federation (ITMF): ITMF Publications, Zürich, Switzerland (2021)

7- The World Trade Organization (WTO): WTO Publications, Geneva, Switzerland (2021)

8- Hans Schmidt & Co GmbH Company: Product-catalogues. Waldkraiburg, Germany (2012-2015)