Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 181 (2017) 330 – 337

Procedia Engineering

www.elsevier.com/locate/procedia

10th International Conference Interdisciplinarity in Engineering, INTER-ENG 2016

Research Regarding the Physical-Mechanical Properties of Knits for Garments – Abrasion Resistance

Alina Mihaela Coldea[a], Dorin Vlad[a,]*,

[a]"Lucian Blaga" University of Sibiu, Department of Industrial Machinery and Equipment, 10 Victoriei Bd., Sibiu 550024, Romania

Abstract

During wear, the fabric is subjected to a complex combination of forces acting at various rates, in various intensities, in various directions and for various periods. This is one of the main causes of a fabric and garment becoming unacceptable for further wear.

The main goal of this research paper is to improve the physical-mechanical properties of knits for garments by choosing the right fabric structure and raw material. The abrasion resistance is a mechanical deterioration and progressive loss of substance from a fabric, resulting from the fabric rubbing against itself or another surface.

Tests was done on weft knitted fabric for garments using cotton, wool and mixed yarns, three different patterns, according to the EN ISO EN ISO 12947: 1999 - Determination of Abrasion Resistance of Fabrics by Martindale Method.

For assessment, two different methods were performed.

Peer-review under responsibility of the organizing committee of INTER-ENG 2016

Keywords: abrasion resistance; knits; cotton; wool; knitted fabric geometry.

1. Introduction

The knitted fabric is necessary part of clothing and it must be comfortable, affordable and is desirable to maintain their quality throughout their life. Low abrasion can reduce the material's life. It will be useful for the producers and costumers to identify the nature of the parameters who are affecting the garments resistance to abrasion [5, 6].

* Corresponding author. Tel.: +40-746-614133; fax: +40-269-213227.
E-mail address: dorin.vlad@ulbsibiu.ro

Peer-review under responsibility of the organizing committee of INTER-ENG 2016
doi:10.1016/j.proeng.2017.02.397

A fusion during use not only contributes to the failure of the fabric and garment; it more commonly contributes to changes in fabric appearance (making it look 'old' or unattractive) such as fuzzing, pilling, frosting (colour change) and “shine”. It also changes fabric performative properties, long before mechanical fracture or rupture occurs.

Frequently, the consumer will consider a fabric to have reached the end of its useful life on the basis of appears nee-related properties rather than on the basis of fabric mechanical failure, such as tearing or rupturing. Factors which affect abrasion resistance include fibres content and properties; yarn structure if e.g. spinning system, yarn twist and yarn linear density), fabric structure (e.g. weave, float length and yarn crimp) and weight and chemical and mechanical treatments imposed during dyeing and finishing processes, particularly in as much as the latter effect the fibre friction and resistance to flexing [1].

Abrasion occurs during wearing, using cleaning or washing process and this may distort the fabric, cause fibres or yarns to be pulled out or remove fibre ends from the surface. The first stage of abrasion is small balls entanglement because of the loose fibres unravels from the fabric surface during usage and washing (see Fig. 1a).

Eventually the fibres which bind the balls to the surface breakdown and a hole occur (see Fig. 1b). If the fabric consists of synthetic fibres with natural fibres, during rubbing action natural fibres, which give the desirable properties of the fabric, move away, only synthetic fibres remain.

This gives the garment undesirable appearance and decrease the overall fabric thickness [3, 23].

a b

Fig. 1. Stage of abrasion test: (a) First stage – small balls entanglement; (b) Second stage – holes apparition.

Abrasion is the process of wear or degradation of a textile material as a result of abrasive friction of an abrading check, under the conditions. Wear by abrasion is surface modification and structure of a textile yarn under abrasion by shifting position in the process of abrasion. Degradation by abrasion is the change of texture by a broken wire between two points of connection, whether the warp or weft yarn for fabric or destruction of a stitch for knits.

Abrasion resistance is the behavior of the materials and abrasion textile applications can be expressed by:

- the number of cycles to a certain degree of wear;
- the number of cycles to decay;
- mass loss of materials submitted for an abrasive action caused [5, 6].

Point of damage is reached:

- in the case of woven materials, when two threads are completely broken, defendant;
- in the case of knitted material, when a wire is broken and there is a hole [5, 6, 22].

Abrasion is an undesirable effect of manufacturing processes and use of textiles and is generated by technological friction couplings homogeneous / mixed.

The wear is manifested as a request by the friction forces on the surface of the fabric, causing: changes of looks and structure, mass loss, decreased mechanical properties, ending with the destruction of the specimen [5, 6].

2. Background

A number of studies have investigated the abrasion resistance of garments. In their study carried out in 1991, Sivakumar and Pillay defined the pilling as a phenomenon exhibited by fabrics formed from staple spun yarns. Pills are masses of tangled fibres that appear on fabric surfaces during wear or laundering, resulting in an unsightly appearance and an unpleasant handle [7].

While Sridharan defined pilling as a physical process appearing on the surface of a garment, taking the form of small balls made up of fibres, sometimes with contaminants. These fibres give a bad appearance to the garment [8].