IMPACT OF WEAVE STRUCTURAL CELLS TYPOLOGY IN FABRIC STRUCTURE ON FABRIC AIR PERMEABILITY

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Abstract: This paper is focused on the impact of structural interlacing cells of woven fabric weave on fabric air permeability, and the properties closely related to the areal porosity. This influence is investigated on weaves with different degree of interlacing and a different arrangement of warp and weft binding points. In addition to the weave, the permeability of the fabric is also affected by other factors: warp and weft density, fabric thickness, yarn twist, yarn fineness, yarn porosity, and fiber parameters. The experimental set of fabric samples consists from five dobby woven fabrics with a square set of ends and picks.

Keywords: *woven fabric, pore, air permeability, weave, multifilament yarn, cell.*

INTRODUCTION

Each fabric has its specific properties based on its geometric structure. Depending on the change in geometric structure, there are also changes in properties such as permeability. The fabric consists of two sets of threads perpendicular to each other and differently interlaced [1]. As a result of the interlacing of these two systems, pores (cells) are formed between the threads, thanks to which the textile gains permeability. The theory of pores in fabric interlacing is built on Backer's knowledge [2] where four types of the pores is defined. The pores in the Backer´s contributions were used for definition of internal geometry of interlacing of fabric structures. This study used this pores as basic areal structural cells describe the mutual interlacing of two neighbouring threads in both the warp and the weft direction. Based on these structural cells it is possible to create all design solutions for dobby and jacquard woven fabrics [3].

WEAVE STRUCTURAL CELLS TYPOLOGY

Spatial geometry is defined by the internal arrangement of threads in woven fabric relative to the axis of the fabric, by force and deformation ratios in the binding point of woven fabrics, etc. The structure of the woven fabric is based on four basic structural cells (pore models): cell type 1 (P1) - full interlacing, cell type 2 (P2) - partial interlacing, cell type 3 (P3) - doubling interlacing and cell type 4 (P4) - full float, see figure 1.

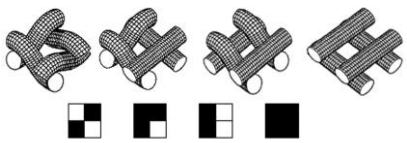

Figure 1 Interlacing structural pores (cells).

Polyester multifilament yarns 110dtex were used in warp and weft threads to produce experimental single-layer dobby woven fabric samples with the same warp and weft set and different weaves. The fabrics were made of polyester multifilament with a protective twist (80/m). The details of the construction parameters of woven fabric samples are given in Table 1.

Table 1 Woven fabric samples - absolute frequency of strucutral cellss in fabric weave

Weave code	Threads sett [cm^{-1}]	Absolute frequency of cells		
	ends/picks	P1	P2	P4
Plain	32/32	4	0	0
Twill K3	32/32	3	6	0
Twill K4	32/32	4	8	4
Twill K6	32/32	6	12	18
Twill K12	32/32	12	24	108

The air permeability of fabrics is closely related to the distribution and frequency of structural cells / pores size distribution, which will be studied by image analysis [4], see figure 2.

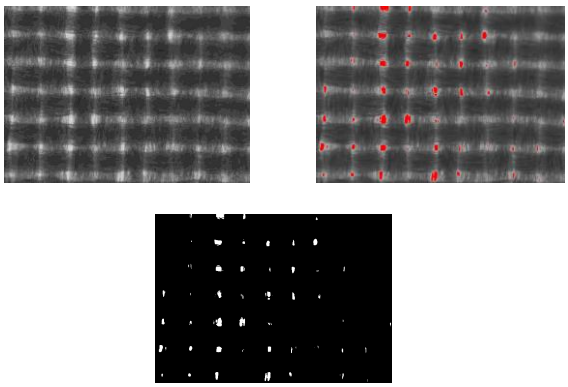

Figure 2 Evaluation of fabric porosity using image analysis.

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