DESCRIPTION FOR THE GENERAL PUBLIC

The main objective of the project is to create knowledge on the structure and properties of three-dimensional woven fabrics of textural surface topography and relationships between the geometric surface structure and properties of three-dimensional woven fabrics. The main hypothesis of undertaken research works are as follows:

- Three-dimensional woven fabrics with a profiled surface are characterized by a unique mechanical, surface and thermal-insulation properties resulting from their geometric structure.
- It is possible to quantify the geometric structure of surface of the three-dimensional woven fabrics with textural surface using a contactless measurement with a three-dimensional scanning.
- Appropriate quantification of the geometric structure of the surface of three-dimensional woven fabrics allows analyzing and describing the mathematical relationships between the geometric structure of the surface of the three-dimensional woven fabrics with the profiled surface, and their mechanical and thermal insulation-properties.

The objects of the investigations will be the seersucker woven fabrics, as the representatives of the three-dimensional woven fabrics with relief. The seersucker fabrics create a unique 3D woven structures. Such 3D structure is usually received on loom by an application of two warps of different tension. A typical seersucker structure is characterized by an occurring the puckered strips in the warp direction.

Despite the more and more common utilization of the seersucker woven fabrics the theoretical bases of the description of their geometrical structure and the relationships between the structure and properties of these fabrics have not been developed till now. Usually, the standard testing methods commonly applied in measurement of the 2D fabrics, are used for measuring the 3D fabrics. The methods are not sufficient to quantify the geometric structure of surface of the seersucker woven fabrics. There are no scientific bases enabling conscious design of these fabrics, providing obtaining their expected properties. It concerns mostly the surface properties, but it is also important in the case of other mechanical properties such as bending stiffens, drapeability as well as the heat-insulating features. Inability to assess the seersucker effect of the seersucker woven fabrics makes impossible to assess the accuracy of the geometric structure of these fabrics, and in the same way it makes impossible the complains to manufacturer when the seersucker structure of the fabrics is incorrect.

The investigations predicted within the framework of the undertaken project will be the first step towards a scientific solution to the above-described problems with defining the structure of the seersucker woven fabrics, especially the geometric structure of their surface.

In order to perform the research works predicted in the frame of the undertaken project the seersucker woven fabrics' variants will be manufactured. 10 variants of various geometric structure of the surface will be produced on looms with two warp sets. The study of geometrical structure of the seersucker fabric surfaces will be performed using the three-dimensional laser scanning. The manufactured seersucker woven fabrics will be also tested in the range of their physical, mechanical and thermal-insulation properties. The measurement results will be analyzed in terms of the development of the parameters reflecting in a numerical way the geometric structure of the surface of the seersucker woven fabrics, and the relationships between the developed parameters of the geometric structure of the fabrics and their mechanical and thermal-insulation properties.

Research undertaken in the proposed project will create the scientific bases for the design of the seersucker woven fabrics. The measureable result of the project is a creation of new knowledge in the field of three-dimensional woven fabrics, especially seersucker woven fabrics, quantification of the seersucker effect as well as the relationship between the geometric structure of the surface of these fabrics and their mechanical and thermal-insulation properties.