Classification of Textile Fibers and the Concept of Fibers

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Textile materials are those materials that consist of textile fibers. These materials include the fibers themselves, threads, as well as products made from them.

Textile fibers are long flexible and strong bodies with very small transverse dimensions, limited length, suitable for the manufacture of yarn and textile products.

Fibers are divided into elementary and technical. Elementary fibers are single fibers, indivisible into smaller ones, while technical fibers are complex fibers, consisting of several elementary fibers glued together. Both fibers have a relatively limited length - several tens or hundreds of millimeters.

A filament is an elementary fiber several tens and hundreds of meters long.

Textile threads are thin, flexible and strong bodies of indefinite length, consisting of elementary fibers or threads joined together and suitable for the manufacture of textiles.

A textile thread obtained by twisting sequentially arranged more or less straightened elementary or complex fibers is called yarn. A thread that is obtained by joining and twisting elementary threads is called complex.

There are a large number of different fibers in nature, however, in order to be used in the textile industry, they must have certain properties: first of all, significant strength, flexibility, have a rough surface, and abrasion resistance. In addition to general properties - elasticity, strength, wear resistance, paintability, etc. - various fibers also have specific properties, which determines their scope of application.

Based on their origin and chemical composition, textile fibers are divided into natural and chemical.

Natural fibers include fibers that are formed in nature without direct human participation and consist mainly of organic heterochain natural high-molecular compounds.

Chemical fibers include fibers produced in factories and consisting mainly of organic heterochain and carbon-chain synthetic high-molecular compounds and a very small part of their natural inorganic compounds.

Natural fibers are divided into three groups: fibers of plant origin (cotton, flax, hemp, kenaf, sisal, etc.), animal or protein origin (wool, silk) and inorganic, mineral origin.

Let's consider fibers of plant origin.

Cotton is the most important textile fiber that covers the seeds of the cotton plant, grown in hot climates. After the cotton plant ripens, the fibers along with the seeds are collected and sent to primary cotton processing plants, where the fiber is separated from the seeds. Cotton fiber has a number of remarkable properties: great flexibility, tenacity, very small thickness, but great strength and wear resistance. In addition, the fiber is easy to dye. The length of the fibers is relatively uniform and reaches 25-40 mm.

These properties make it possible to obtain a wide variety of yarns from cotton fibers: from thick ones for the production of coarse and various furniture and clothing fabrics to very thin ones,

from which thin elegant fabrics such as maya, cambric, marquise or percale type fabrics for technical purposes are produced.

Bast fibers are found in the stems, leaves or shells of fruits of various plants. The textile industry uses mainly stem bast fibers, the most important of which is flax. In the domestic industry, flax accounts for 95-97% of bast fibers.

Bast fibers are located in bundles in the bark of flax, hemp and other plants. To separate the fibers from the bark, plants must undergo a long natural soaking process, then undergo heat or chemical treatment, then they are crushed and then subjected to scuffing. This process is very complex and lengthy.

The properties of flax and other bast fibers differ from cotton. They are durable, but rougher and thicker, especially technical ones. The length of bast fibers is longer than that of cotton fibers, but has greater unevenness. Therefore, thicker yarn is obtained from bast fibers than from cotton. High-quality linen yarn is used to produce towels, table and bed linen, dress and technical fabrics. Coarser linen yarn and other fibers (hemp, kenaf, jute) are used to produce container and bag fabrics, as well as ropes and cables.

Natural fibers of plant origin include wool and silk.

Wool is the fiber that covers the skin of sheep, goats and camels. There are natural, industrial and regenerated wool. The first is obtained by shearing animals, the second by finishing animal skins, and the third by processing recycled wool.

Wool fibers are longer than cotton fibers, less durable, but more elastic. Thanks to this, woolen fabrics have a number of valuable properties - low creasing, wear resistance and drapability, i.e. the ability to well maintain the shape originally given to the product made from these fabrics. Two types of yarn are made from wool fibers: cloth - thick, soft, with low strength, used for the manufacture of coats and drape fabrics, and worsted - thin, smooth, durable, used for the manufacture of dress and suit fabrics and knitwear.

Silk is a thin thread secreted by the caterpillar of the silkworm butterfly. Silk threads have remarkable properties. They are strong, smooth, elastic and have a pleasant appearance. To obtain a textile thread from them, it is enough to twist together several elementary threads (fibers). However, the cocoons can only be unwound halfway. The other part forms waste, which is processed into yarn in silk spinning factories. Light, beautiful dress fabrics, as well as technical fabrics, are made from silk threads.

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