

Textile Fibres

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Discontinuous and continuous fibres

Discontinuous fibres are limited in length for few centimetres. Continuous fibres have a large length that is limited only for technical reasons: in the case of the natural silk, the cocoon's content; in the case of the non-natural fibres, the support's capacity (for example, the cone).

Fibres origin and their classification

Textile fibres can have many origins and this is generally the criteria used to classify them.

Thus, fibres can be categorised as the following:

Natural, if produced by nature in a way which makes them suitable to be used in a textile process.

Non-natural, if produced by industrial processes, whether from natural polymers transformed upon the action of chemical reagents (artificial or regenerated fibres), or through polymers obtained by chemical synthesis (synthetic fibres).

Fibres Classification

Natural Textile Fibres

Textile fibre is an element characterised by its flexibility, fineness and large length proportionally to its diameter that make it suitable for textile purposes.

- **Vegetable Origin** . Extracted from plants
 - Cotton: Seed
 - Flax: Stalk
 - Sisal: Leaf
 - Coconut Fibre: Fruit
- **Animal Origin** . Obtained from animals
 - Silk: fibres produced by larvae glandular secretion of some insects
 - Wool: fibres composed by some mammals' hairs
- **Mineral Origin** . Issued from rocks with a fibrous structure
 - Asbestos: composed essentially by silicates

Non-natural Textile Fibres

All fibres produced through chemical processes, from natural products (polymers) or from polymers obtained by chemical synthesis.

- **Artificial Fibres** . Obtained from natural products. (Viscose, Modal, Acetate)
- **Synthetic Fibres** . Obtained by chemical synthesis:
 - Organic Nature**
 - Acrylic
 - Elastane
 - Polyamide
 - Polyester
 - Inorganic Nature**
 - Glass
 - Carbon

Man-made fibres are manufactured from a natural or synthetic polymer that is dissolved in an appropriate solvent or simply melted.

With the polymer in solution, a filament is made under the forced liquid flow through the course, where occurs the material solidification.

This process is called extrusion.

On regenerated fibres manufacture basis, there is a natural polymer that has special meaning – cellulose.

On synthetic fibres basis, there are man-made polymers from simple substances – as polymers manufactured from crude oil.

Viscose, also known as artificial silk, is a regenerated non-natural fibre, manufactured from refined pulp (cellulose). The 6-6 polyamide fibre, more known as nylon, was the first synthetic fibre to be accepted, even though it was manufactured on benzene basis.

The polyester has like base the polyethylene terephthalate, becoming the more important synthetic fibre. From the synthetic fibres are known the creasing resistance properties, the good mechanical strength and the quick drying.

The acrylic fibre presents a wool-like touch. It's composed by acrimonious base.

Fibres defects

In the following list, we show the defects that derive directly from fibres intrinsic characteristics, which appear during the different stages of the textile process.

- **Cotton Dead Fibres**
- **Bacterial Attack to the Wool**
- **Microbiological Attack**
- **Pilling**
- **Extraneous Fibres**

Spinning

If a portion of fibres is twisted and drawn out simultaneously, a lengthening of this fibrous mass will be caused and some friction will be introduced between the fibres, forming this way a tow with some resistance.

The spinning is the industrial execution of this action, although it has to be performed in a more complex and rigorous manner, in order to obtain uniform and prime continuous threads.

The manufacturing process is divided into several stages that could vary according to the thread type to obtain. Basically, it is possible to manufacture thread with natural fibres, non-natural fibres or with the blend of both fibres that could still be carded or combed (thinner and with a better quality), single or twisted.

As an example, we will show the stages for the carded cotton thread production:

- The initial stage aims at the opening and cleaning. Fibres are removed from bales, separated and cleaned from residues, earth, seeds, etc., doing also the blending of fibres from different bales. The forwarding machines are openers and beaters.
- Next, the main purpose is fibres orientation. Thus, the fibrous mass is combed and lengthened, in order to complete the cleaning and guide all the fibres in the same direction. For that, cards and rollers are used.
- In a third stage, the purpose is to produce the thread and, for this, it is necessary to thin the fibrous mass of the correctly guided fibres.

Like that, a slight stretching is realised and some twist is introduced in a machine so-called roving frame and, at last, the issued roving is processed in the continuous form, by there getting the wished thread.

Others types of thread can be obtained, using eventually others fibres, others equipments and others manufacturing processes. As an example, combed threads or open-end threads.

Some of the most relevant characteristics of a thread are its counting, twist, strength and elasticity.

The thread counting or number can be represented by the international counting system, the **Tex** unit, that is the weight of the thread in grammes at a length of one kilometre of textile, or by the English counting system, the **Ne** unit, that is the reverse of **Tex**, in others words, how thicker is the thread, smaller will be its **Ne**.

The major function of the twist is to keep the fibres together for the thread formation. The twist can be indicated by the letters Z or S, in accordance to the direction in which was made the twist.

In accordance to the twist, the thread strength and others characteristics increase. It is possible to produce threads gathering more than one tow. The forwarding machines are twisters.

Spinning Defects

In the following list, we show the defects that derive directly from fibres intrinsic characteristics, which appear during the different stages of the textile process.

- **Twist Defect**
- **Thin Thread**
- **Texturing Defect**