

# TEXTURED YARN PROCESS TECHNIQUES AND PRODUCT DEVELOPMENTS

Texturization is also called as disorientation process because in this process the flat continuous filaments are distorted to have loops, crimps, coils or curls along their full length to improve the bulkiness, porosity, softness and elasticity nature of material. The manipulation process of textured yarn results in the modification and altering the molecular arrangement in the filaments. It produces a permanent change in the physical structure of the yarn and so textured filament no longer lie parallel to each other. Generally, it consists of three steps. The first step is to distort the filaments in the yarn and so the inter-fiber bonds will get break. Then the material has to heat according to their respective melting points, which breaks the bonds between the polymers, thus allowing the filaments to stay crimped or looped or any other disordered form and then the heated material has to be cooled immediately to enable the new bond formation between the polymers in the yarn stage itself to make the distorted state as permanent on their structure. When the yarn is untwisted or otherwise released from its distorted state, the filaments remain in a coiled or crimped condition; it will provide versatile opportunities to find the specific applications, this type of yarns can be broadly classified into three major categories, such as,

- 1) **Stretch yarns:** This type of yarns show high stretch, moderate bulk per unit weight. It exhibits elasticity more than 300%. These yarns are mostly used for the stretch-to-fit type fabrics, sports wears, etc.
- 2) **Modified stretch yarns:** This type of textured yarns exhibit moderate degree of stretch, high bulk per unit weight, helical or plainer crimpiness. This category of yarns used in shirtings, suitings etc.
- 3) **Bulk yarn:** Bulked textured yarns exhibit increased bulkiness with little or no stretch, loopy structure and common extensibility. These yarns specially used in carpets and car interiors, etc.

Even though textured yarns are produced from several techniques, all types of textured yarns are having certain similarity due to the rearrangement of molecular chains in the structure like good air permeability, high bulkiness, etc., it results in increased warmthness, greater water absorption characteristics and good dimensional stability of product. Due to these bulky nature with less packing density of molecular structure make greater influences in results of fabric handle values.

## METHODS OF TEXTURIZATION

Textured yarns are the manipulated continuous filaments by physical, chemical or thermal changes in the structures and so that they are no longer will be straight or uniform form. All man-made and natural fibres can be treated to produce yarns with some degree of stretch and recovery but the machine selection should be depends on the end use requirements and product specifications, for example heat setting in a twisted condition of filament will cause the texture effect in thermoplastic materials, whereas in the non-thermoplastic materials texturization can possible only in Air jet texturing (AJT) process. So, appropriate machine and process conditions are required. Introducing crimps, coils, loops or other fine distortions along the lengths of the filaments are presented by a textured yarn, a constant filament yarn that has been treated. These

effects can be produce in the filament by various methodologies, like False twist texturing, Airjet texturing, BCF process, Edge crimping, Stuffer box crimping, etc.,

### False Twist Texturing:

This technique is most popular method to produce high stretch yarn. In this process the bundle of filaments are pass together in heated roller and then immediately that has to be cool down and so the twisted configuration of disoriented molecules in structures will get set during the cooling time. When the yarn is moved from left to right with the peg formations in the twisted bundle, the twist on the right side would be moved and then gets fade away but the left side would continue to be twisted, all the false twist-texturing machines are working based on this principle shown in Figure1. A peg generates a definite twist stop, and therefore friction disks are better options, which execute the same and have the benefit of rotating the yarn. Due to the changing configuration in filament bundle, results in change of original nature of material and so the modified form of structure gets fixed in its molecular state of material. After the cooling process the material has to untwist immediately and so the output material has no twist in its outside structure, but the modified configuration will results in textured effect on the material. Hence, this process is called as false twist texturing. Real twist ('S'&'Z' twist altogether) texturing was very time-consuming and laborious process, whereas in false twisting process the speed of twist texturing accelerated production speed in more than 1000 m/min.

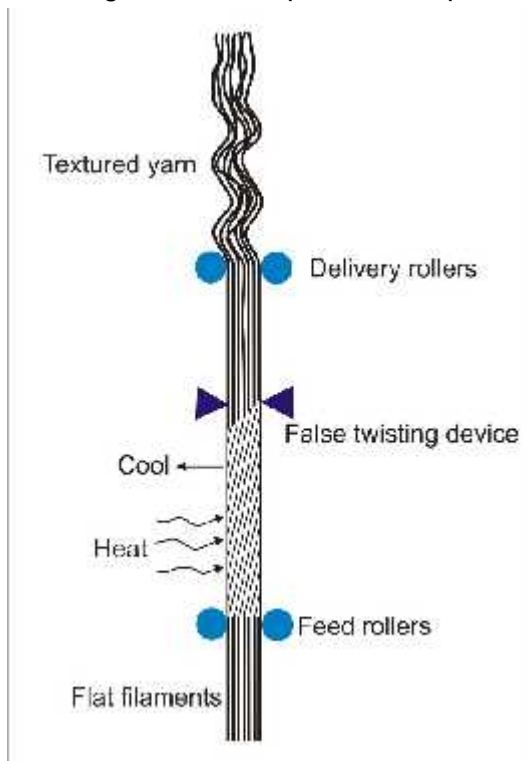


Fig.1 False twist texturing process

## Airjet Texturing:

Airjet texturing process is the only process for non-thermoplastic polymers, cellulosic or non-organic filaments texturization. In this process, filaments are fed over a tiny blast of air that forces the filaments into the loops. One or more end of filament yarns are overfed at a constant rate inside the air jet, which blows fastly depending on the amount of overfeeding, it varies from 15% to 150% between the inlet and outlet feeds respectively, the material process flow in airjet texturing machine is shown in Figure2. The speed of air texturing machine is about 400m/min to 500m/min, this made gainful air texturing of finer yarn counts of up to 100dtex with continuous string of smaller and larger loops. The individual filaments are compacted by the air stream, which stabilizes the loops. An advance in air-texturing over the years has been relied only on the growth of air-jet nozzle modification, since it's contributing the major portion of Airjet material output. Newer nozzles have led to the processing of a wider range of yarns at greater processing speeds, lower energy consumptions and lower noise levels.

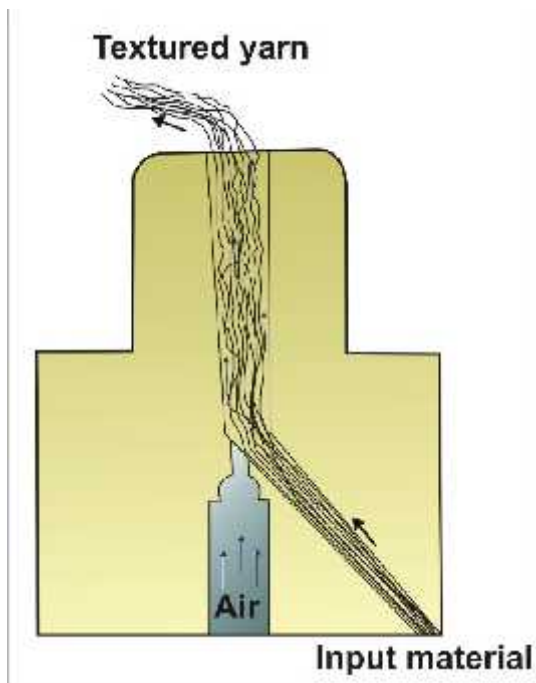


Fig.2 Airjet texturing machine

Several filaments of different deniers and various material types can be mixed to construct the ideal Airjet Textured Yarn (ATY) for specific enduse applications. ATY are generally made from partially oriented yarns (POY), ATY is a yarn with millions of small loops, which give it a distinct feeling and look on the output. Whereas, Drawn textured yarns (DTY) generally produce crimped yarn structure without loop. The loops in ATY contribute to the bulk and loft of a fabric, whereas in DTY produces crimp in every filament creates the bulk and volume of a fabric. ATY can offer an entirely different aesthetic look and hand value compare to other fabrics. The manufactured yarns are used for sewing thread applications, apparel fabrics, fancy yarn articles, automotive interior fittings, and home furnishing fabrics, carpets, fire blankets, etc.,

### **BCF process:**

High bulk yarns are created and processed by nonlinearity in individual filaments in Bulk continuous filament (BCF) process. In this method of texturization process, the materials handled as similar as that of manmade filament manufacturing, the only change is that in material collection area. Bulk yarns may shrunk and stretched to introducing shrink differentials in its structure, thus the resulting yarns of this processes are bulked, fluffed and twisted yarns. This also called as carpet yarn because of the high bulky structure, the structural difference between spun yarn and bulked continuous filament yarns are shown in Figure 3.

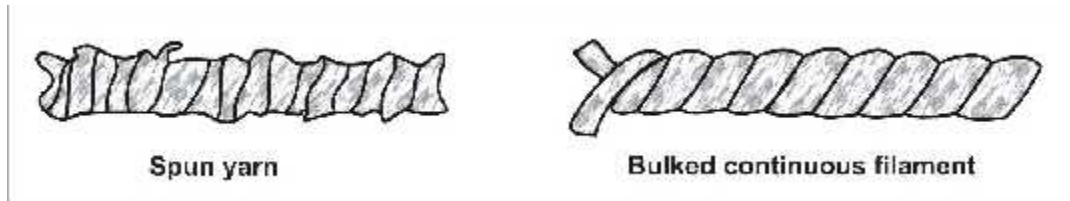


Fig.3 Spun yarn and BCF yarn Structural arrangements

Polymer granules are extracted through spinnerate as similar as that of filament manufacturing process, after the quenching and drawing process the material stretch value would be 1- 4%, It reduces the denier of the carpet yarn. When the material process through the Jet nozzles, plug formation takes place. Plug formations are depends on position of holes and number of holes present in the jet arrangement. In the outlet area perforated cooling drum will rotate and collect the material, it will change the nature of material in textured form. At last, the heat-set fibre is stitched or tufted into the primary carpet backing, amount of yarns used and closeness of the tufts to one another determine the density of the carpet. In kitchen or bathroom floor textured carpet, shown in Figure 9, which will avoid slippery nature and also it will enhance the aesthetic look of the room.

### **CONCLUSION**

Technology is the real partner of innovation of the industry today. In the field of texturization process, air interlacing jets with better presentation can be anticipated. They will fulfill the needs of accelerating process speeds, and on the other hand it will take care of escalating process permanence. The outcome will be a yarn with greater bulk, higher stretch and more beautiful properties as per requirements. High flexibility of the air texturing process with an application range from approx. 22dtex to 18,000dtex, makes all kind of yarn possibilities, with the great number of yarn combinations. Pre-dominant applications of these yarns are in the areas of hosiery, ladies wear, sports and leisurewear and also in textile automotive linings. The level of the market increase for air-textured yarns, will depend on the future Research and development activities of various enduse applications.