INVESTIGATION ON COTTON FIBER BREAKAGE

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Abstract

Cotton fiber is a natural fiber used in the production of premium ring-spun yarns. Natural variability in cotton fiber quality can translate into imperfections within the yarn and finished textiles. Imperfections in yarn quality on the premium textile market result in discounts and lost profits. Mechanical processes such as harvesting, ginning, and cleaning break fibers and introduce additional variability into cotton fiber quality. Fiber breakage results in a buildup of short fiber content. Recent studies have shown shorter fibers in processed cottons are weaker and more immature when compared to longer fibers. This indicates that fiber breakage depends on the distribution of length and maturity within a sample.

The Advanced Fiber Information System (AFIS) provides within sample distribution of cotton fiber quality. Fibers are fed into the AFIS as a sliver where a mechanical rotor, called the AFIS fiber individualizer, is used to separate single fibers from the bundle. AFIS provides the within sample distribution of fiber quality, making it an ideal tool for characterizing breakage during processing. However, the AFIS opener is aggressive and breaks fibers as they are individualized for evaluation. Once the variability introduced by the AFIS individualizer is characterized, fiber quality distributions provided by the AFIS can be used to investigate fiber breakage from industrial processing.

In order to characterize the fiber quality variability introduced by the AFIS opener, 37 cottons were selected to capture a wide range of variability in fiber quality. Each cotton sample was formed into 10x10k fiber slivers for AFIS fiber quality evaluation. After each sample was evaluated, the waste fiber was collected and reformed into slivers. This was continued through 5 consecutive AFIS runs for each of the 37 cottons.