

**DISTRIBUTIONAL CHANGES IN COTTON
FIBER LENGTH DURING PROCESSING**

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Abstract

Cotton fiber length changes after each processing stage because of a) fiber breakage, b) removal of fiber crimps, c) unrecovered displacement from extension, d) lost of fibers, and so on. Monitoring the fiber length change is vitally important to optimize processing and to improve product quality. An AFIS (Advanced Fiber Information System) was employed to investigate fiber length changes. The AFIS measures the length, fineness etc. of each individual fiber, and provides their distributions. A total of 36 varieties of U.S. upland cotton were processed. Our test results showed that most fiber damage occurred during carding. The mean length was reduced by 0.03 inch on the average for the 36 cotton samples, with a maximum reduction of 0.09 inch. The correlations between length reduction and other fiber properties (AFIS length, length variation, fineness, maturity, HVI length, length uniformity, strength and Micronaire) were analyzed. Although the fibers with weaker strength, longer length, and higher variation seemed to suffer more damage, the correlation coefficients were too low to be statistically significant.

A computer program was developed to simulate fiber breakage and to estimate the percentage of breaking fibers. The actual length distribution of cotton from AFIS before carding was used as input. The calculated curve having least squares to the length distribution of carded cotton was selected to estimate the fiber breakage. The simulation results showed: the average minimum length for a fiber to be broken was 5/8 inch, or in other words, a fiber would not break into pieces less than about 5/16 inch; the probability of a fiber to be broken was proportional to the 3rd power of its length; and on the average, 5% fibers by number and 15% fibers by weight were broken during carding.