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Improved High Volume Instrument Elongation Measurements

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Textile Technology[Full Text PDF](#) (630K)

Cotton fiber elongation (extensibility, elongation at breaking load) is one of the least utilized measurements from the high volume instrument (HVI). This may be due, in part, to the large standard deviation of this HVI measurement. In addition, the correlation of fiber elongation with yarn elongation is not as high as the physical theory of yarn strength suggests. Thus, an improved method for deriving elongation from HVI stress-strain data was needed. The response of the HVI breaker system was characterized by clamping an index card in the jaws and measuring the tensional force applied to the non-rupturing card. This measured response was then used to correct the raw HVI stress-strain curves. A modified analysis of this corrected stress-strain curve resulted in improved measurements of fiber elongation and crimp. A set of 18 cottons was broken at 10 different break amounts to test the validity of the curve correction and modified analysis. Comparisons of these modified measurements with bundle stress-strain curves generated from Mantis® single-fiber data showed similar levels of elongation (approximately 5% higher than traditional stelometer values). Measurements were also made on samples from the 1990 through 1994 crops in order to investigate the correlations of the modified elongation data with stelometer data and to determine the utility of the modified elongation measurements as predictors in yarn strength and elongation models.