

EVALUATING IMMATURE FIBER BIAS IN FIBER CROSS-SECTION ANALYSIS**Lakshmi Padmaraj****Mourad Krifa****Bugao Xu****The University of Texas at Austin****Austin, Texas****Abstract**

Maturity is an important parameter that determines the final quality and properties of cotton fibers and yarns. Fiber maturity-fineness can be determined by a variety of indirect methods such as the air-flow or electro-optical principles (FMT, AFIS...). However, only fiber cross sectional analysis can measure fundamental features such as cell wall thickness and perimeter and hence is used as a reference for all other methods. Accurate and unbiased values of maturity using this method are crucial for the correct calibration of other maturity measurement instruments. This research focuses on the possible bias during maturity measurement as per the standard procedures in research laboratories using the Fiber Image Analysis Software. The objectives of this study were: 1) to check for the presence of a possible bias against immature fibers during measurement of maturity by standard laboratory procedure and 2) to quantify the immaturity bias, if present. A total of 14 samples with 3 cross-sections each, and approximately 2800 fibers per cross-section were analyzed using the FIA05 software. The standard laboratory procedure was followed, where faulty fibers were eliminated by the operator after image analysis. A subset of images was studied in detail to assess the failure in the detection of immature fibers by determining the total failure percentage and failure percentage due to immaturity. It was seen that about 20-50% of fibers were eliminated in the samples, of which 50-90% of the eliminated fibers were immature, thereby establishing the immature fiber bias. In order to quantify the bias, the sample images in the subset were edited manually by enhancing the contrast between lumen, perimeter and background thus detecting all the cross-sections correctly. Comparing the maturity values obtained before and after editing the images, it is seen that there is an overestimation of maturity by around 8-9% using the existing standard laboratory procedure. Thus improving efficiency of existing cross-sectional measurement is essential and can be achieved by improving the sample image acquisition method or filtering the image to improve detection of cross-sections by the software.

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