A STUDY ON THE HIDDEN PORTION OF THE FIBER BEARD IN COTTON LENGTH MEASUREMENTS

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Abstract

The beard method is widely used in the rapid measurement of cotton fiber length. Fibers are picked by a clamp/comb to form a tapered fiber beard, and then the beard is scanned to generate a fibrogram. Cotton fiber length parameters, such as Mean Length (ML) and Upper Half Mean Length (UHML), can be derived from the fibrogram. Beard method is the method used by the High Volume Instrument (HVI) for measuring fiber length parameters. HVI has been used globally to measure cotton fiber length as well as other properties because of its speed and accuracy. In order to fully utilize the potential of HVI, we are exploring ways to obtain the entire fiber length distribution from the beard method. The method used for making the fiber beard impacts the resulted fibrogram, hence influences the derived length parameters. When making a beard, a portion of the sampled fibers is held in the instrument and not tested. In this paper, we report our preliminary results of studying the hidden fibers with experimental data and numerical simulations.

There are several assumptions in the original fibrogram theory, which was developed by Hertel in the 1940s. One of them is that: The clamp holding the fiber beard is very thin, which means that, when scanning the beard, the undetectable fiber length portion held inside the clamp is negligible. In this research we focused on studying this assumption to reveal the influence of the hidden fiber portion on fiber length measurements.

We conducted a series of experiments including eight sets of cotton fiber samples of different lengths. In these experiments, we separate each fiber beard into two portions: (1) the projecting portion, which is the fiber portion of a beard that projects out from the fiber comb and is scanned, and (2) the hidden portion, which is the fiber portion of a beard that is held in the fiber comb needles and is not scanned. We measured the weight ratio of the hidden portion to the entire fiber beard. The smallest value is 35.7 %. This means that the assumption that the undetectable fiber length portion is negligible is not accurate.

We found that the weight ratio of hidden fibers to the original beard was not constant either. It decreases as the ML of the beard increases, which indicates that the hidden portion has a smaller influence on measurements of longer cotton.

We used AFIS to measure the individual fiber length of the hidden portion and the projecting portion separately. The results show that the correlation coefficients between the length parameters (such as mean length) of the projecting portion and the length parameters (such as the Upper Quartile Length) of the original beard are very high (~0.985). These results prove that though the hidden portion cannot be neglected, scanning the projecting portion provides sufficient information for obtaining ML and UQL (or UHML).

We are currently studying the effects of the hidden portion on the accuracy of length distributions and Short Fiber Content measurements.