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ROADMAP TO EVALUATION OF COTTON'S PROCESSING QUALITY

Kearny Q. Robert
USDA-ARS
Southern Regional Research Center
New Orleans, LA

Abstract

This purpose of this work is to lay down a technical research strategy by which the utility value of cotton as a raw material for textile processing can be defined and predicted from measured fiber properties. From the time a cotton is harvested, a series of opening and cleaning mechanisms are applied, both before and after ginning. This sequence is continued in the textile mill as the crucial aspect of the opening-cleaning, blending, and alignment of fibers which constitutes preparation for spinning. Opening and cleaning principles and machinery employed in the gin and mill are sufficiently similar to allow for a unified description of the cotton cleaning process. The governing principle is that to be cleaned to a given degree of fineness of foreign matter, the cotton must be opened to that level of fineness. In the present work, a mathematical framework is proposed for describing cotton cleanability as a trade-off between the reduction of foreign matter on the one hand, and the amount of mechanical damage which on the other hand must necessarily be inflicted upon the cotton to achieve that level of opening. If indices of cleaning and damage are appropriately defined, then cleaning is modeled mathematically as an algebraic extinction process, while damage can be viewed as a saturation process. Most importantly, the trade-off between cleaning and damage can be shown to have certain systematic features which can be utilized to characterize the processability of a cotton and to predict optimum processing strategies. A significant feature of this analysis is that it demonstrates how a cotton bale's processing (ginning and mill preparation) history influences its performance in downstream operations such as spinning.