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INTERACTION BETWEEN COTTON FIBER CHARACTERISTICS AND SPINNING PROCESS: CONVENTIONAL VS. COMPACT RING SPINNING

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Abstract

The innovations in spinning technology have always resulted in placing the emphasis on new demands on fiber quality, because these innovations alter the relationships between certain fiber properties and yarn quality.

Compact spinning represents one of the most significant innovations brought to the market in the recent years. It has been shown to significantly improve the yarn tensile properties and reduce its hairiness, which results in a high-performance yarn processing during the downstream operations.

Former research conducted by the authors showed that in addition to the obvious yarn quality improvements described above, some interactions may exist between the compact spinning effect and the raw fiber properties. Indeed, the improvement observed on yarn quality appeared to be greater when spinning shorter staple cottons than longer ones.

Such interactions could be of a great interest when selecting the raw fiber to be used for a given application. The present research was therefore carried out with the main objective of investigating the said interactions and identifying the fiber properties involved.

38 cotton bales were selected to form a wide range of the main fiber properties: length, Micronaire, length uniformity and strength. This range was necessary to highlight, if they are confirmed, the possible interactions between the spinning process and the different fiber characteristics. The samples were spun into a 26 Ne yarn on both conventional and compact ring spinning frames.

As expected, the yarn testing results showed a highly significant effect of the spinning process (conventional vs. compact) on yarn tensile properties (strength and elongation) and hairiness. The examination of the interactions between the spinning process and the fiber properties revealed that only yarn hairiness was affected. The fiber characteristics involved in this interaction were mainly fiber length and length distribution parameters (uniformity, short fiber content…). In fact, compact yarn hairiness appeared much less sensitive to the variation of fiber length characteristics than conventional yarn hairiness. The yarn tensile properties, on the other hand, were not affected by such interaction since the slopes relating these parameters to fiber characteristics were homogenous among the spinning processes.

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