

DIMENSIONAL STABILITY MEASUREMENTS OF COTTON FABRICS

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Abstract

Dimensional change of fabrics, especially due to repeated laundering, is a critical attribute and, hence, its accurate quantification is a major concern for all sectors of the textile industry.

Several experiments were designed in this research project. The first experiment was aimed at comparing human measurement of shrinkage to image analysis. Therefore, a vision system for automatic quantification of fabric geometric distortion was implemented and tested. The intended utility of this system is to replace the manual measurement of fabric shrinkage or growth as governed by the AATCC (American Association of Textile Chemists and Colorists) Test Method 135 and 187. The system uses commercial, off-the-shelf hardware components, together with a customized image-processing algorithm to capture digital images of pre-marked fabric swatches and to accurately measure the distance between the benchmarks before and after laundering. This study compared shrinkage obtained on 7 fabric types using 2 washing technologies (home laundering according to AATCC Test Method 135 and Quickwash according to AATCC Test Method 187) and 2 measurement technologies (human and image analysis). In addition, all experiments were replicated at two locations (International Textile Center and Cotton Incorporated). From this study it resulted that:

- There are no statistically significant differences between human reading and image analysis.
- There are slight but statistically significant differences between Quickwash and regular wash in both width and length directions.
- The repeatability within each laboratory is excellent.
- There are statistically significant differences between Cotton Incorporated and ITC laboratories in both width and length directions.

In a second experiment the operator effect on width and length measurements using image analysis was tested. The results showed very good agreement between operators. Nevertheless, the operator one found slightly shorter distances between the dots for both the width and the length directions.

Finally, the 3rd experiment was aimed at controlling the sample size effect on fabric shrinkage measurements with human operators. There are statistically significant differences between sample types in both width and length directions. Nevertheless, the correlation coefficients between sample sizes are excellent.

In conclusion, image analysis for fabric shrinkage measurement is very efficient and repeatable. The sources of the differences between laboratories and sample sizes need to be investigated further. It is planned to have the Cotton Incorporated and ITC technicians cross-trained in the two laboratories in order to track the possible sources of variations.