



Cotton Woven: Durability and Sustainability

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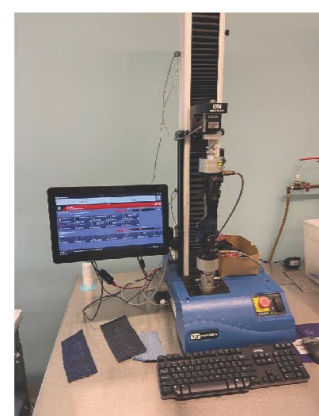


Background

The notion of durability has evolved due to the rise of fast fashion, Just-In-Time-Manufacturing, and a relentless pursuit of margins has increased the emphasis on efficiency as opposed to durability. However, with the prevailing climate crisis, rising concerns in sustainability, and growing trends towards circular economies, there is a growing desire for garments created to be durable, built to last, and with limited environmental footprints. In an increasingly competitive fashion landscape, a more nuanced understanding of durability is required to fulfill diverse performance and commercial requirements.



Maytag Top-Load Washer



Instron Tensile Testing Machine



Taber Abrasion Machine

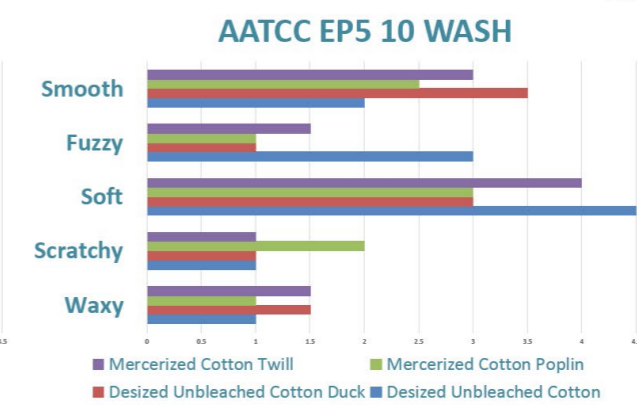
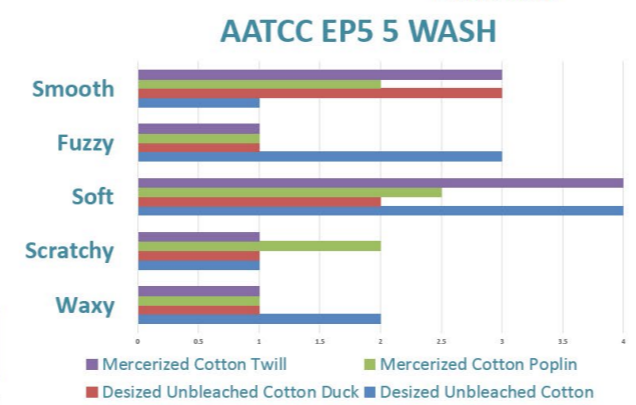
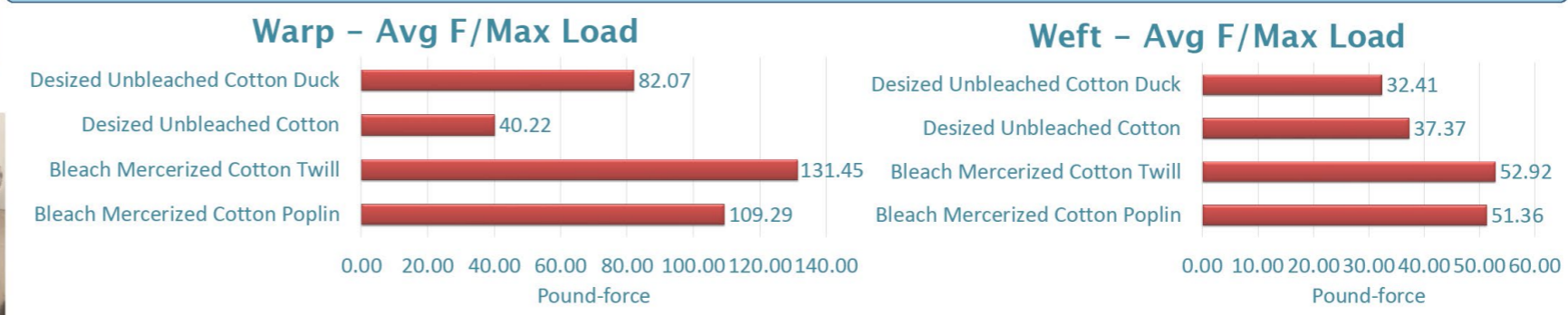
Objectives

- (1) Test the durability of 4 woven, cotton fabrics using a variety of methods; (2) Estimate the lifespan of each fabric; and (3) Determine each fabric's optimal end-use.

Method

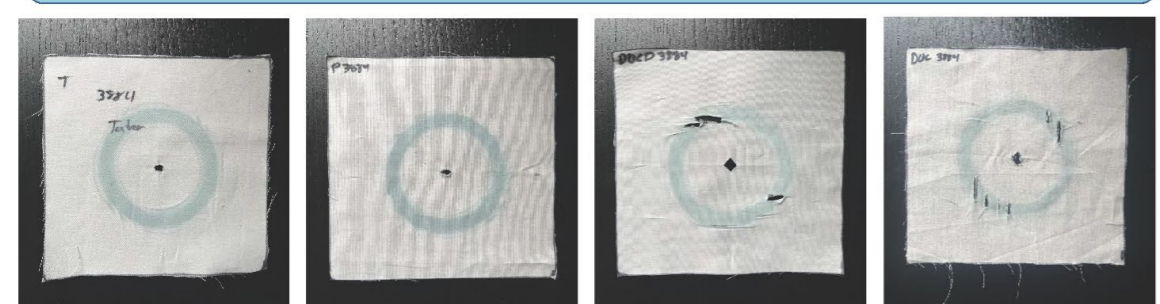
Four unused cotton fabrics with different weaves were tested for tensile strength, abrasion resistance, hand feel, and visual appearance tests using ASTM D5034, ASTM D3884, AATCC EP5, and ISO 15487 test standards respectively.

Tensile Strength Test - ASTM D5034



Handfeel Test
AATCC EP5

Abrasion Resistance Test ASTM D3884 - 250 Cycles

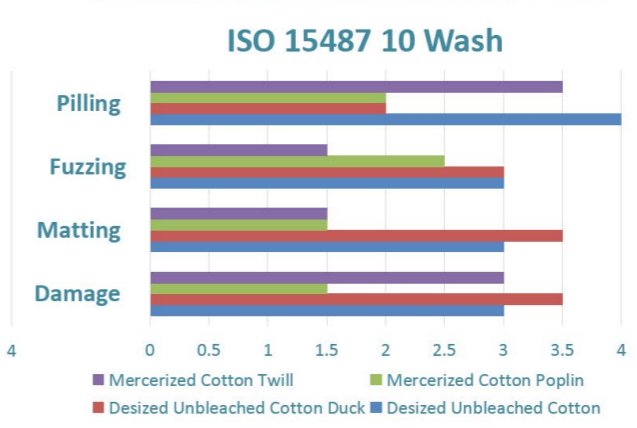
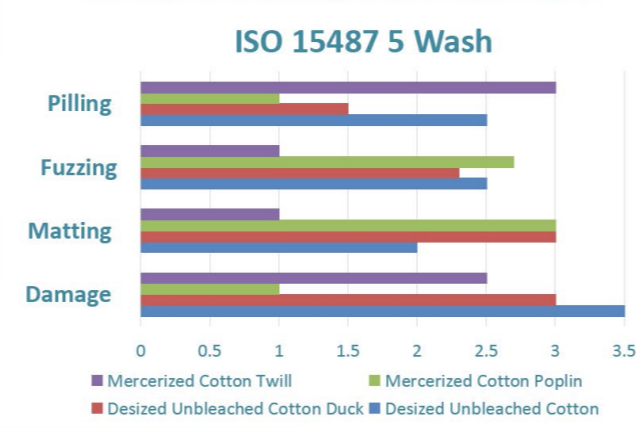


Mercerized Cotton Twill - PASS

Mercerized Cotton Poplin - PASS

Desized Unbleached Cotton Duck - FAIL

Desized Unbleached Cotton - FAIL



Visual Appearance Test
ISO 15487

Findings

It was discovered through testing that the original hypothesis was partially correct. The mercerized fabrics were much more durable than the fabrics that were not mercerized. This was found to be the ultimate determinant of durability, more so than the weave structure of the fabric. As a result, the lifespan of non mercerized cotton fabrics is much shorter than fabrics that are treated. It has been found that the weave construction is less essential than the finishing treatments applied to the fabric.

Sustainability

This study tries to answer- do durability and sustainability go hand-in-hand? Or, can durable products be labelled as sustainable products? The answer of this question is quite complex and dynamic; it depends on many factors (e.g., care and use of apparel, consumer behavior, consumption pattern, etc.). Durable textiles are often challenging to recycle, to remake or to compost. Though mercerized cotton woven depicts a durable one, it is hard to compare the carbon footprint between imparting mercerization and caring at consumer stage, and making a virgin product using virgin resource.

Conclusions and Implications

This study will help determine the estimated lifespan of these fabrics and corresponding application for commercial use. By testing the durability of each fabric, manufacturers can be better informed in the selection of textiles for the appropriate end use. Further testing is recommended to expand the scope and depth of the study. Insightful results can be produced if the research design were revised into a longitudinal study with tests performed over a longer timeframe, with a more diverse set of cotton, woven samples both used and unused.