

TECHNICAL BULLETIN



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PROCESSING 100% COTTON WOVEN FABRICS FOR FILLING STRETCH

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INTRODUCTION

There are several ways to obtain filling stretch in woven fabrics. This technical bulletin explains the concept to obtain this characteristic by slack mercerizing with sodium hydroxide, and gives two specific examples of 100% cotton fabrics thus treated.

Conventional equipment found in a continuous finishing plant is usually adequate for processing, and commercially available chemical finishes can be applied. Fabric widths and yields require special consideration since these factors are different in a stretch construction when compared to more rigid fabrics.

WEAVING

In weaving fabrics for filling stretch, the sley is normally reeded wider. The amount for a different construction may vary, and only actual experience will determine proper conditions.

PREPARATION

A singe, desize, scour and bleach by normal methods are usually satisfactory.

MERCERIZATION

Although this is one of the more critical steps in producing a satisfactory fabric for filling stretch, it should not be any more difficult than conventional mercerization.

Preliminary laboratory work is important, and two plant methods have been satisfactorily evaluated. Details follow.

Laboratory Procedure - Prior to processing fabric in the plant, a piece of full-width greige fabric should be laboratory desized and slack mercerized in 48° to 50° Tw sodium hydroxide (22 or 23%). The width after washing and drying determines the starting width on a chain mercerizer.

Chain Mercerize (Plant) - Slack mercerize on chain mercerizer with 48° to 50° Tw sodium hydroxide. Starting width can be determined by the laboratory sample. After starting, the chain width should be adjusted to hold the fabric in the chain without creasing. Cascades and suckers should be turned off so as not to cause extra weight and pull fabric out of the chain. The purpose of caustic treatment here is to make the fabric shrink in the width; therefore, removal of the sodium hydroxide down to a level of 5% before leaving the chain is not as critical as in conventional mercerization. Good off-chain washing is recommended, and acid scouring may be required in some cases.

Mercerize (Roll Accumulator) - Fabric can be caustic slack mercerized with 48° to 50° Tw sodium hydroxide using other equipment. Range used in example consisted of: two caustic saturators; a roll accumulator with 2 minute dwell at 60 yds/min; 11 wash boxes; wash box 1 - 7 hot water wash; wash box 8, acid; 9, 10, and 11, hot water wash, dried on cans.

DYEING

Dye fabric by normal methods. Fabric to be resin finished after dyeing should have a total alkalinity of less than 0.05% (expressed as NaOH) to ensure fixation.

FINISHING

Final stretch and recovery and shrinkage control are determined by this important process. Again, preliminary laboratory work is important to determine the proper finished width. General laboratory and plant procedures follow.

Laboratory Finish - It is recommended that laboratory work be conducted to determine resin level to obtain maximum stretch and recovery potential. **Note:** Finish width to be determined by washing full-width piece of dyed only fabric. (Three home laundering/tumble drying cycles with 140°F water).

Plant Finishing - Chemicals currently being used for resin finishing can be used after formulas are determined by laboratory work. **Note:** The best stretch and recovery is obtained if the fabric is not finished wider than the washed width mentioned above.

TEST RESULTS - PROJECT 1728

Test	Dyed	Finished
Durable Press	--	2.7
Shrinkage (%)	6.5 × +3.5	0 × 0
Tensile (lbs.)	206 × 89	106 × 42
Tear (lbs.)	13.4 × 8.7	9.0 × 3.2
Count	68 × 41	66 × 43
Weight: oz/sq	7.2	7.4
Width: Orig (in)	45	47
Laundered (in)	46 7/8	47
Stretch (%)	19.0	15.5
Growth (after cycle)	5.0	0.1
Growth: 85% ext (30 sec)	6.7	3.5
Growth: 85% ext (30 min)	4.5	2.0

Notes on Test Conditions:

- 1) Shrinkage on dyed-only fabric = 3 launderings @ 140°F, tumble dried.
- 2) Physical and durability tests on finished fabric made after press and cure.
Press = 5/10/5 @ 340°F; Cure = 15 min @ 300°F.
- 3) Durable press and shrinkage on finished fabric tested after 5 launderings @ 120°F and tumble dried.

TEST RESULTS - PROJECT 1757

Test	Dyed	Finished
Durable Press	--	3.2
Shrinkage (%)	9.5 × +5.5	2.0 × +1.5
Tensile (lbs.)	181 × 83	125 × 46
Tear (lbs.)	6.2 × 3.5	NT × 3.5
Count	76 × 39	73 × 39
Weight: oz/sq	7.4	7.9
Width: Orig (in)	45.5	46.4
Laundered (in)	47.0	47.25
Stretch (%)	12.4	14.3
Growth (after cycle)	4.0	4.5
Growth: 85% ext (30 sec)	5.4	3.3
Growth: 85% ext (30 min)	4.3	2.8

Notes on Test Conditions:

- 1) Shrinkage on dyed-only fabric = 3 launderings @ 140°F, tumble dried.
- 2) Physical and durability tests on finished fabric made after press and cure.
Press = 5/10/5 @ 340°F; Cure = 15 min @ 300°F.
- 3) Durable press and shrinkage on finished fabric tested after 5 launderings @ 120°F and tumble dried.

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- Agricultural research leads to improved agronomic practices, pest control, and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.
- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.
- Computerized fiber management techniques result from in-depth fiber processing research.
- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.
- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.
- A fiber-to-yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.
- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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