TECHNICAL BULLETIN



COTTON INCORPORATED

6399 Weston Parkway, Cary, North Carolina, 27513 • Telephone (919) 678-2220

TRI 3008

PROCESSING 100% COTTON WOVEN FABRICS FOR FILLING STRETCH

© 2000 Cotton Incorporated. All rights reserved; America's Cotton Producers and Importers.

TABLE OF CONTENTS

INTRODUCTION	1
WEAVING	1
PREPARATION	1
MERCERIZATION	1
Laboratory Procedure	1
Chain Mercerize	1
Mercerize	1
DYEING	2
FINISHING	2
Laboratory Finish	2
Plant Finishing	2
EXAMPLES	3

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.

<u>Chain Mercerize</u> (**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.

<u>Mercerize</u> (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.

<u>**Laboratory Finish**</u> - 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).

<u>**Plant Finishing</u>** - 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.</u>

EXAMPLES

Details of two product development projects are listed with test results.

EXAMPLE 1.

PROJECT 1728 100% Carded Cotton Filling Stretch Slack Fabric				
Specifications:		Fabric		
	Ends/in	Picks/in	Width/in	oz/yd ²
Greige Finished	56 66	43 43	55.1 47.0	6.95 7.40
Co	unt	T.M.	Co	ontent
Warp N Fill N	Ve 10/1 e 12/1	4.25 "Z" 3.80 "S"	100% Carded Cotton 100% Carded Cotton	
Warp Size: 7% P.V.A. Reed Number: 26.40 Loom Type: Picanol Ends/Inch in Loom: 52.8 Speed: 220 ppm Pick Gear: 42 Reed Width of Cloth: 58.18" Weave: 2/1 Left Hand Twill Ends/Dent: Body - 2, Selvage - 4 Preparation: Singed, desized, scoured, and bleached open-width. Lab Mercerized: Full-width sample lab mercerized in 23% caustic for 2 minutes, washed and dried. Width = 47.5". Mercerized (Chain): Fabric mercerized with 48° Tw caustic. Chain width set at 47" at the beginning and was not changed. Dyeing: Fabric continuously dyed with sulfurs. Walnut Brown shade. Lab Finishing: Samples were finished in lab with 15% resin (modified glyoxal) and this level produced low strength. Twelve and one-half% resin was recommended for plant run. Finish Width: 3 HLTD 140°F, 47".				
BathFinish Condition12.5% Modified GlyoxalPad - 2 dips, 1 m2.5% Magnesium Chloride catalystTenter Dried - 303.0% SoftenerSpeed - 50 yds/m0.2% Nonionic wetterFinish Width - 4SanforizedSanforized		Finish Conditions Pad - 2 dips, 1 nip Penter Dried - 300-325 Speed - 50 yds/min Finish Width - 46-47"	5-300°F	
Samonzed				

TEST RESULTS - PROJECT 1728			
Test	Dyed	Finished	
Durable Press		2.7	
Shrinkage (%)	$6.5 \times +3.5$	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.
- 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.

PROJECT 1757 100% Carded Cotton Filling Stretch Slack Fabric				
Specifications:				
		Fabric		2
	Ends/in	Picks/in	Width/in	oz/yd ²
Greige Finished	65 73	42 39	52 46.4	7.8 7.9
Co	unt	T.M.	В	lend
Warp N Fill N	Ne 10/1 e 12/1	4.40 "Z" 100% Carded Cotton 4.25 "Z" 100% Carded Cotton		urded Cotton urded Cotton
Fill Ne 12/14.25 "Z"100% Carded CottonWarp Size: 7% P.V.A.Ends/Inch in Loom: 61Reed Width of Cloth: 55.5"Pick Gear: 42Ends/Dent: 3Weave: 2/1 Right Hand TwillReed Number: 20.25Preparation: Singed, desized, scoured, and bleached open-width.Lab Mercerized: Full-width sample lab mercerized in 23% caustic for 2 minutes, washed and dried. Width= 47.75".Mercerized (Roll Accumulator): Fabric mercerized with 50° Tw caustic (no width control) using part of prep range described earlier.Dyeing: Fabric continuously dyed. Vat Otter shade.Lab Finishing: Samples were finished in lab with 15% and 20% resin levels. Fifteen % level gave best balance of properties.Finish Width: 3 HLTD 140° F, 47".Plant Finishing (Post Cure):BathFinish Conditions				
15.0% Modi 3.0% Cataly	15.0% Modified GlyoxalPad - 2 dips, 1 nip3.0% CatalystTenter Dried - 315-330-320°F			
3.0% Softer	ner	sr Speed - 55 yds/min		
0.25% Wetter Finish Width - 46-47" Sanforized				

TEST RESULTS - PROJECT 1757			
Test	Dyed	Finished	
Durable Press		3.2	
Shrinkage (%)	$9.5 \times +5.5$	$2.0 \times +1.5$	
Tensile (lbs.)	181 × 83	125×46	
Tear (lbs.)	6.2 × 3.5	$NT \times 3.5$	
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.

The statements, recommendations and suggestions contained herein are based on experiments and information believed to be reliable only with regard to the products and/or processes involved at the time. No guarantee is made of their accuracy, however, and the information is given without warranty as to its accuracy or reproducibility either express or implied, and does not authorize use of the information for purposes of advertisement or product endorsement or certification. Likewise, no statement contained herein shall be construed as a permission or recommendation for the use of any information, product or process that may infringe any existing patents. The use of trade names does not constitute endorsement of any product mentioned, nor is permission granted to use the name Cotton Incorporated or any of its trademarks in conjunction with the products involved.

RESEARCH AND TECHNICAL SERVICES

Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- 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.

For further information contact:

COTTON INCORPORATED WORLD HEADQUARTERS 6399 WESTON PARKWAY CARY, NC 27513 PHONE: 919-678-2220 FAX: 919-678-2230 COTTON INCORPORATED CONSUMER MARKETING HEADQUARTERS 488 MADISON AVENUE NEW YORK, NY 10022-5702 PHONE: 212-413-8300 FAX: 212-413-8377

Other Locations • Los Angeles • Mexico City • Osaka • Shanghai • Singapore •

Visit our website at: www.cottoninc.com

