

SUBTLE TO STRIPED

Sustainable Fashion With Cationic Cotton





THE ULTIMATE TEXTILE RESOURCE



Q&A

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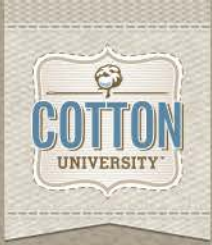
Website

Link to webinar slides,
Q&A, and other
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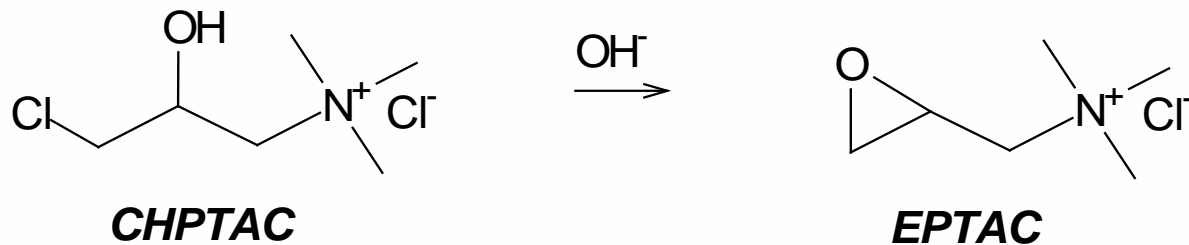


CATIONIC COTTON

Technical Details
Application
Benefits

WHAT IS CATIONIC COTTON?

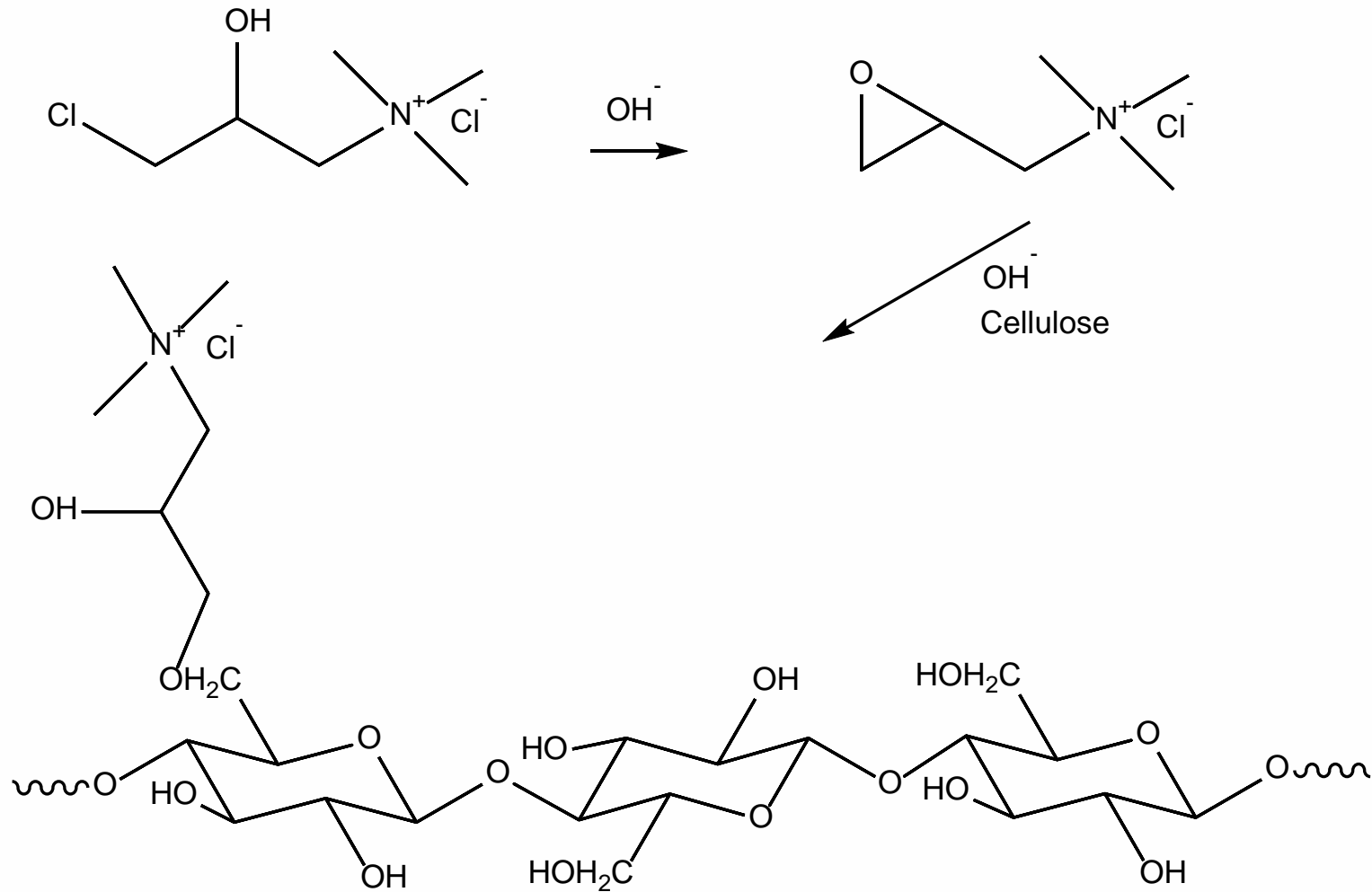
- Cationic cotton refers to cotton that has been chemically modified to possess a permanent cationic (positive) charge
- Typical cationization reagent, 3-chloro-2-hydroxypropyltrimethylammonium chloride (CHPTAC)
- 1:1 equivalent NaOH to CHPTAC to form EPTAC



REACH CERTIFICATION

- CHPTAC - Intermediate Registration
- <http://echa.europa.eu/information-on-chemicals/registered-substances/-/disreg/substance/100.020.045>
- <http://echa.europa.eu/brief-profile/-/briefprofile/100.020.045#collapseSeven>
- <http://echa.europa.eu/brief-profile/-/briefprofile/100.020.045#SDe-RegistrantsSuppliers>

CATIONIZATION PROCESS



APPLICATION PROCESS

- Versatile Chemistry
 - Can react with variations of time, temperature, and levels of caustic
- Many processes
 - Exhaustion, cold pad batch, pad steam, pad dry cure, combinations
- Apply to various cotton substrates
 - Fiber, yarn, or fabric
- The efficiency of the reaction and the resulting degree of cationization is directly related to the amount of quat applied and the substrate and process utilized

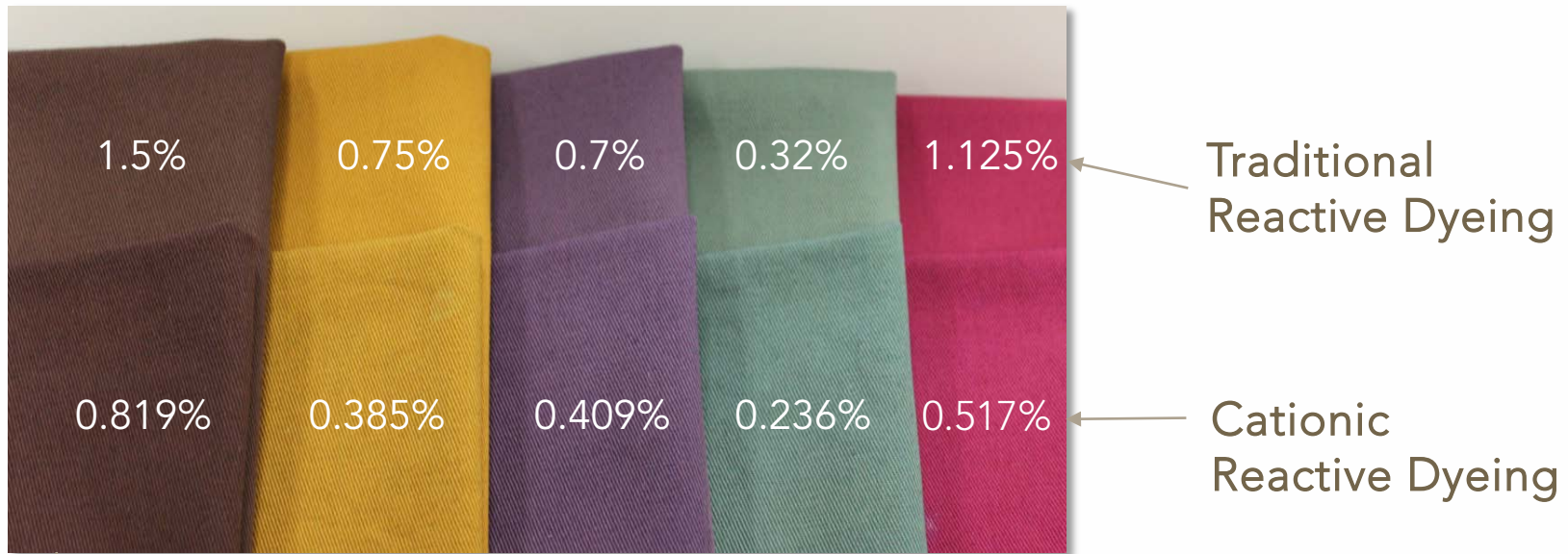


WHAT GOOD IS IT?

- From permanent cationic charges, traditional dyeing of cotton goods can now be accomplished:
 - Without the need for salt,
 - Up to 100% dye utilization of anionic dyes (mainly acid, direct, reactive)
 - With reductions in consumables such as energy, water, and steam,
 - Overall cost savings are possible
 - Will become more important as reactive dye prices increase
- Dyestuff Reduction
 - Related to dyes used, dye process, liquor ratio, shade



COMPARISONS



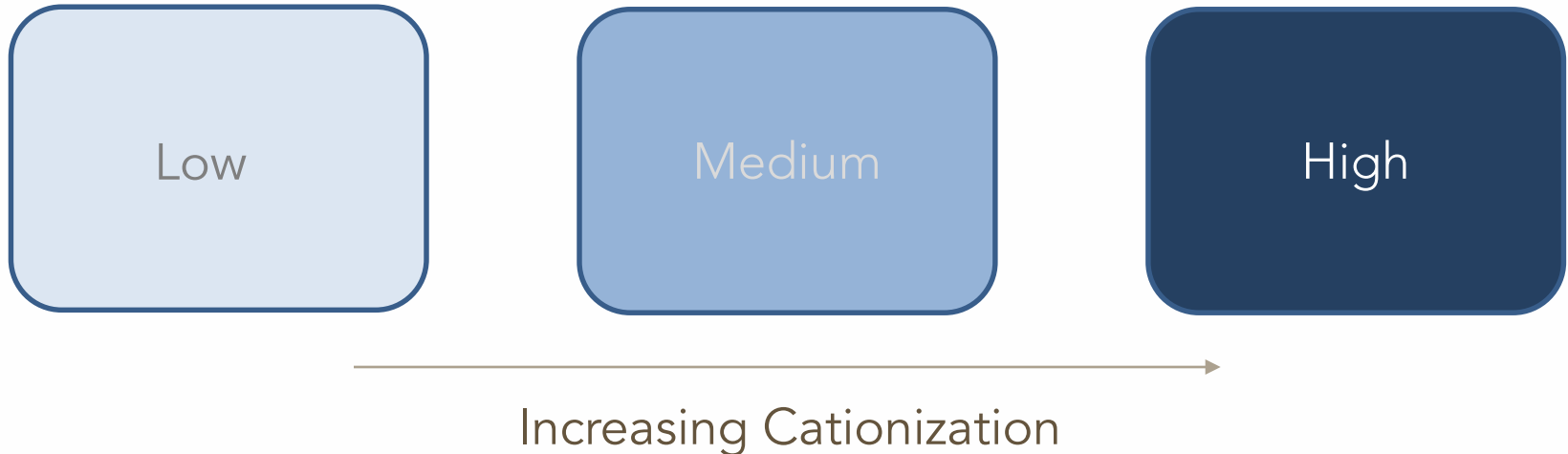
Cationic End Dyebaths



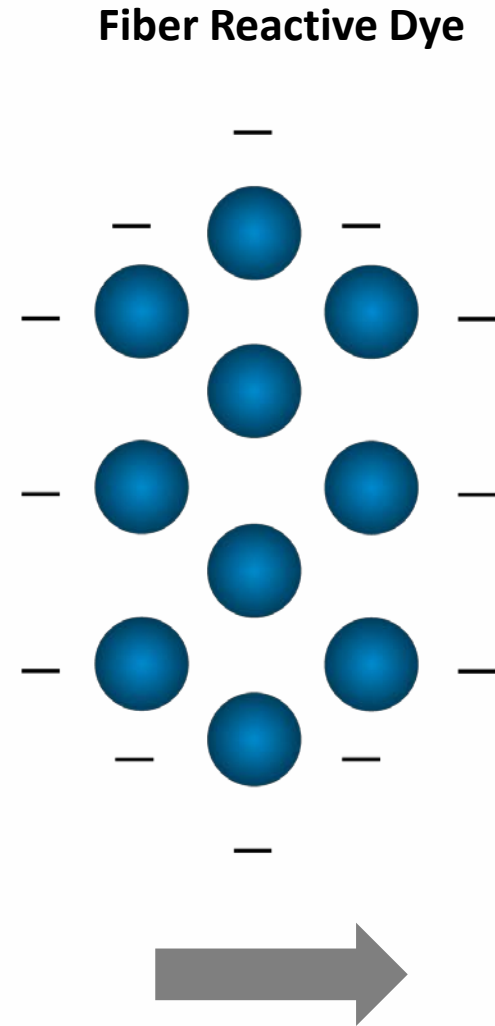
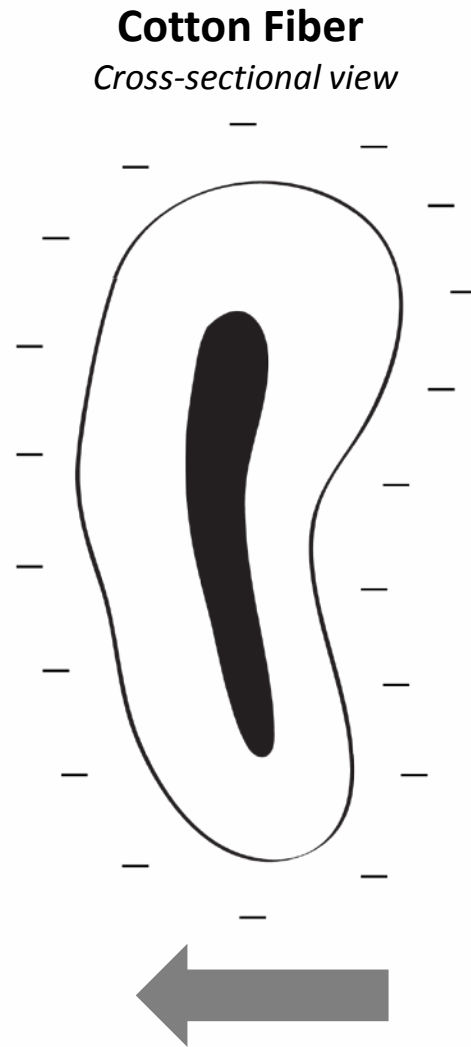
Farrell MJ , Ankeny MA, Hauser PJ (2014) Prediction of recipes for cotton cationisation and reactive dyeing to shade match conventionally dyed cotton Coloration Technology 130,363-367.

LEVEL OF CATIONIZATION

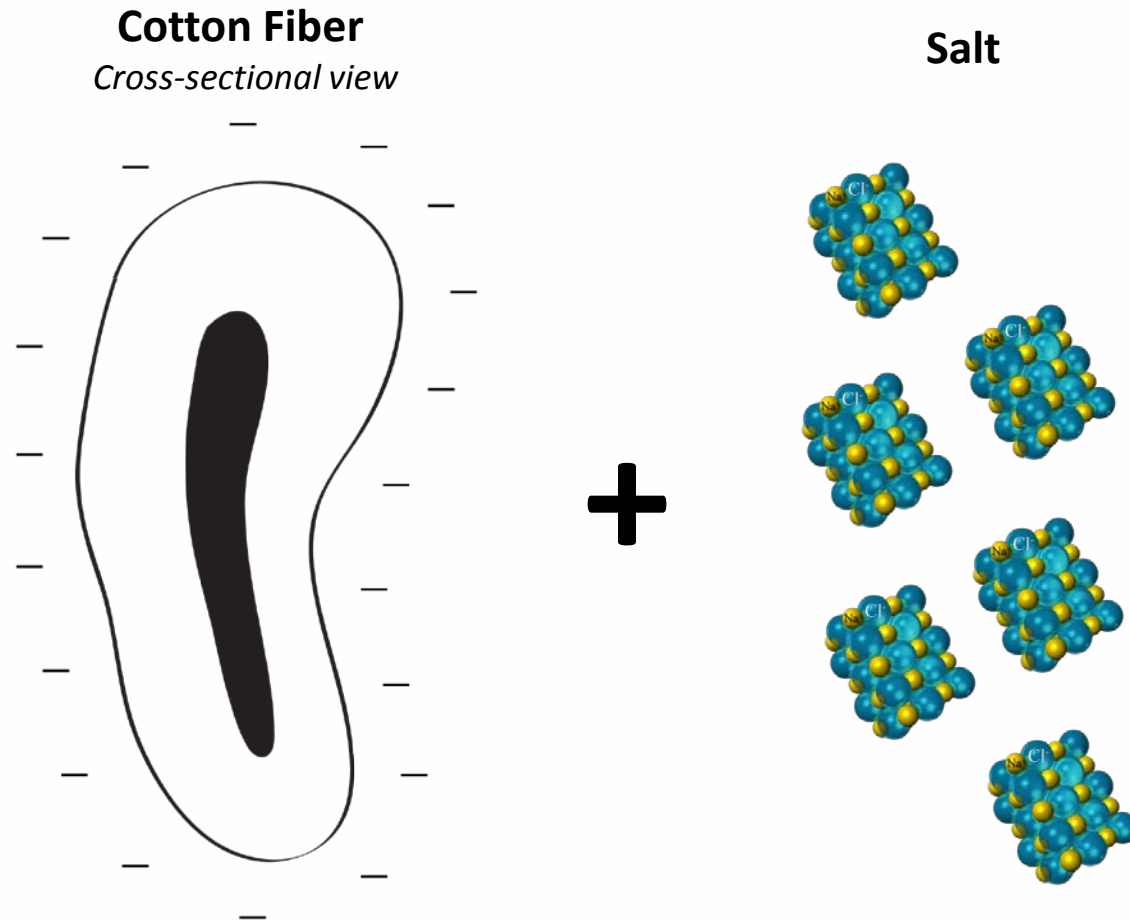
- If buying from a supplier, the supplier may offer several levels of 100% cationic yarn or blended yarn
 - If treating in house, have control of the level of cationization
- The higher the level of cationization or blend of cationic fiber, the more dye the fiber can hold



TRADITIONAL DYEING OF COTTON



TRADITIONAL DYEING OF COTTON



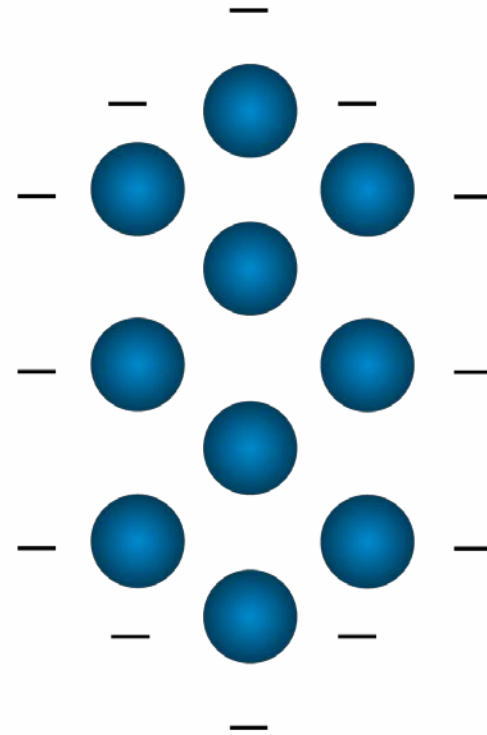
TRADITIONAL DYEING OF COTTON

Cotton Fiber

Cross-sectional view



Fiber Reactive Dye



TRADITIONAL DYEING OF COTTON

Dyed Cotton Fiber

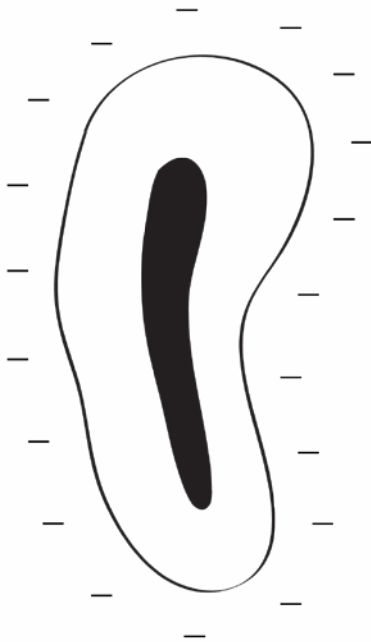
Cross-sectional view



DYEING OF CATIONIC COTTON

Cotton Fiber

Cross-sectional view



DYEING OF CATIONIC COTTON

Cationic Treated Cotton Fiber

Cross-sectional view



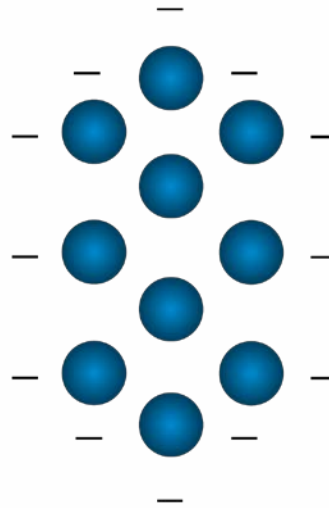
DYEING OF CATIONIC COTTON

**Cationic Treated
Cotton Fiber**

Cross-sectional view



Fiber Reactive Dye



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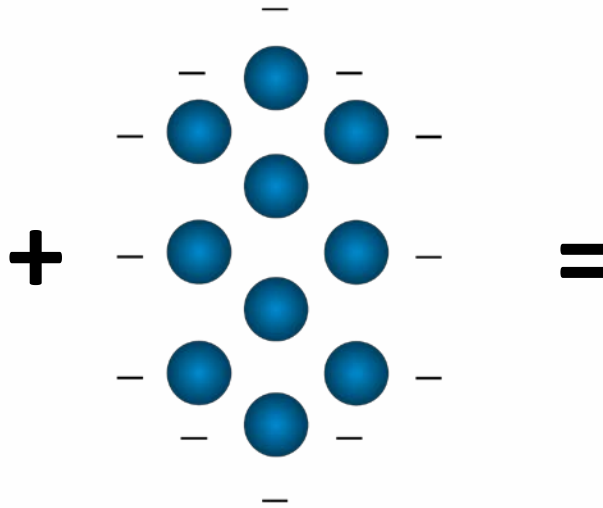
DYEING OF CATIONIC COTTON

**Cationic Treated
Cotton Fiber**

Cross-sectional view



Fiber Reactive Dye



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HOW TO DYE

- Challenge: To control dye strike rate for blended yarn and/or 100% cationic yarn of fabric
 - Too rapid dye strike results in un-level fabric
 - Generally, lower temperatures and slow dye addition slow strike rate
 - If shade depth and cationization level are comparable, easier to control the dyeing process
 - As good or better fastness properties can be obtained with cationic cotton because of ionic and covalent bonding
- Dye Processes
 - Best suited for exhaust batch dyeing, either piece or garment



CATIONIC COTTON DEVELOPMENTS

- Area where Cotton Incorporated continues to research and develop
 - Funded multiple research projects around cationic cotton
 - Deep blacks, capping and modeling, dyeing processes for cationic cotton, simultaneous preparation and cationization, MS and PhD thesis
 - Written papers on reducing the odor of cationization, predicting dyeing and cationization recipes, how to obtain deep black cotton shades, how to dye cationic cotton
- ColorZen
- Evaluation of new cationic chemistries resulting in new cationic cottons
 - Impart new functionalities to cotton fabrics with new cationic cotton





CATIONIC COTTON

Sustainability Opportunity
Inventory Advantages
Design Possibilities

REDUCED WATER, ENERGY, & CHEMICALS

- Salt and alkali not needed to dye cloth
- Color adheres to fabric quickly
- Less dye needed to achieve same color
- Less effluent left in dye bath

INVENTORY ADVANTAGES

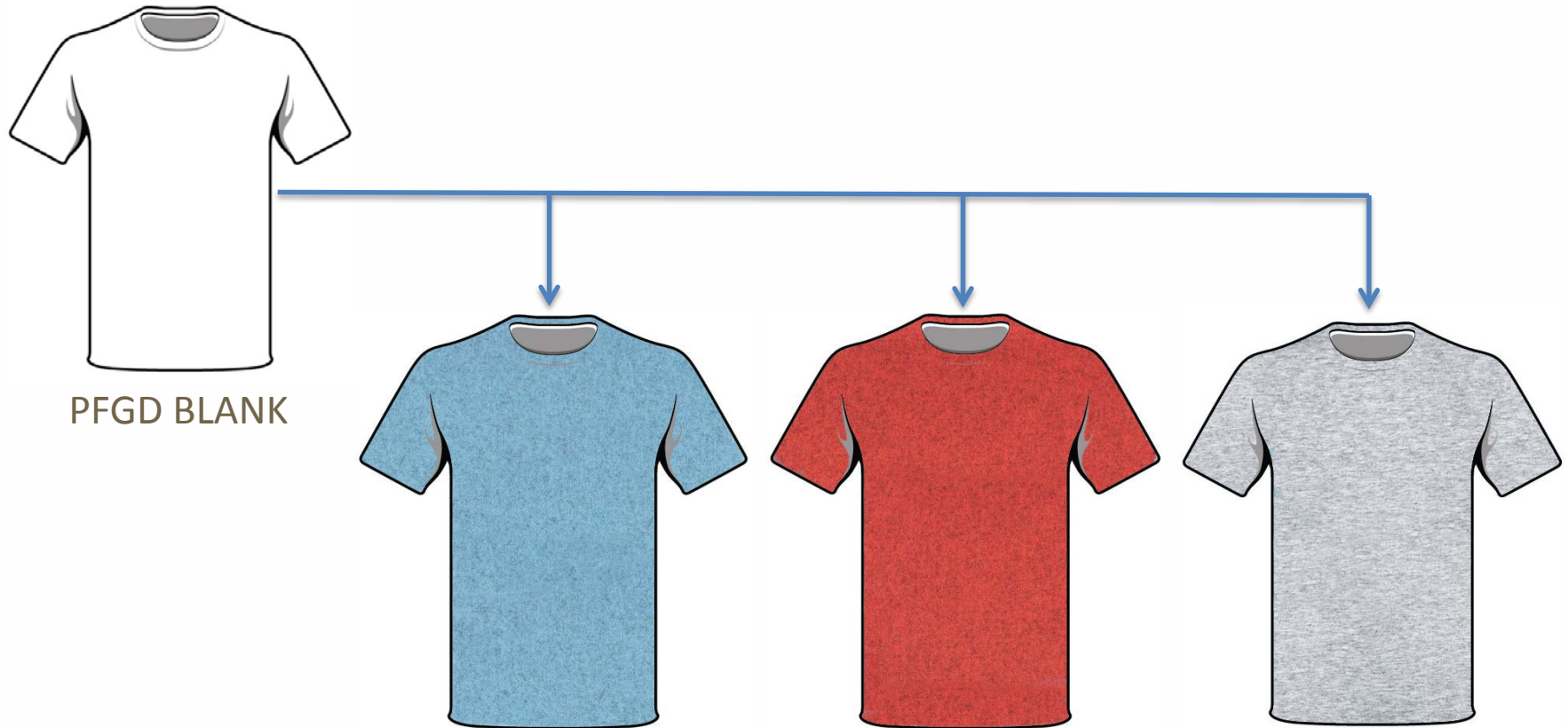
- Can be piece or garment dyed
- Reduction in product SKUs
- Minimized forecasting risk
- Reduced package-dyed yarn inventories
- Quick replenishment of product

DESIGN POSSIBILITIES

- Solids & stripes
- Color and white
- Heathers & melange
- Gradient effects
- Tone on tone
- Texture
- Jacquards
- Colored warps
- Print effects

DESIGN & INVENTORY ADVANTAGES

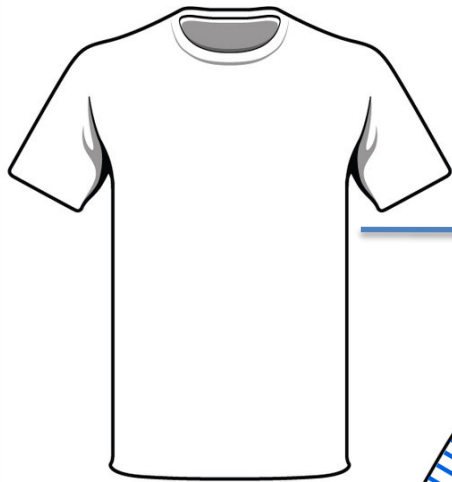
Versatility in All-Over Heathers



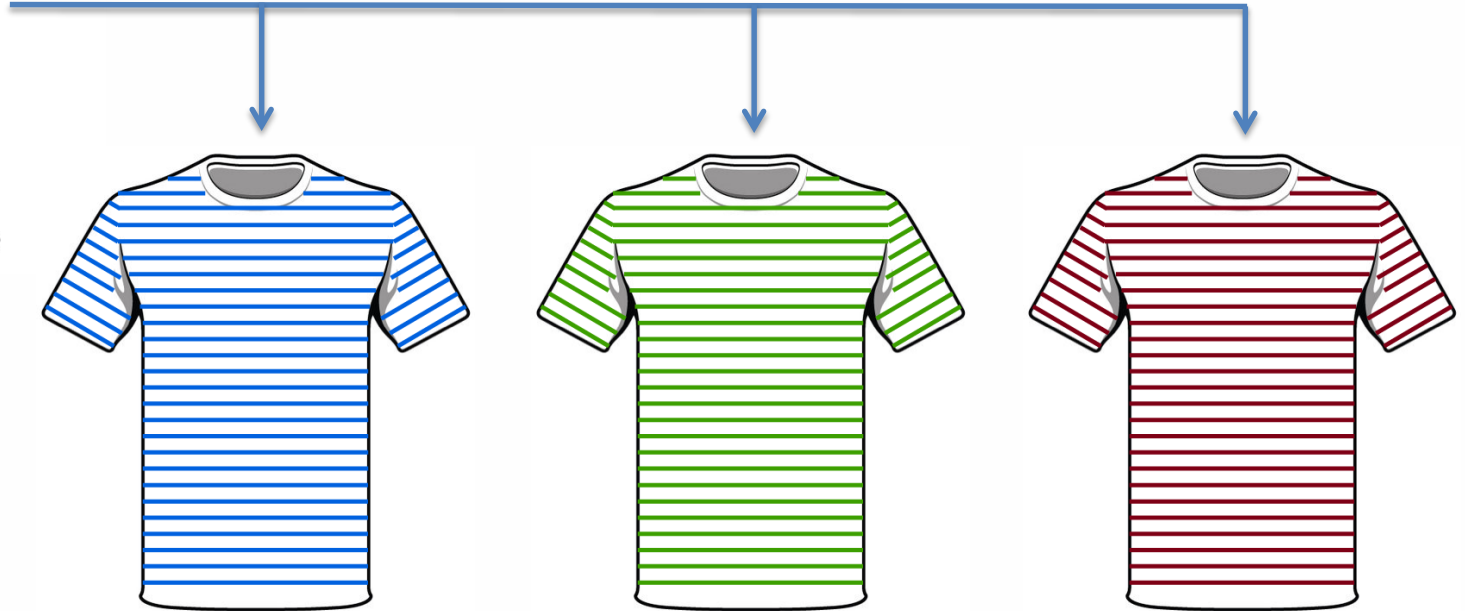
COLOR POSSIBILITIES FROM ONE SKU

DESIGN & INVENTORY ADVANTAGES

Versatility in Colored Stripes



PFGD BLANK



BEFORE & AFTER



Greige Fabric



Dyed Fabric



Heather Jersey





Rainbow Heather Jersey





Fine Texture with Heather Yarn





Pinstripe Heather





Tonal Stripes with Heathers and Solids





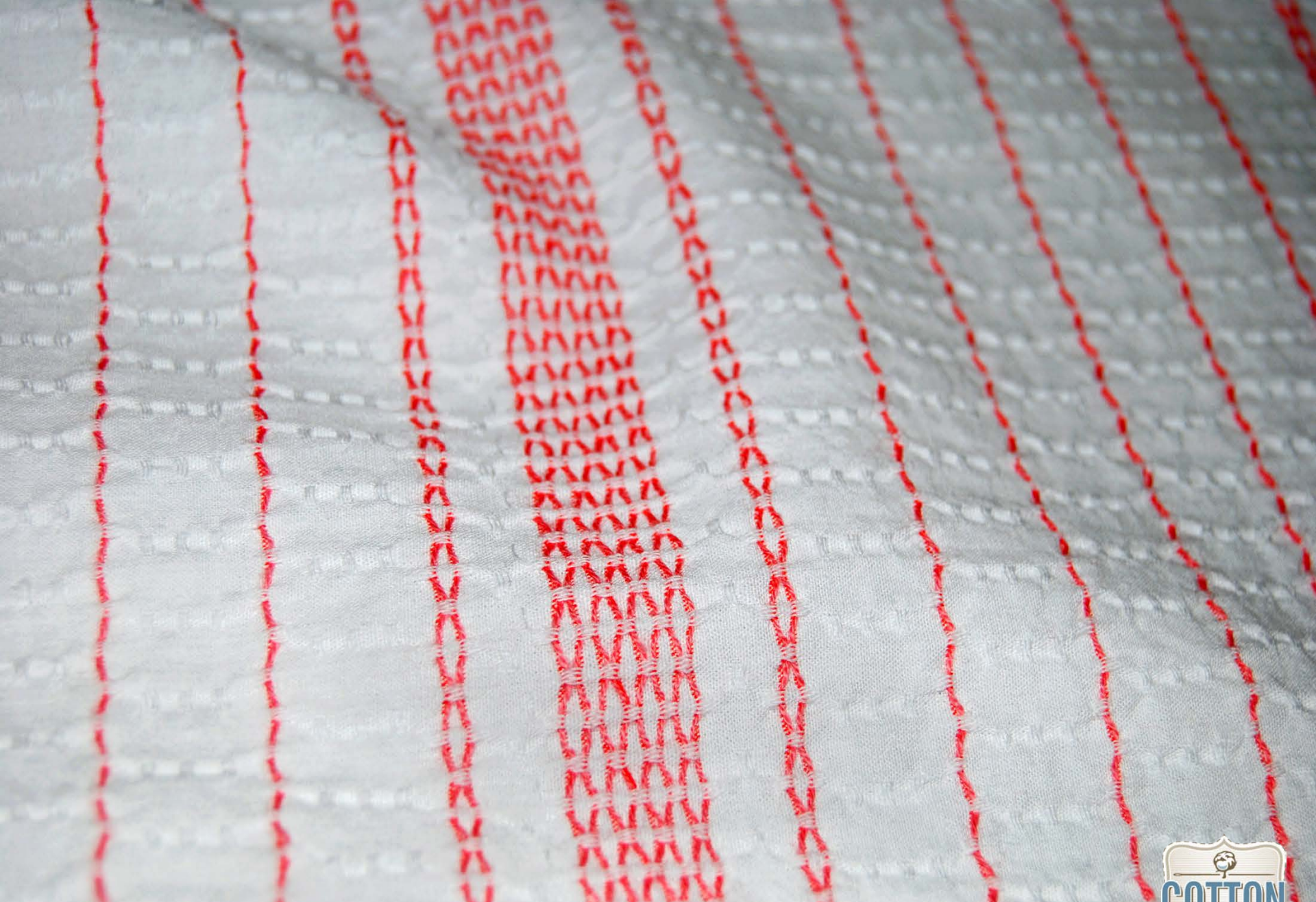
Multi-tone Striped Jersey





Textured Stripe





Color and White “Yarn Dye Like” Effects





Speckled Texture





Heather Twill Look





Speckled French Terry





Striped French Terry





Novelty Sinker Loop Terry





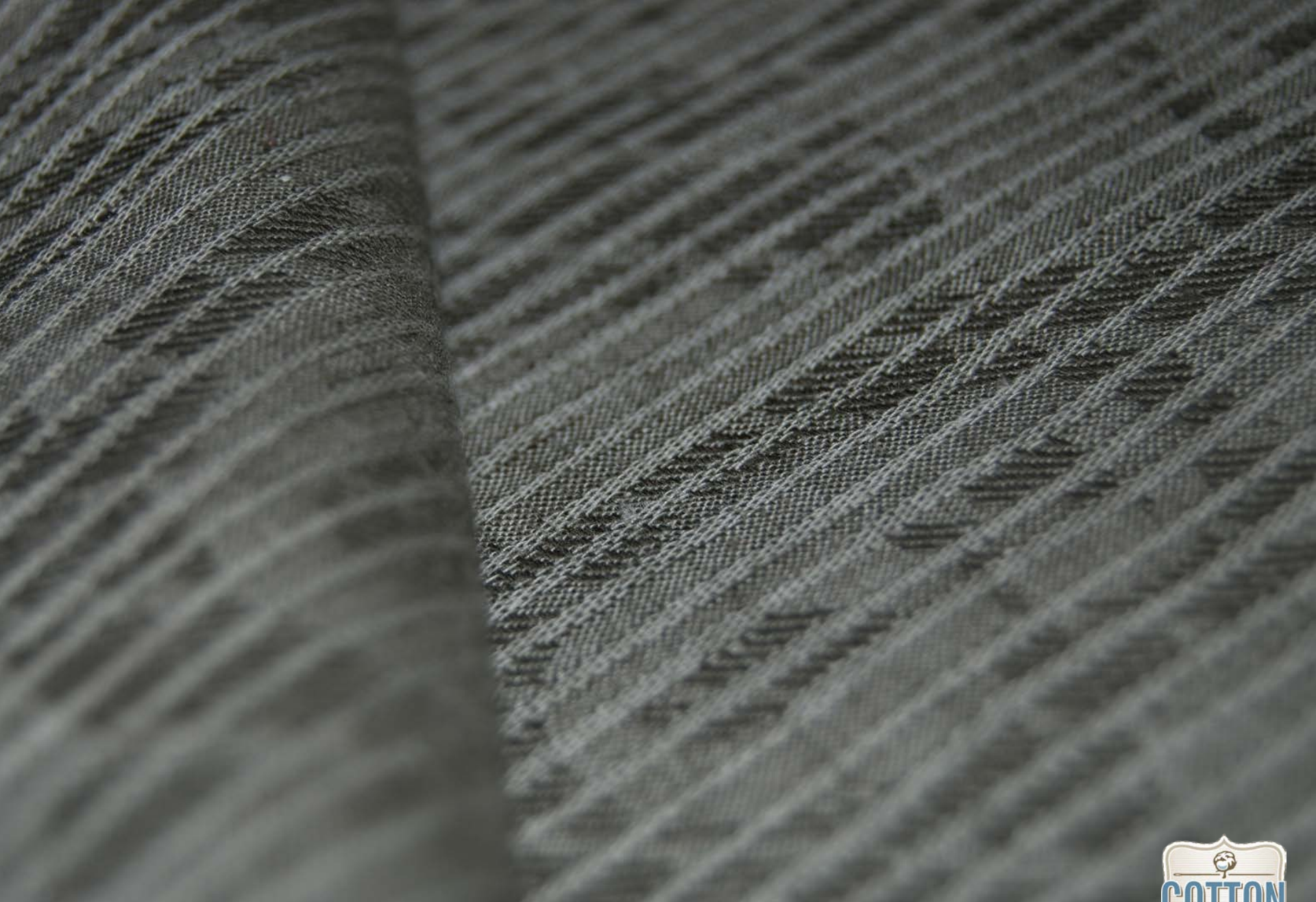
Speckled Jersey





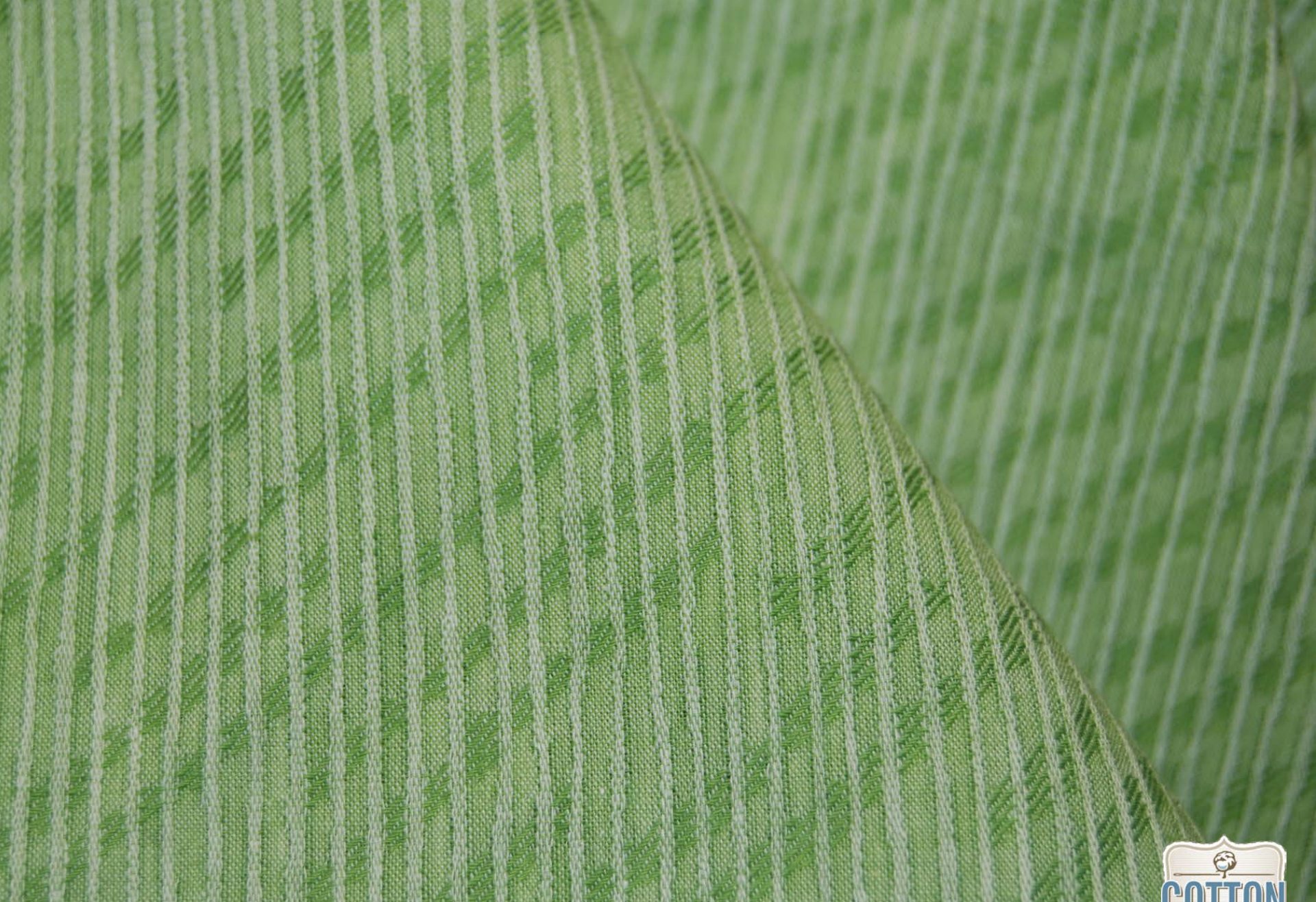
Speckled Striped Jersey





Jacquard Cationic Treated Fill





Jacquard Cationic Treated Fill





Texture Dot





Double-Sided Look





Dobby Pick-Stitch with Cationic Treated Slub Yarn in Fill





Plain Weave Filling Stripe of Cationic Treated Heather Yarn





Basket with Cationic Treated Space Dye Fill





Striped Texture with Space Dyed Novelty





Twill Cationic Treated Warp | Cotton/Spandex Fill





Plain Weave Cationic Treated Warp





Twill Cationic Treated Slub Filling





3x1 Twill with Cationic Treated Warp





Twill with Cationic Treated Warp | Discharge Print





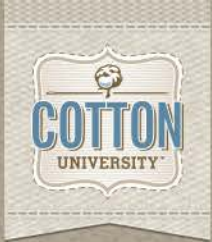
Twill Cationic Treated Warp | Discharge Print





Discharge Printed Tonal Fine Gauge Knit





CATIONIC COTTON

Suppliers
Summary
Q&A

SUPPLIERS

FIBER



TINTORIA PIANA US

Cationic Treated Fiber

www.tintoriapiana.com



Cationic Treated Fiber

www.colorzen.com

YARN



ProTura™ Yarns

www.tuscarorayarns.com



EcoFresh™ Yarns

www.bros.com.cn

FABRIC



Cationic Colored Denim

www.conedenim.com



Cationic Treated Woven Greige Goods

www.inmanmills.com



Cationic Treated Knits





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Spotlight or **The College of Dyeing**

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Webinar slides for download + Additional Q&A + Supplemental material

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