

Denim Finishing for a more sustainable future



With hundreds of easily searchable resources, we're your go-to textile tool for discovering what's possible with cotton.

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Today's Speakers

Mary Ankeny

Vice President, Product Development & Implementation Operations Textile Chemistry Research Cotton Incorporated

Kristie Rhodes

Manager, Woven Product Development Product Development Cotton Incorporated



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Sustainable Options today and beyond



Sustainable Options



- Laser etching
- Enzyme washing
- Ozone bleaching
- Potassium permanganate alternatives
- Alternative abrasion methods
- Innovations that may change the future of denim
- Alternatives to indigo denim



Technologies laser etching



Laser Etching | the new norm

- Replaces traditional methods
 - Hand-sanding
 - Sandblasting
 - Potassium permanganate spraying
- Uses less water and chemicals to create a wide variety of denim looks
- Highly reproducible
- Digital design files allow for rapid prototyping and adjustment



Laser Etching | the new norm



intentional holes | whiskering | potassium permanganate + bleach effects



Laser Etching | modes of operation

BITMAP

- Short pulses
- Photorealistic images
- Use for potassium permanganate or sandblasted effects
- Control through Pixel Time (µs) and Grey Scale

VECTOR

- Continuous lines
- Line art/Hatching
- Use for hand-sanded effects or cutting
- Control through Speed (m/s)

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Laser Etching | hand-sanding alternative

- Rapid slicing of yarns using vector design files
- Slower process when using bitmap design files
- Reduced tear strength



Laser Etching | sand-blasting alternative

- Multilayer bitmap design files produce realistic effects
- Moderate etching of fabric surface
- Surface fiber is removed to reveal the white core of the warp yarns
- Suitable for mid-weight wovens and heavier



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Laser Etching | potassium permanganate alternative

- Rapid, superficial etching of fabric surface
- Indigo is easily discharged
- Suitable for lightweight fabrics





Laser | considerations



fabric characteristics



all denims are not created equal



Laser | beyond basic



batik + shibori inspired, ombré, and other surface effects | endless creative possibilities





Washdown Alternatives enzymes + ozone



Enzymes | fading

- Can be used as an alternative to harsh chemicals during the bleaching process
- Only the dye and appearance are changed fabric quality, strength and elasticity remain unchanged

Laccase enzymes

- alter the indigo dye through oxidation
- rapid fading
- low temperature and neutral pH

Esterase enzymes

- targets sulfur dyes and other colorants
- requires addition of hydrogen peroxide
- moderate temperature and neutral pH







Enzymes | biopolishing

- Neutral cellulase enzymes remove the surface of the fiber
- Low-temperature wash process
- Can be used independently or to enhance abrasion processes
- Improves softness and hand
- May weaken the fabric, enzymes must be deactivated





Ozone | bleaching alternative

- Powerful bleaching agent generated from oxygen
- Works quickly and requires fewerrinses compared to other bleaching methods
- At the conclusion of the bleaching process, any remaining ozone is converted back into oxygen and water



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Ozone | bleaching alternative

- Ozone bleaching may be conducted as a wet or dry process, depending on manufacturer recommendations
- Oxygen can be supplied via industrial grade compressed gas cylinders or an oil-free air compressor depending on the type of ozone generator















Ozone | creative exploration



garment processing techniques for unique effects via ozone



Ozone | considerations



all denims are not created equal

- indigo levels on fabrics
- is it indigo or another type of dyestuff
- affects other dyestuffs differently



New Chemistries lower environmental impact



Potassium Permanganate | alternatives

Potassium Permanganate

- Widely used
- Bleaches at ambient temperatures
- Produces harmful
 decomposition products
- Requires large volumes of water for washing and neutralization
- Can cause yellowing if not well neutralized
- Now banned in EU

Alternative Products

- New to the market
- May require heating to bleach
- Multi-component mixes
- Break down quickly, some are biodegradable.
- Require less water for after-washing



Potassium Permanganate | alternatives





TOUGH COTTON[™] | increased durability

- TOUGH COTTON™ technology adds increased durability and abrasion resistance
- TOUGH COTTON[™] technology without resin uses a proprietary blend of softeners and crosslinking agents to achieve superior abrasion resistance, durability, and strength while improving fabric hand and sewability
- The TOUGH COTTON™ technology can be exhaust applied in garment form
- Maintains the natural comfort and breathability of cotton
- Lasts the life of the garment, so you can keep your denim jeans longer



TOUGH COTTON[™] DENIM





Up to 8x better abrasion resistance than untreated cotton for wovens



NATURAL STRETCH Denim | 100% cotton

- Mechanical stretch technology designed for 100% cotton woven fabrics
- Comfort stretch without the use of any spandex
- Several steps are eliminated during the engineering of NATURAL STRETCH fabrics, such as core spinning and heat-setting
- Only 100% cotton NATURAL STRETCH technology allows the development of durable, comfortable stretch without the use of elastomeric yarns







Mechanical Technology for sustainable garment effects



NoStone[®] | alternative abrasion method

Stonewashing

- High environmental impact from mining operations
- Energy and labor-intensive process for stone removal
- Pumice stones deteriorate quickly, generating dust and sludge



Tonello NoStone[®]

- Reusable plate available in a texture designed to work on most fabrics
- Easy-lock removable plate allows for quick placement or removal in seconds to allow garment washing machines to be used for other purposes
- Developed in collaboration with Levi Strauss & Co.



NoStone® | alternative abrasion method





Robotic Manikin | assists laser process



robotic manikin for automatic laser machine with inflatable legs



Modern Indigo + Alternative Dyes innovative dyeing options



Modern Indigo | foam dyeing

- Revolutionary technology enables indigo dyeing on a range just a fraction of the conventional size
- Reduced indigo foam is applied to the yarn
- One pass, minimal dwell, zero washing
- Foam dyeing with indigo eliminates the use of several chemicals but still allows for traditional processes, washdowns, and effects seen with traditionally-dyed indigo fabrics
- Commercially developed by Tejidos Royo, IMD and Gaston Systems



Modern Indigo | earth friendlier dyes

• DyStar

- Dystar indigo vat 40% solution
- Pre-reduced indigo
- Reduces sodium hydrosulfite usage by 60-70%
- Archroma
 - Archroma Denisol® Pure Indigo 30 liq
 - Aniline-free



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Alternative Dyes | indigo-free

Archroma

- Diresul® specialties allow to create a universe of greys and deep black and navies
 - from superficial to solid blacks for both extreme wash-down and stay black effects
- Diresul[®] Smartdenim Blue liq
 - Greenish blue cast closest to indigo tone
- Diresul® RDT Ocean Blues, ocean-themed bright sulfur blue dyes
 - can be combined with Denisol® Indigo 30 liq
 - Bottoming
 - Topping
 - Fresh blue hues





photos courtesy of Archroma





Alternative Dyes | EarthColors®



Plant byproduct

Cotton



Finely ground

plant byproduct

Dye



Garment



EarthColors® by Archroma

- Fully traceable biosynthetic dyes derived from natural waste products of the agricultural and herbal industries
- Transformed natural wastebased colorants synthesized using up to 100% of raw materials from natural waste such as non-edible shells of nuts, leaves, and cotton gin waste.
- Traceable with NFC technology



Alternative Dyes | EarthColors®



The Future of Denim? creative alternatives



Cationic Denim

TRADITIONAL COTTON DYEING



- Cationic cotton is cotton that has been chemically modified to possess a permanent cationic, or positive, charge
- Cationic cotton technology prepares the fabric to accept a greater variety of dyes and provides for greater flexibility in the color offering
- Almost 100% dye utilization significantly reduces wastewater and the need for rinsing the fabric to remove unfixed dye
- Dyebath looks clear
- Reduced dye time because color adheres to fabric more quickly
- Overall less dyestuffs needed to achieve same color
- Eliminates the need for salt and alkali in dyeing process



Cationic Denim



warp yarns are cationic treated with natural filling | can have one fabric and dye any color



Natural Dyes for Denim

- Historically natural dyes did not have great fastness (wash and light) properties
- Advancements have been made to improve fastness properties
- Colors inspired by nature







Recycrom[™] Dyes for Denim

- Officina+39, based in Biella, Italy, developed a line of patent pending dyestuffs that transform fabric textile waste fibers into fine powder that can be used like a pigment dye
- Recycrom[™], is available in many colors, and can be applied by garment dyeing, garment dip and screen printing





CFFICINA39

Digitally Printed Denim | considerations



realistic denim effects | print (I) real jeans (r)

the sky's the limit



No Finishing | raw denim + natural





denim purists prefer fade with wear only with no washings





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