Recycling Market
DEVELOPMENT CENTER

FOUR-PART
WEBINAR SERIES

Recycling Market Development Center

State agency partnership for collaboration to advance market development to prevent and reduce waste (RCW 70A.240.030)

- Statewide recycling studies
- NextCycle WA accelerator
- Diverse Advisory Board
- Focused pilot projects
- Waste stream market research
- Business & technical resources

Recycling Market
DEVELOPMENT CENTER

DEPARTMENT OF ECOLOGY
State of Washington

Washington State Department of Commerce

Hemmed in to Cutting Loose: Adopting New Innovations

MAY 13TH 10AM – 12:30PM PST

Explore cutting-edge technologies enabling circular textile practices while addressing infrastructure, logistical, and economic barriers to scaling innovation.

Infrastructure and investment needs	Concrete, scalable examples relevant to Washington	Tech innovations in textile circularity (fiber ID, platforms)

fibarcode

LOOPTWORKS

SORTILE

alqia.

Hosts

Timothy Parent (He/She/They)

Carly Mick (She/Her)

Reforme U

UNIVERSITY OF OREGON

Housekeeping Notes

Recording:

This webinar is being recorded and will be posted to Ecology's YouTube and shared via the Recycling Market Development Center.

Q&A + Chat:

- **Use the Q&A box for speaker questions (use the 👍 upvote feature!)**
- **Use the chat to connect, share reflections, or drop helpful resources**

Privacy Reminder:

Please do not use AI notetakers (e.g., Otter.ai) — we're recording with limited, respectful access.

Take Care:

We'll have a 5-minute bio break, but feel free to step away as needed.

Feedback:

We'll drop a short survey link in the chat — your input helps shape future sessions!

Fastening the Textile Community; Advocacy & Coalition Building

MAY 15TH 10AM – 12:30PM PST

Unify and empower stakeholders across levels to advance textile policy and collaboration, driving actionable steps for advocacy and ongoing community engagement in WA and beyond.

Coalition-building frameworks	Global to local policy & stakeholder landscape	Route to sustained collaboration

Lisa Hilbert Founder, Redesign Collective

Leslie Perkins, Commerce

Megan Davis, RMDC

Carly Mick, Director of Sports Product Design, U of O

Kathryn Horvath, Fashion Advocate

Behnosh Najafi, Co-Founder, Circular Spring

Amrit Bhuie, Sustainability Advocate, Ph.D in Toxicology

Zakiya Cita, The Chayah Movement

JeLisa Marshall, Community Organizer, PhD Candidate

Lizzy Paul, Circular Economy Leader, RRS

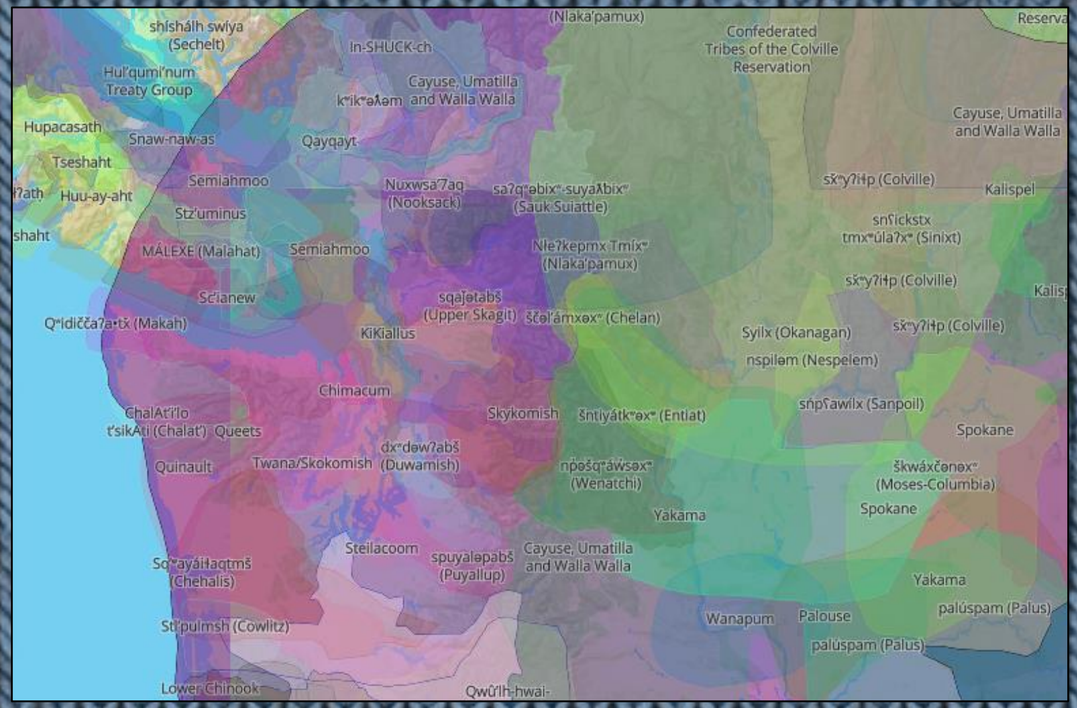
Mya Keyzers, RMDC

Nina Olivier, Circular Economy, King County

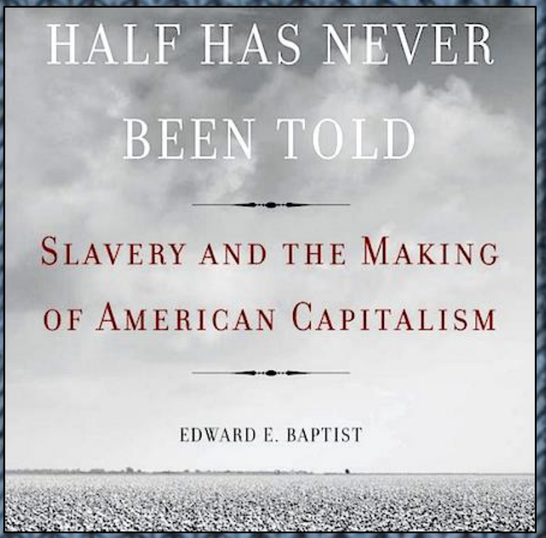
Land & Labor Acknowledgement

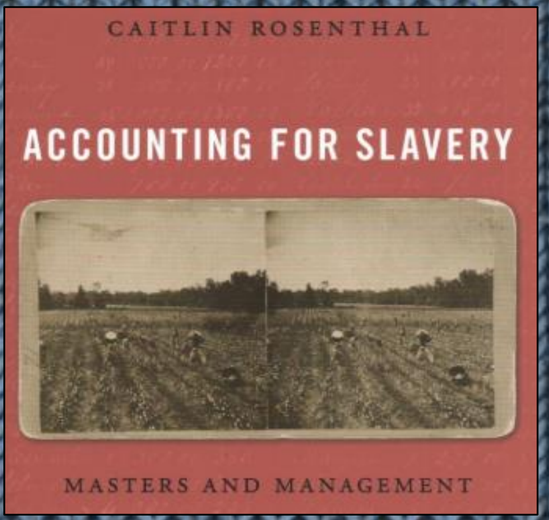
Newcombe, C. F. (1915). *Woman spinning yarn at the Coast Salish village of Musqueam* [Photograph]. University of Victoria Legacy Art Galleries. https://legacy.uvic.ca/gallery/salishcurriculum/coast-salish-design-elements/spindle-whorls/

Women Spinning yarn at the Coast Salish Village of Musqueam. Newcombe, C.F. (1915) https://legacy.uvic.ca/gallery/salishcurriculum/coast-salish-design-elements/spindle-whorls/



Map data provided by Native Land Digital (https://native-land.ca/) Used with permission for educational and non-commercial purposes.





Hemmed in to Cutting Loose: Adopting New Innovations

- 🎙️ Speaker Presentation: Brian Iezzi, Fibarcode + 💬 Q & A
- 🎙️ Speaker Presentation: Constanza Gomez, Sortile + 💬 Q & A
- ☕ 10-Minute Bio Break
- 🎙️ Speaker Presentation, Scott Hamlin, Looptworks + 💬 Q & A
- 🎙️ Speaker Presentations: Stephanie Benedetto, Aloqia + 💬 Q & A
- 🎙️ Speaker Presentations: Hang Liu & Patricia Townsend, WSU + 💬 Q & A
- 📌 Closing Remarks

Survey + info for the final webinar

Brian Iezzi,
Founder, Fibarcode

Brian Iezzi leads the development of Fibarcode, a fiber-based textile labeling technology that allows for durable authentication, traceability, and end-of-use sortation across the entire apparel product life cycle while mitigating recycling disruption.

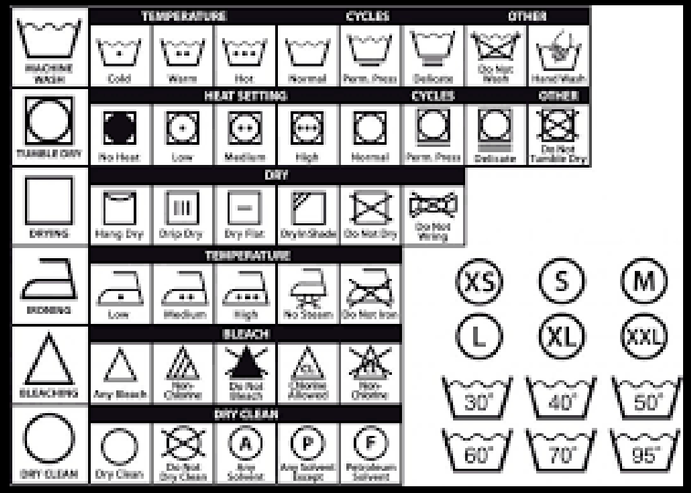
He has over 10 years of experience in textile manufacturing and materials R&D, including fabric durability assessment at W.L. Gore & Associates (makers of Gore-Tex) and developing novel biodegradable synthetic yarn additives at Parkdale Mills, Inc.

1963
Jersey City, NJ

1971 – Care Labeling Rule passed by Federal Trade Commission

2023 – AAFA begins push for digital labeling with FTC

April 2025 – US Fashion Industry Association files comments in favor



AMERICAN APPAREL & FOOTWEAR ASSOCIATION

Advocacy that fits.

740 6th Street, NW • Washington, DC 20001 | P: 202-853-9080 | www.aafaglobal.org

February 28, 2025

U.S. Federal Trade Commission
Office of the Secretary
600 Pennsylvania Avenue NW
Suite CC-5610 (Annex J)
Washington, DC 20580

Petition for Rulemaking Concerning the Digital Labeling of Apparel

Pursuant to 5 U.S.C. § 553(e) and 16 C.F.R. § 1.31, the American Apparel & Footwear

https://www.ftc.gov/system/files/ftc_gov/pdf/R507003-RULEMAKINGPETITION.pdf

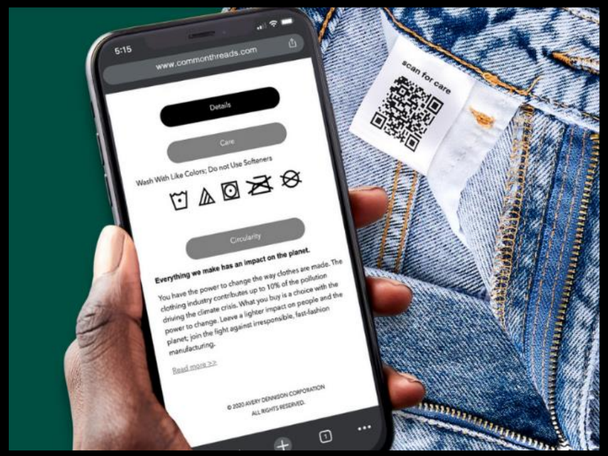
DIGITAL LABELING TECHNICAL SOLUTIONS: QR CODES

Pros:

- High data density (up to 2,953 bytes for QR)
- Low cost of printing onto existing labels
- Easily readable on standard smartphones

Cons:

- Labels can be easily removed/fade over time
- Visible QR codes easy to replicate
- Difficult to print directly onto textiles



Avery Dennison

Arylla

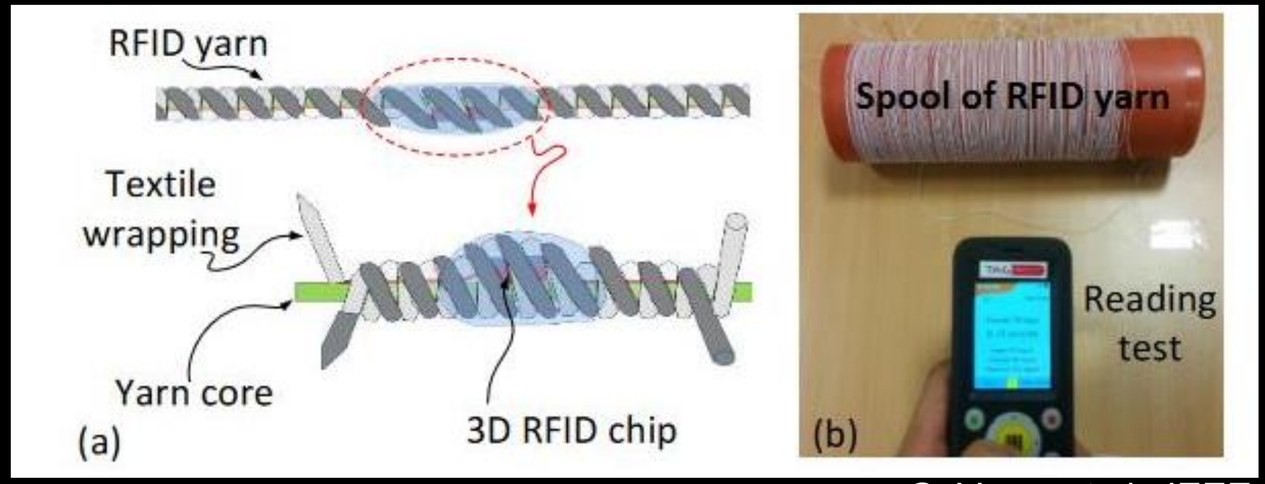
DIGITAL LABELING TECHNICAL SOLUTIONS: RFID/NFC

RFID: Radio Frequency Identification

NFC: Near-field Communication

Pros:

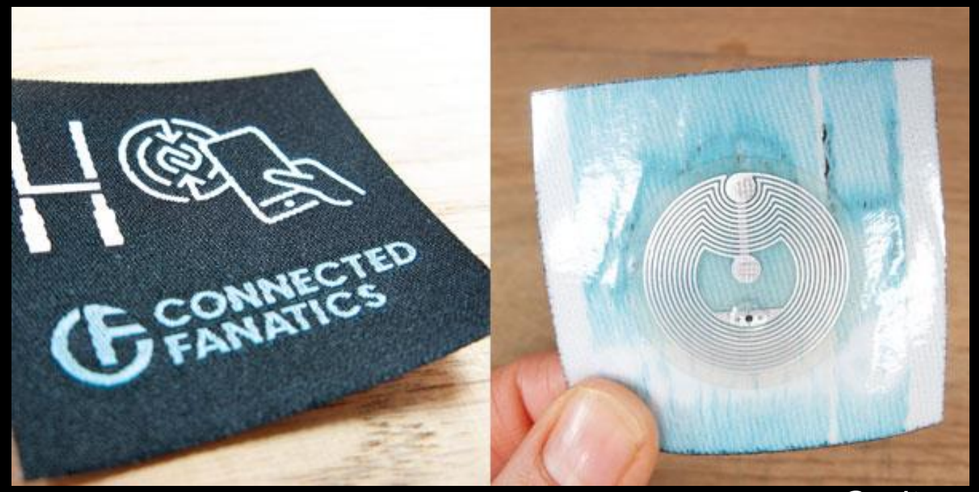
- Can be read at increased stand-off distances (1-5 meters)
- Can read multiple tags at once
- Thread-based devices are difficult to remove



G. Vera, *et al., IEEE*, 2017

Cons:

- RFID/NFC tags are relatively expensive compared to printed labels (~$0.10-$1.00)
- Potentially non-compatible with recycling processes
- Consumer privacy concerns



Seritag

THE PROBLEM

Textile waste has grown by

80%

(other waste: 25%)

Legislation REQUIRES responsible disposing of items.

Tags get cut out making disposal information INACCESSIBLE.

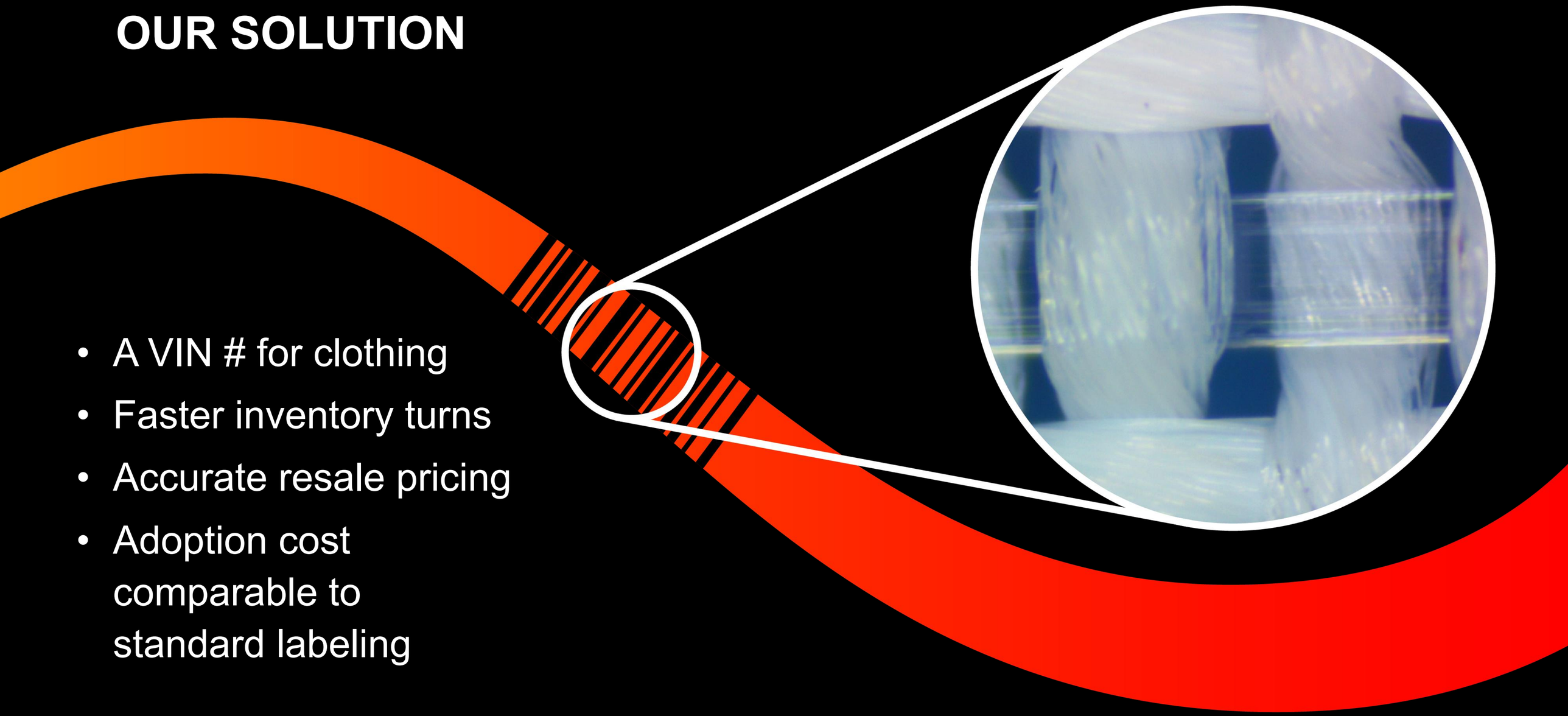
$73B RESALE MARKET missed due to lack of post-sale data.

FIBARCODE

Thread That Is Read

FIBARCODE // Brian Iezzi // brian@fibarcode.com

OUR SOLUTION



- A VIN # for clothing
- Faster inventory turns
- Accurate resale pricing
- Adoption cost comparable to standard labeling

FIBARCODE // Brian Iezzi // brian@fibarcode.com

LIFE-CYCLE APPROACH

The barcode stays with the item for each product's entire lifecycle.

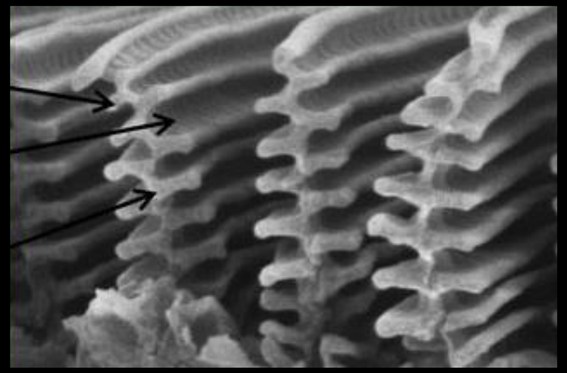
PATENT
PENDING

FIBARCODE // Brian Iezzi // brian@fibarcode.com

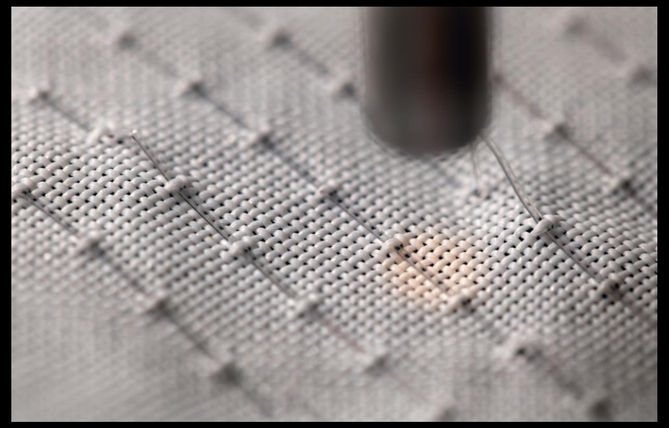
INSPIRATION/INTELLECTUAL PROPERTY

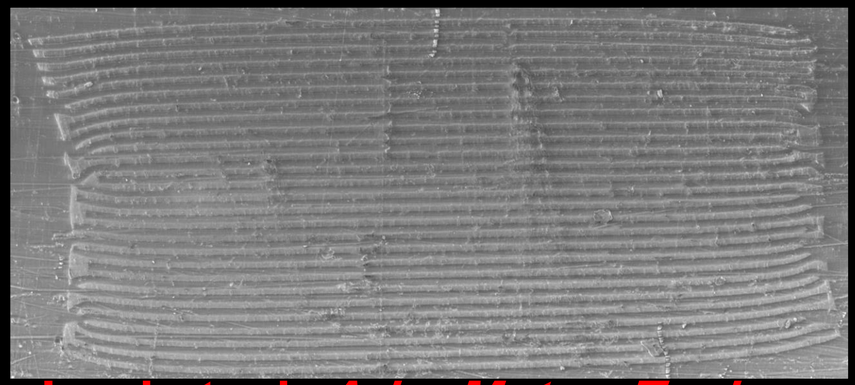
Joint IP
Exclusive License

MORPHO BUTTERFLY



FIBER BARCODE





Iezzi et. al. *Adv. Mater. Tech.* (2023)

Fibarcode can be made with materials that are:

- Bio-based
- Biodegradable
- Recyclable

GO-TO-MARKET STRATEGY

FUNDING/PARTNER SHIPS

OAK RIDGE National Laboratory

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

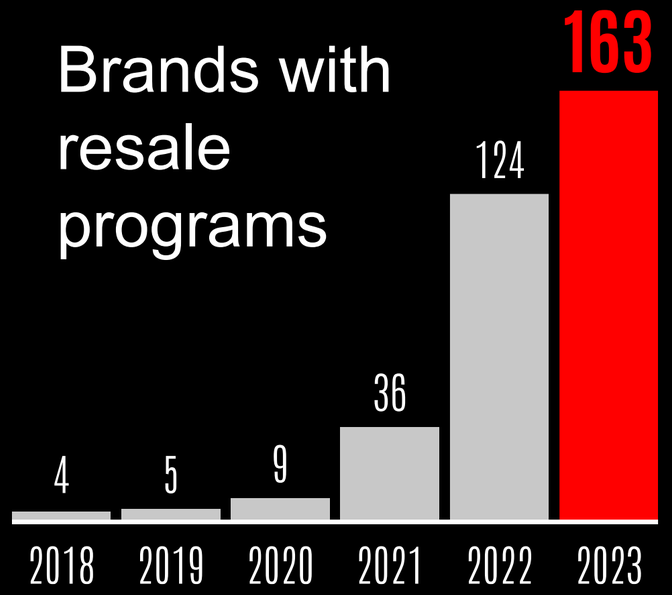
NC STATE UNIVERSITY

TARGET AUDIENCE

80 OUTDOOR APPAREL BRANDS who are investing in sustainability and sell 100 MILLION items per year, per brand

MARKET SIZE

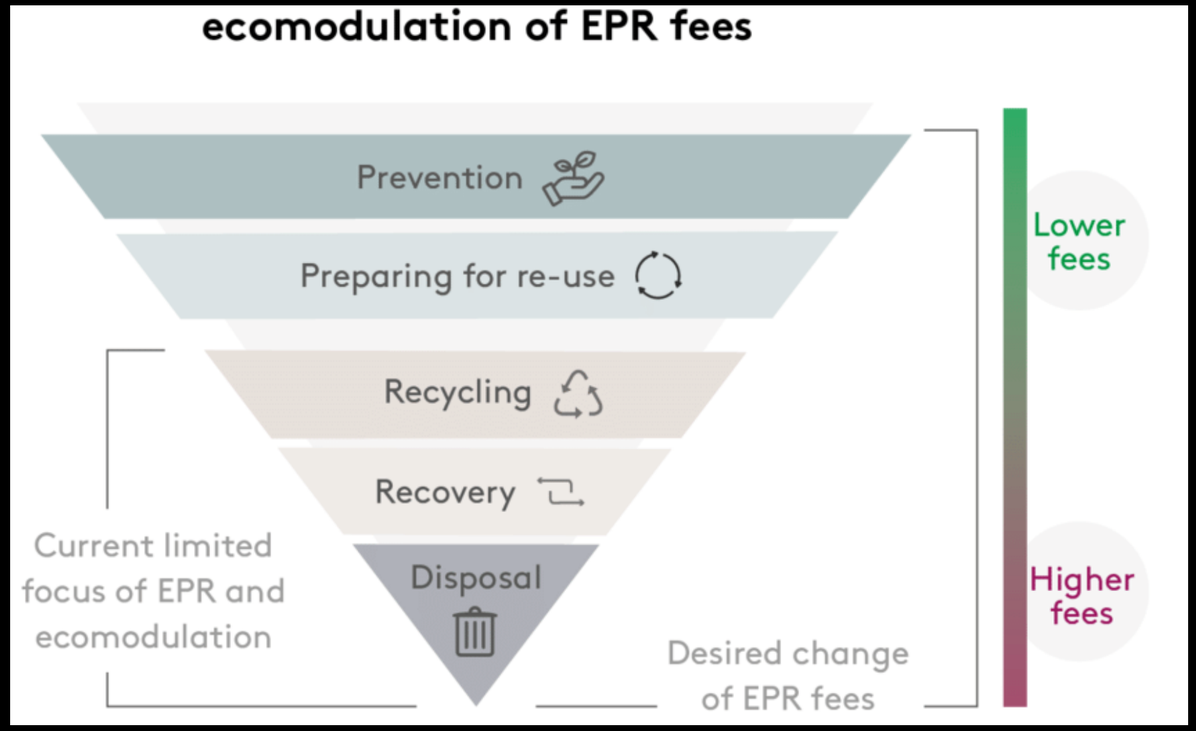
Brands with resale programs



FIBARCODE // Brian Iezzi // brian@fibarcode.com

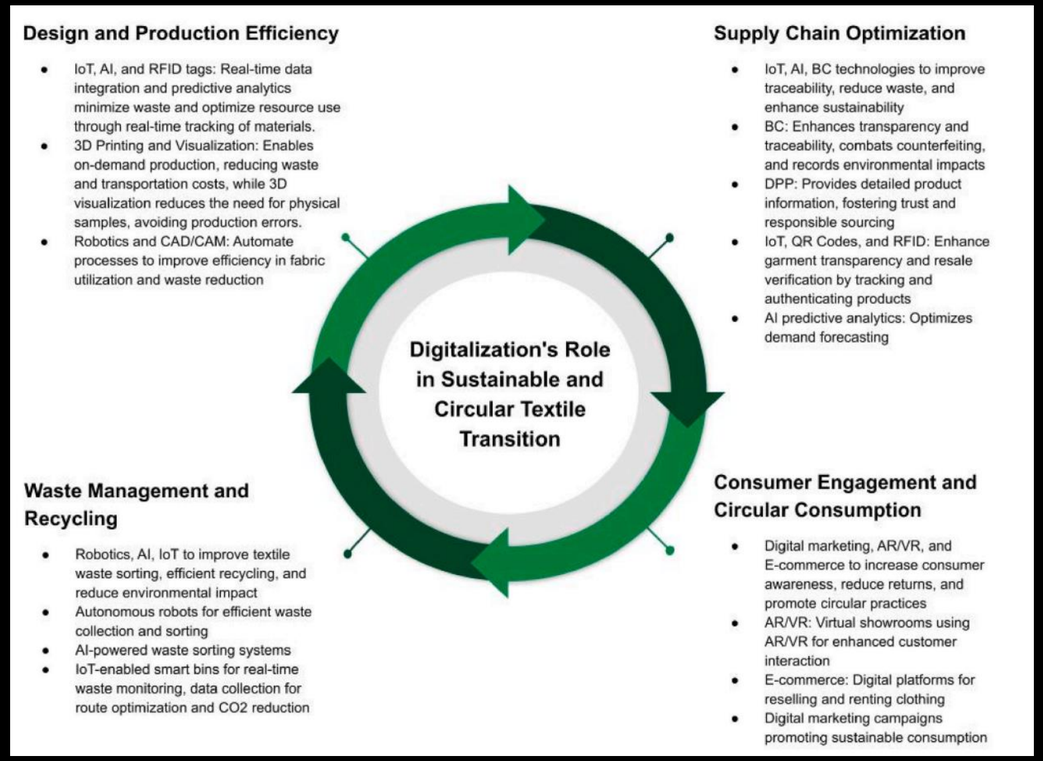
PATHS TO SYSTEM CHANGE

POLICY



Christiansen, Anne & Hasse, Gaia & Tønder, Rasmus. (2021). Extended Producer Responsibility in the Danish textile sector: Assessing the optimal development and implementation. *Textile Revolution*

INDUSTRY



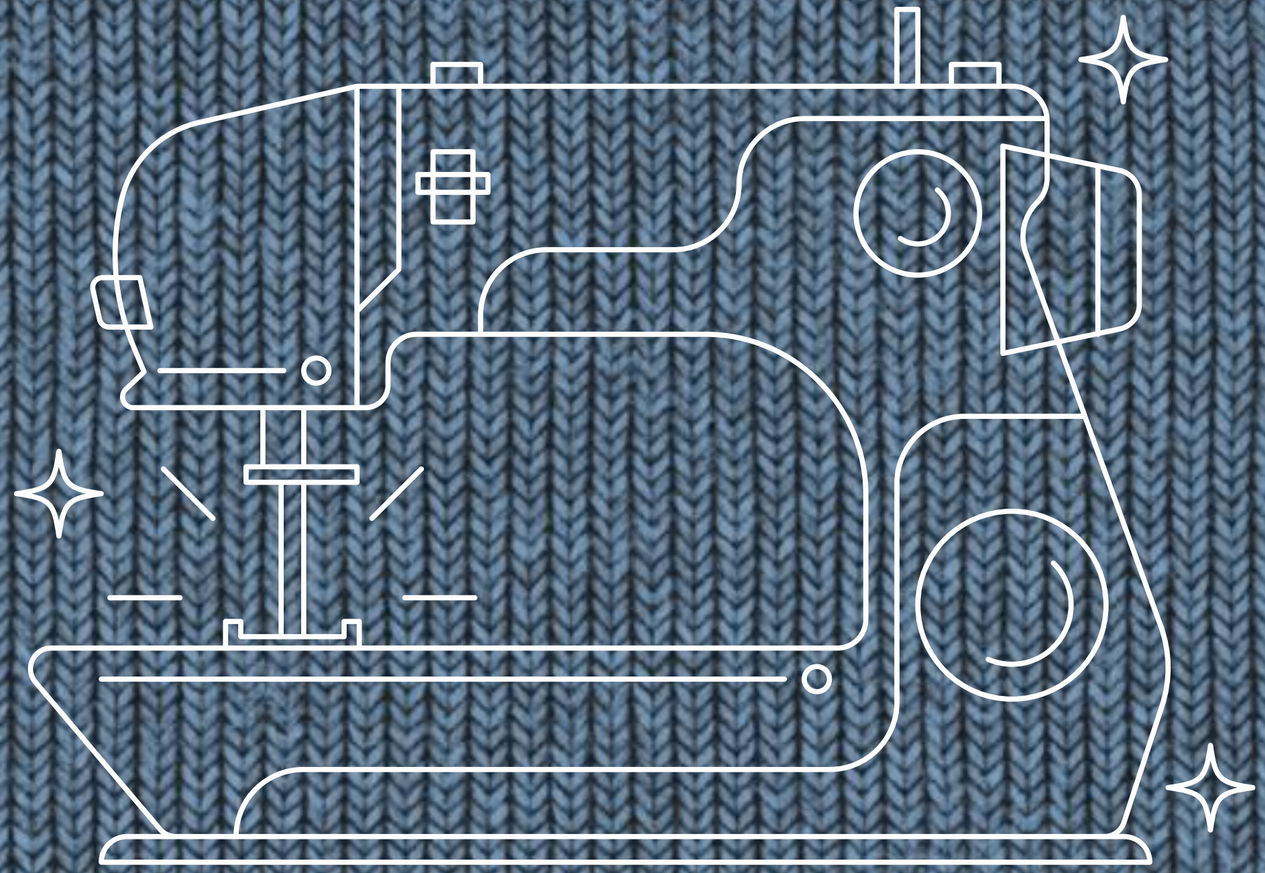
Fabio De Felice, Anaiz Gul Fareed, Arslan Zahid, Maria Elena Nenni, Antonella Petrillo (2024) Circular economy practices in the textile industry for sustainable future: A systematic literature review *J. Cleaner Production*

FIBARCODE // Brian Iezzi // brian@fibarcode.com

Unraveling the Textile Industry

for a regenerative Washington

Audience Q&As



FOUR-PART
WEBINAR SERIES

Constanza Gomez, Co-Founder and CEO of Sortile

Constanza Gomez is the co-founder and CEO of Sortile, a New York-based startup that uses technology to enable textile recycling.

Originally from Chile, she studied industrial engineering and earned an MBA from Columbia Business School. Her interest in supply chains and end of life product management led her to start Sortile in 2021.

SORTILE

Enabling Circularity: Textile Sorting with Sortile


Textile sorting is
manual and
focused on reuse
2 HEAVY MIX
2 JOGGING RECYCLE
2 DENIM RECYCLE
2 POLO RECYCLE
JEWELS & GLASSES
SHOES
2 FLANNEL
POLO-SHORT
JOGGING
SWEATER

WHY DOES SORTING FOR RECYCLING MATTER?

Only 1% of used clothing is recycled into new clothing, and that number **has to increase rapidly** to deal with global textile waste.

Only 50-60% of what is collected today qualifies for reuse and this number is **decreasing** with the rise of fast fashion.

New laws are being passed around the world to restrict clothing going to landfills.

Recycling companies have **strict rules** about what they are able to take in, most often what's collected is mislabeled or missing information.

Recycling has to be **easy and efficient** to be more **profitable** than keeping the old systems of extracting virgin materials.

RECYCLING TEXTILES IS REALLY HARD

The Sorting Problem

There’s 1000s of different specifications to take into consideration:

- Material
- Color
- Construction
- Chemical Additives

THE COST OF INEFFICIENCY

Sorters

Cost to sort and preprocess: > $1.00 / lb

Avg. Price paid for materials: < $0.3 / lb

- $0.6

Price to export unsorted: > $0.30 / lb

Avg. Tipping fees in WA: ~$0.05 / lb

Recyclers

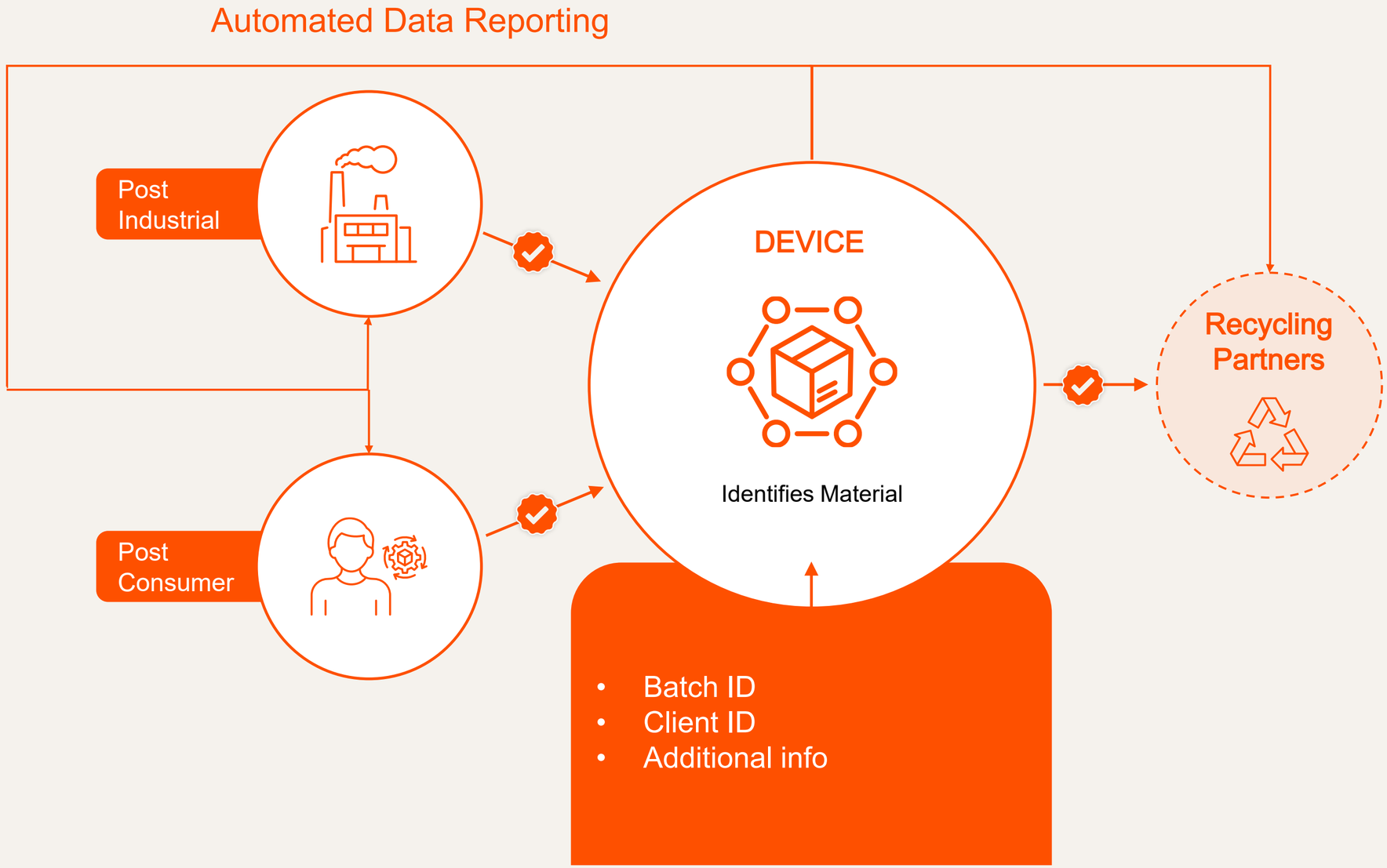
Purchasing feedstock at > $1.00 / lb makes it impossible to compete with virgin materials on price

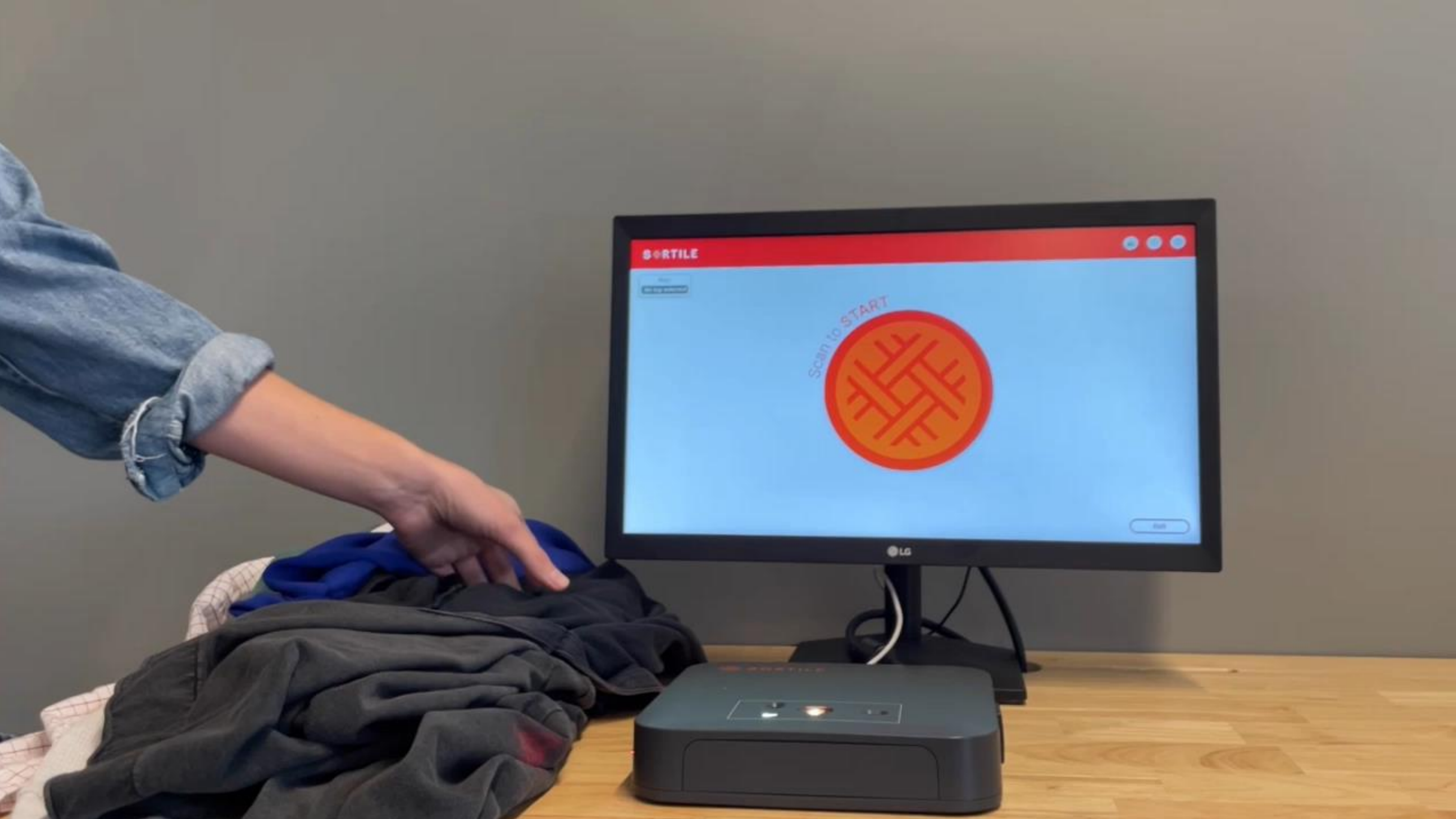
Today, it is easier and cheaper to throw materials out than to recycle

SORTING TECHNOLOGIES

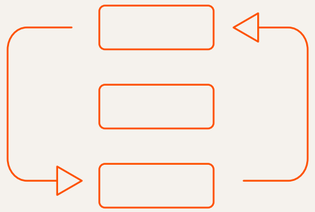
	Manual	Semi - autonomous	Autonomous
Pros	• No additional cost or training needed	• Increased speed • High accuracy • Can train workforce to handle difficult garments like multi-layer, multi-paneling and certain constructions • Low upfront cost	• Speed • High accuracy • Some can sort by other qualities as well including construction and item type
Cons	• 30-40% garments do not have tags at end of life making them difficult to sort accurately • Slow, not cost efficient in developed markets due to labor costs	• Workforce needs to be trained • Speed is dependent on training and quality of employees as there is still human interaction	• Cost • Difficult to handle multi-layer, multi-paneling and certain constructions • Require at least 1 person with technical expertise

HOW DOES SORTILE WORK?




SORTILE
Scan to START
LG

SOME CURRENT CHALLENGES



Process & Logistics

- New processes need to be optimized
- Pre-processing
- New material flows
- Traceability

Identification

- Carbon Black / Dyes
- Additives (ex. PFAs)
- Construction (ex. knits v. woven)
- Etc

Recycling

- Contamination limits
- Blends
- Stable specifications
- Stable volumes

HOW CAN YOU GET INVOLVED?

Brands

- Commit to purchasing recycled materials
- Share data on materiality, additives, dyes
- Fund innovation and R&D
- Pilot traceability programs for recycled materials

Recyclers/Sorters

- Adopt and test new tech
- Share data and feedback with innovators
- Help define specifications and create standards for feedstock
- Collaborate on R&D for managing blended materials
- Share operational constraints

Others

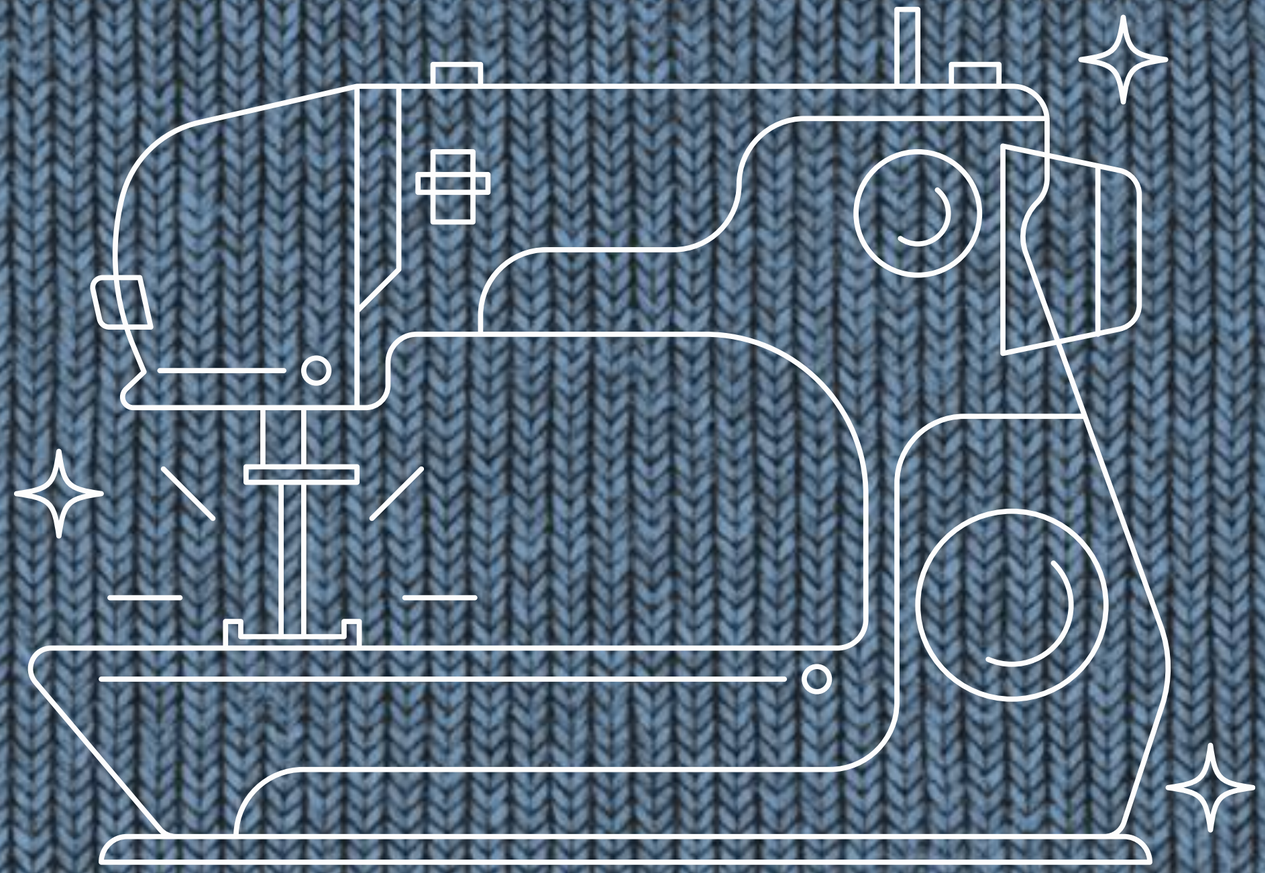
- Fund pilots
- Push for regulatory alignment
- Build public awareness
- Contribute to material databases

SORTILE

Unraveling the Textile Industry

for a regenerative Washington

Audience Q&As



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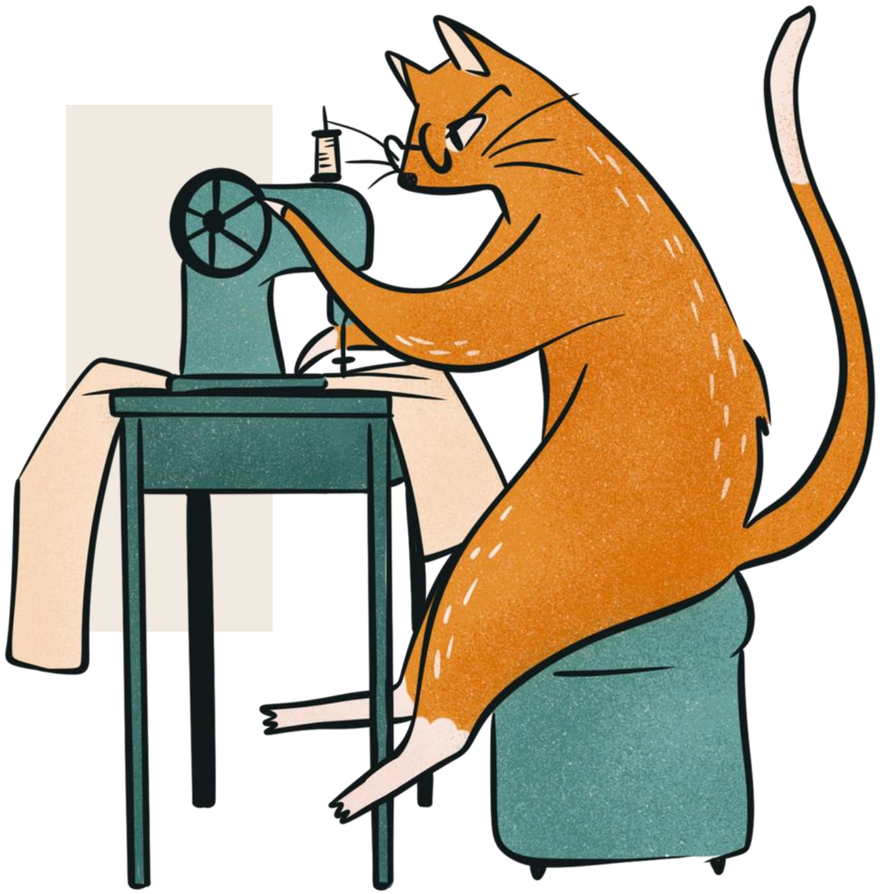


Bio Break

5 Minutes

Scott Hamlin, Founder and CEO of Looptworks

Scott Hamlin has over 32 years experience of strategic brand positioning and management, innovative product creation and sustainable supply chain, marketing and sales for global organizations.

In 2009, founded Looptworks as a DTC and B2B brand and industry solution for turning excess materials into upcycled products.

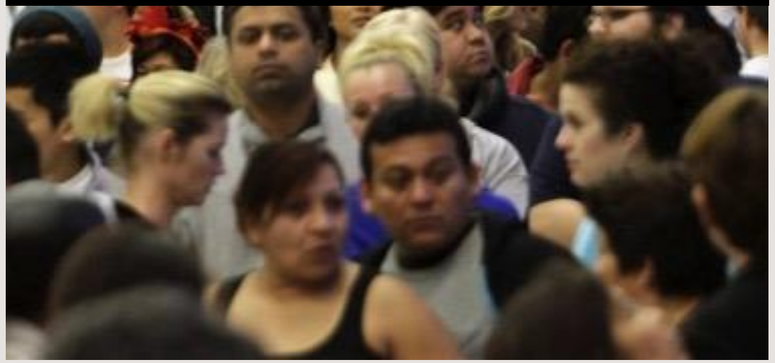
LOOPTWORKS HAS BEEN SUSTAINING, GROWING AN INNOVATING IN TEXTILE CIRCULARITY SINCE 2009

TEXTILE INDUSTRY REMAINS IN NEED OF GAME CHANGING SOLUTIONS

OVERPRODUCTION

11.3 million tons of textile waste created on an annual basis

OVERCONSUMPTION



Equivalent to 81.5 pounds per person per year

UNDERUTILIZATION

Consumers do not use what they BUY, 85% ends up in a landfill

*Data from Earth.org

15% of all textiles are “recycled” – EPA.

Only 1% of all textiles are ACTUALLY recycled.

INDUSTRY DEFINITION OF TEXTILE “RECYCLING”

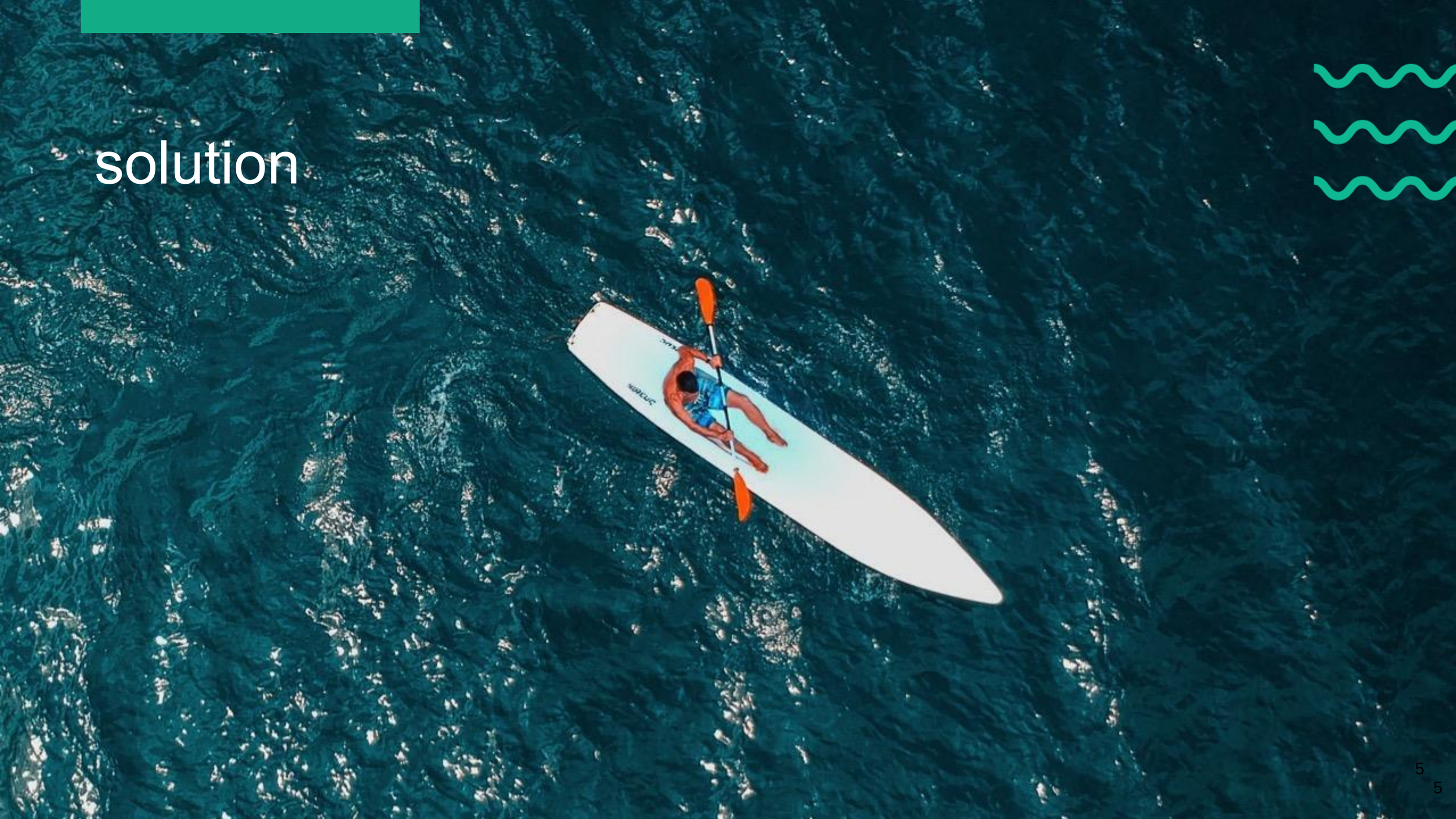
VINTAGE/THRIFT

OVERSEAS/RAGS

LANDFILL/INCINERATION

IMAGE SOURCE: PATAGONIA

solution

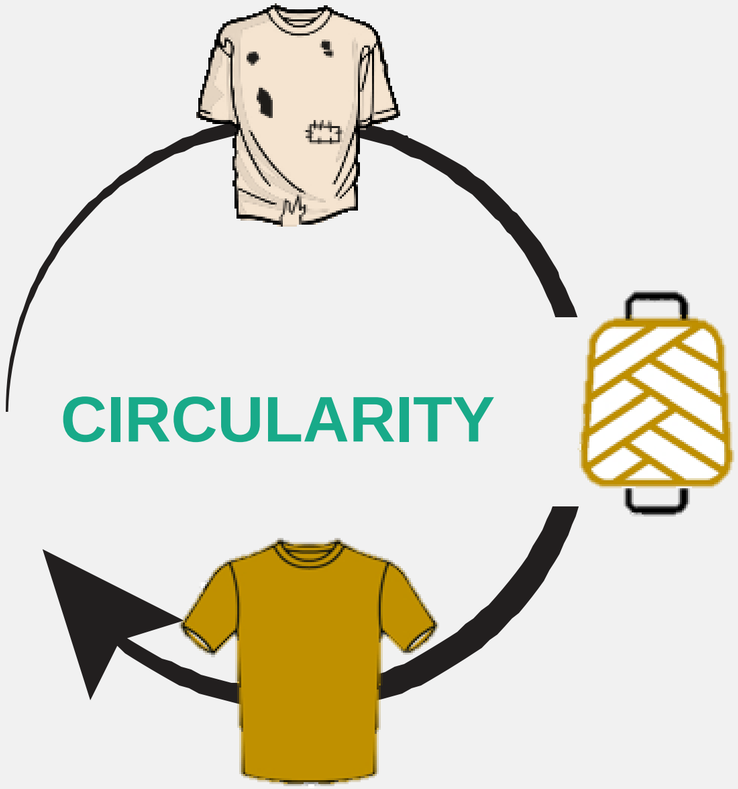


CIRCULARITY IS THE WAY FORWARD

LINEAR

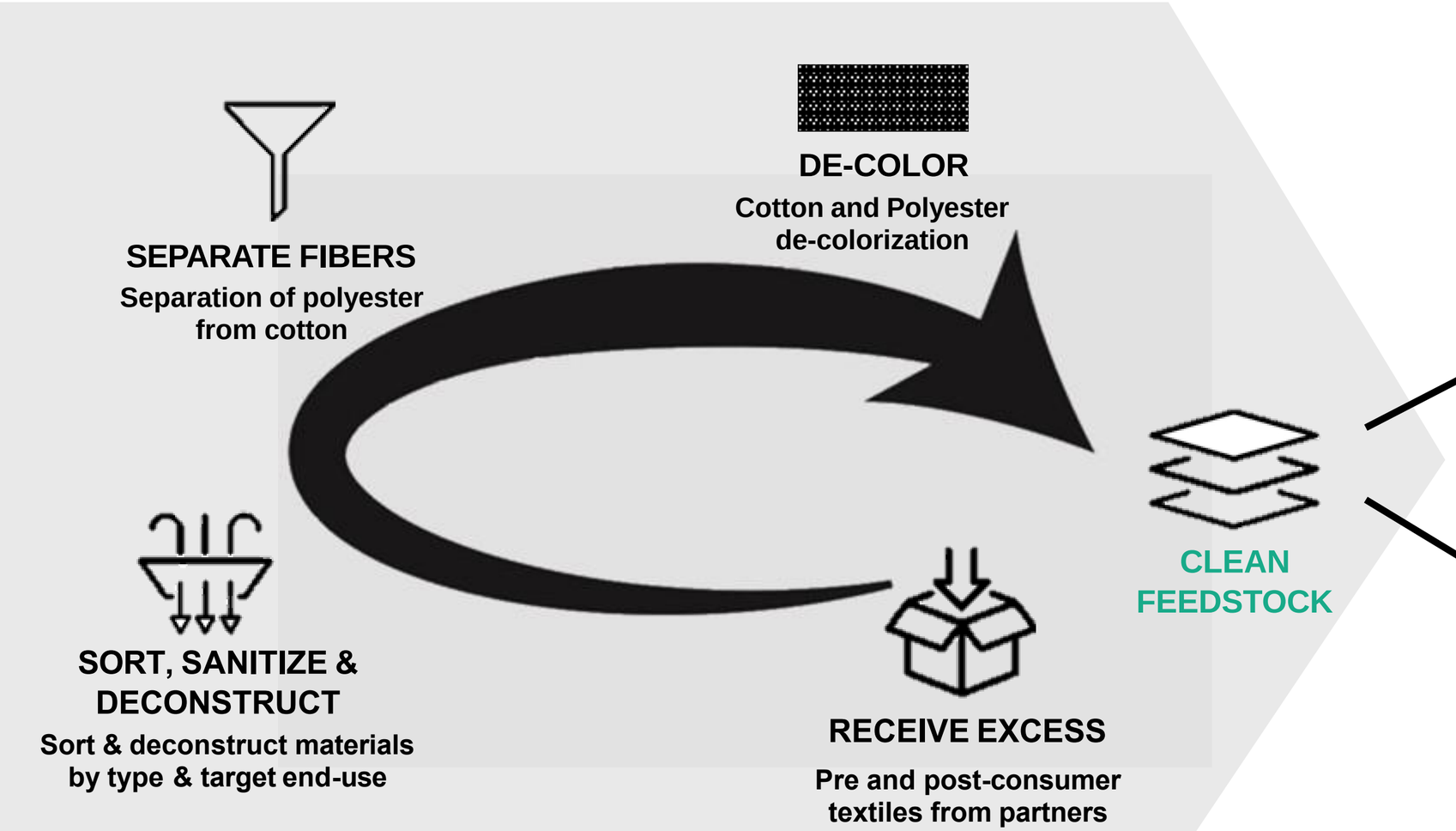
TAKE **MAKE** **WASTE**

- Less than 1% of apparel purchases in the USA are recovered back into the supply chain.
- 2.6 million tons of returned clothes ended up in the landfills in 2020 in the US



*PCTW Data from WM - 2021

CIRCULARITY THROUGH AUTOMATED TECHNOLOGY



SEPARATE FIBERS

Separation of polyester from cotton

DE-COLOR

Cotton and Polyester de-colorization

SORT, SANITIZE & DECONSTRUCT

Sort & deconstruct materials by type & target end-use

RECEIVE EXCESS

Pre and post-consumer textiles from partners

CLEAN FEEDSTOCK

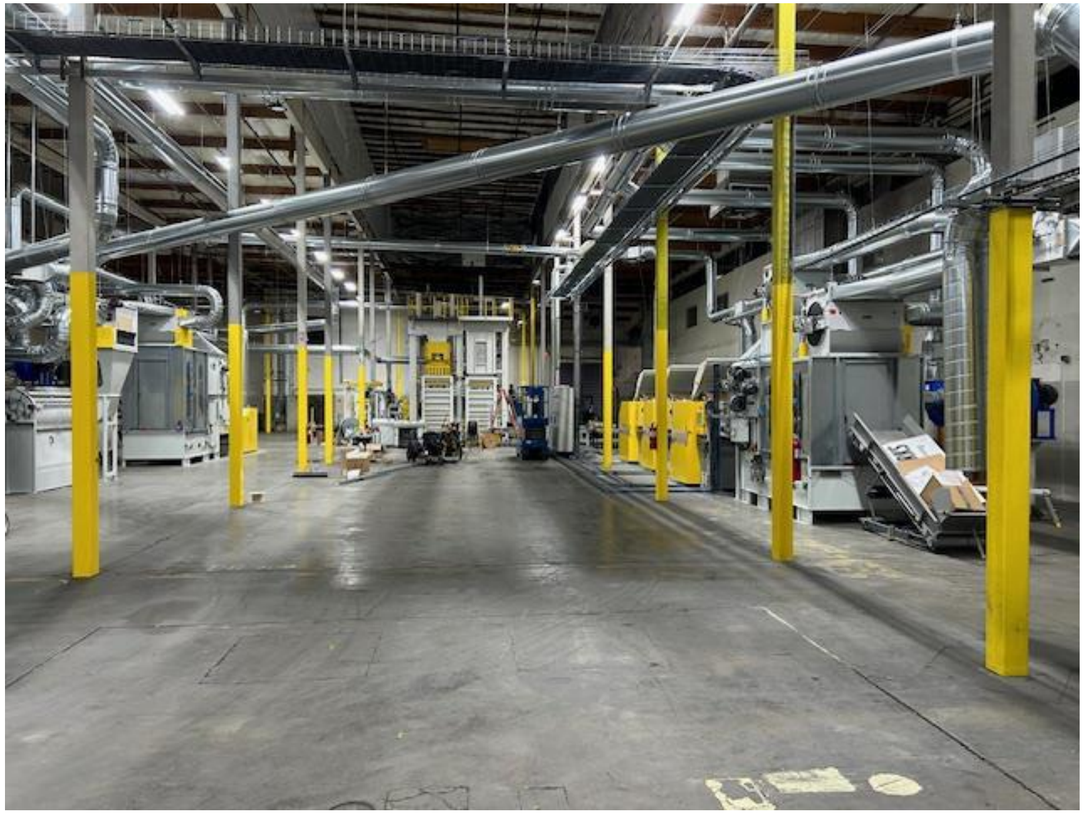
DOWNCYCLE

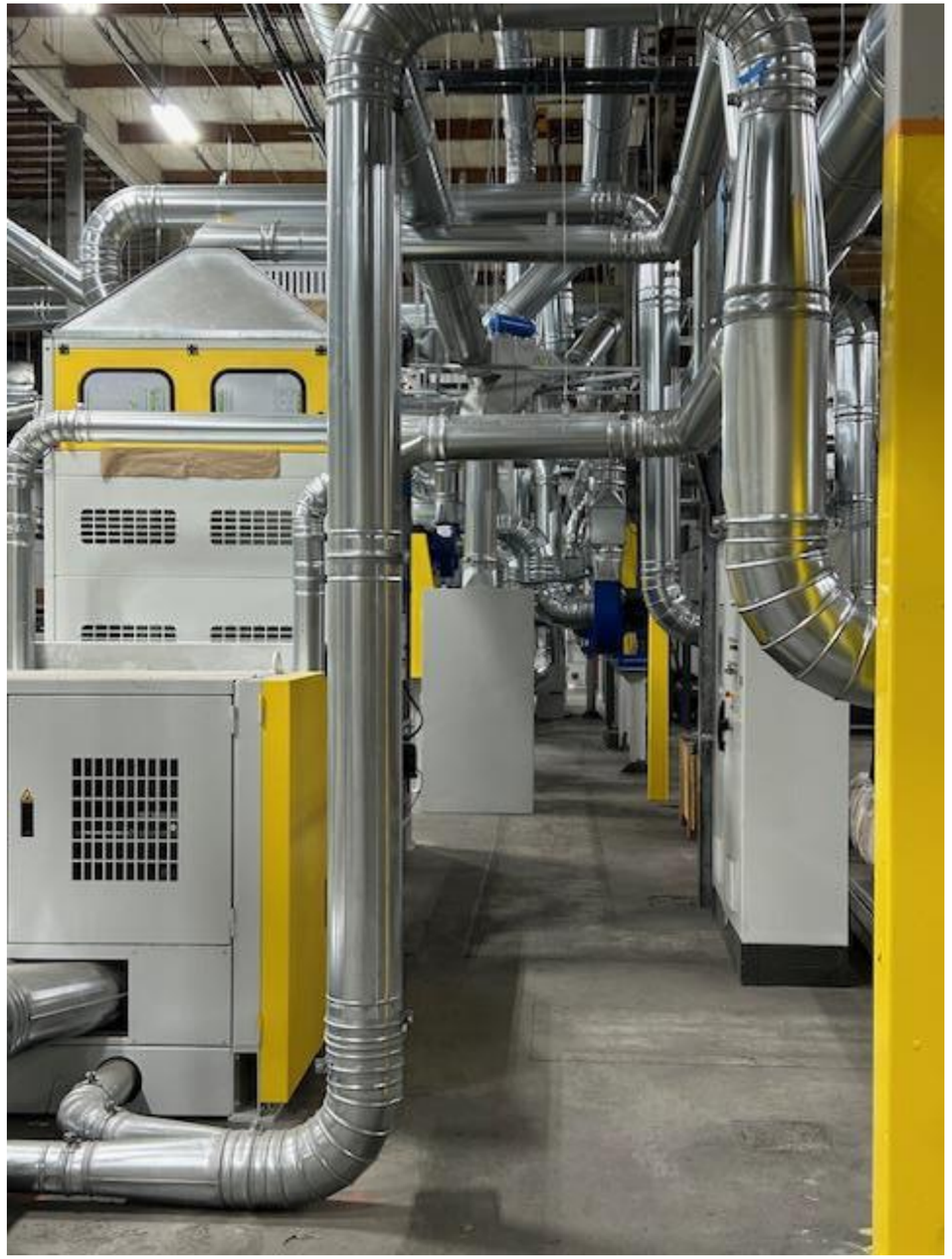
Zero waste to landfill by converting excess materials into feedstock for insulation and non-woven uses

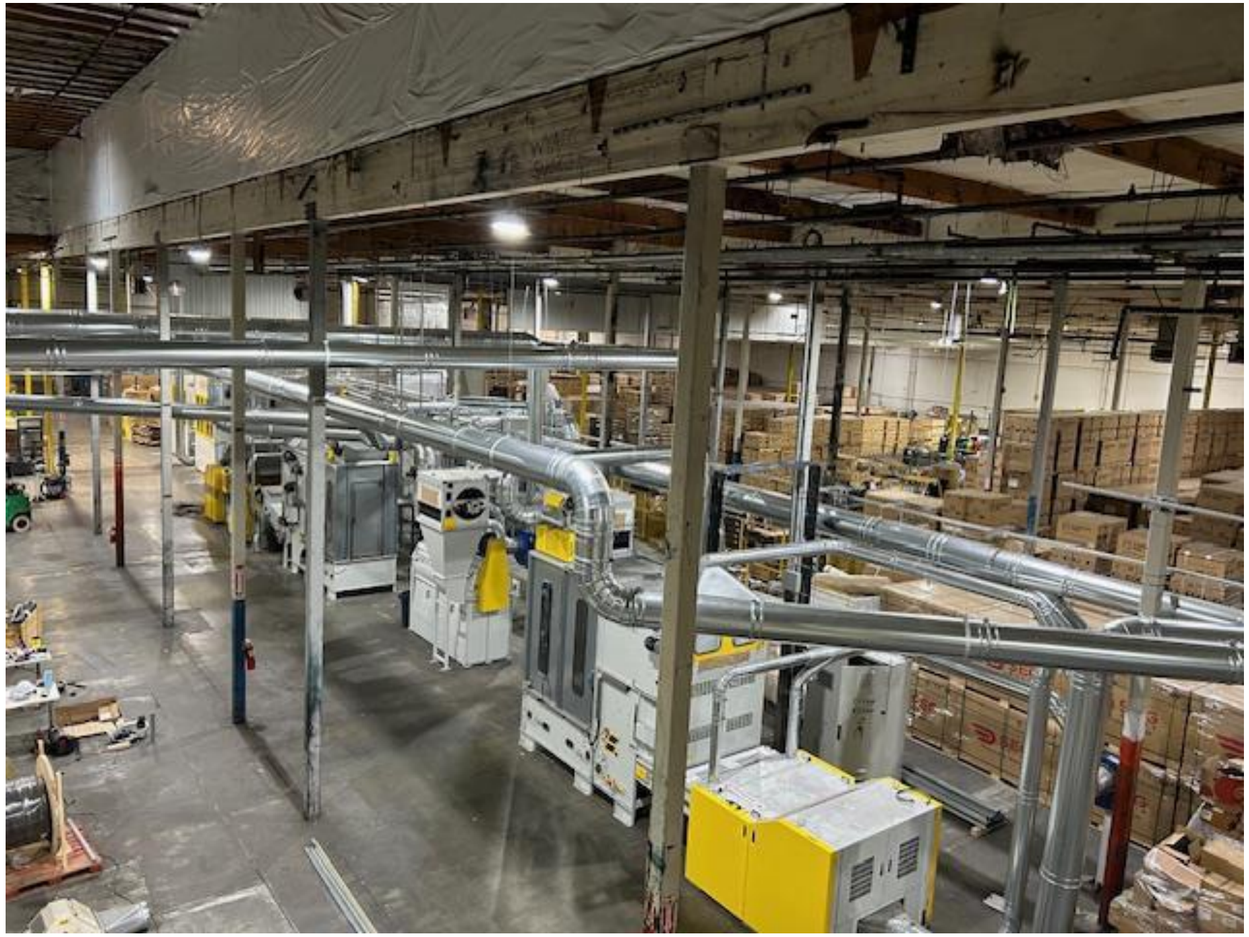
CIRCULARITY

Return material to spinning fiber to make recycled yarns for the global supply chain

CONVERTING TEXTILE WASTE INTO VALUABLE FEEDSTOCK







LOOPTWORKS

Transforming the textile industry for a positive impact on Washington and the World.

Contact: Scott Hamlin

Scott@Looptworks.com

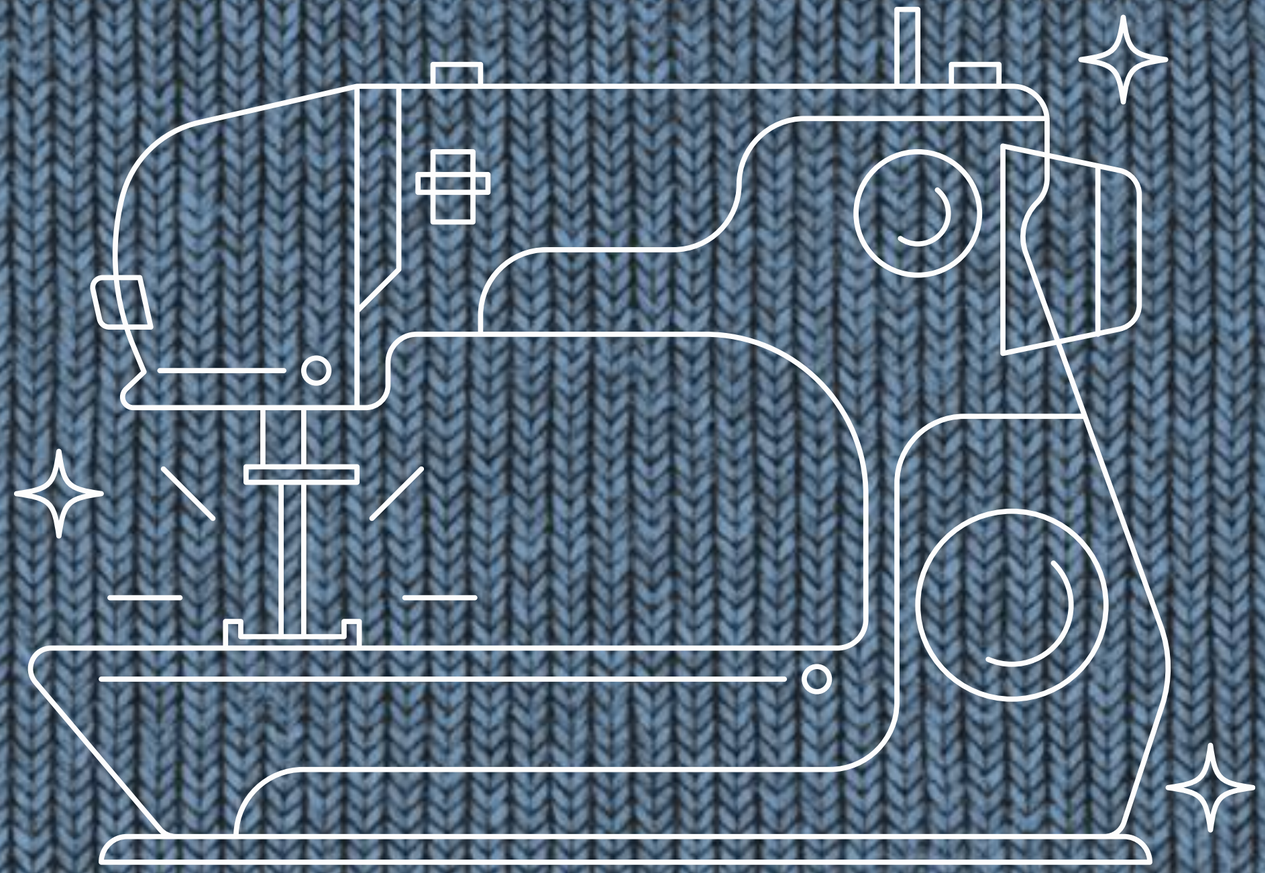
(503) 972-0168

LOOPTWORKS

Unraveling the Textile Industry

for a regenerative Washington

Audience Q&As



FOUR-PART
WEBINAR SERIES

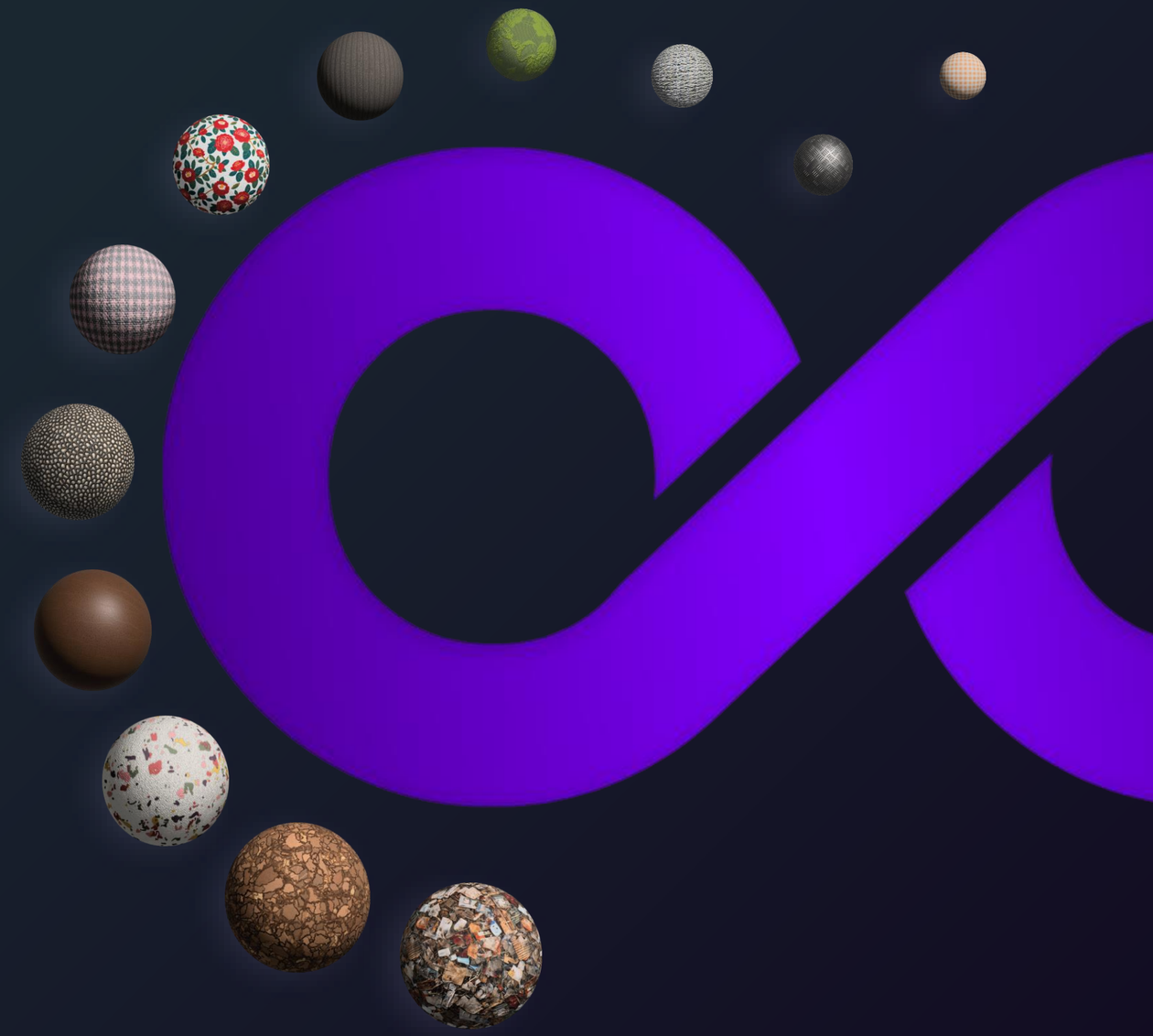
Stephanie Benedetto,
Founder of Aloqia

Corporate attorney turned climate fintech entrepreneur, Stephanie is the CEO of Aloqia (formerly Queen of Raw), award-winning software helping companies turn excess into opportunity.

Prior to starting Aloqia, Stephanie worked as a lawyer in the fashion, media/entertainment, and technology industries and co-founded a sustainable textile manufacturing facility.

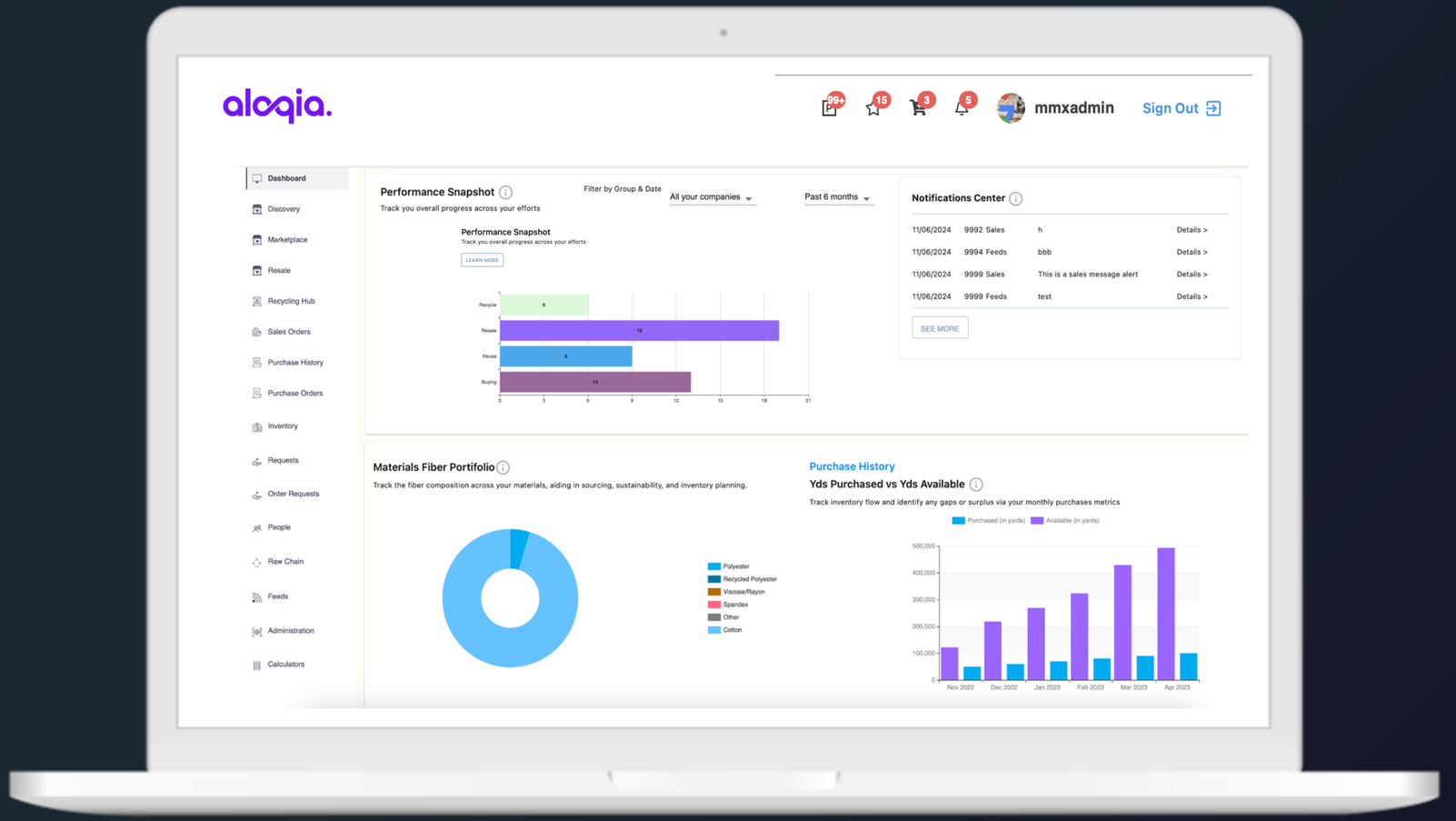
aloqia.

Turning Excess Into Opportunity



$1.77 trillion


QUEEN OF RAW

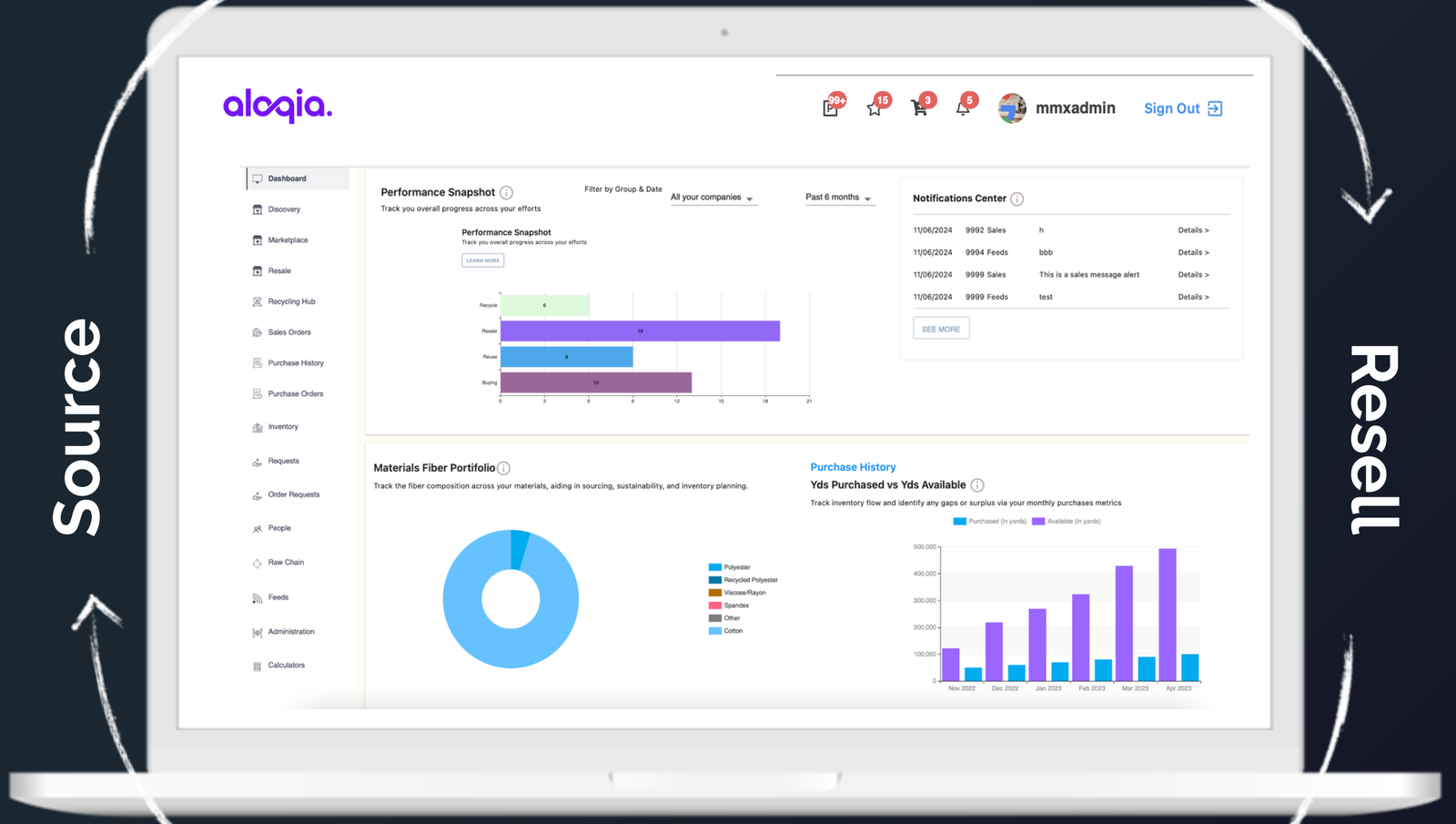

alegia.
99+
15
3
5
mmxadmin
Sign Out
Dashboard
Discovery
Marketplace
Resale
Recycling Hub
Sales Orders
Purchase History
Purchase Orders
Inventory
Requests
Order Requests
People
Raw Chain
Feeds
Administration
Calculators
Performance Snapshot
Track you overall progress across your efforts
Filter by Group & Date
All your companies
Past 6 months
Performance Snapshot
Track you overall progress across your efforts
LEARN MORE
Recycle
Resale
Reuse
Buying
6
19
9
13
0
3
6
9
12
15
18
21
Notifications Center
11/06/2024 9992 Sales h Details >
11/06/2024 9994 Feeds bbb Details >
11/06/2024 9999 Sales This is a sales message alert Details >
11/06/2024 9999 Feeds test Details >
SEE MORE
Materials Fiber Portifolio
Track the fiber composition across your materials, aiding in sourcing, sustainability, and inventory planning.
Polyester
Recycled Polyester
Viscose/Rayon
Spandex
Other
Cotton
Purchase History
Yds Purchased vs Yds Available
Track inventory flow and identify any gaps or surplus via your monthly purchases metrics
Purchased (in yards)
Available (in yards)
500,000
400,000
300,000
200,000
100,000
0
Nov 2022
Dec 2022
Jan 2023
Feb 2023
Mar 2023
Apr 2023

Reuse

Resell

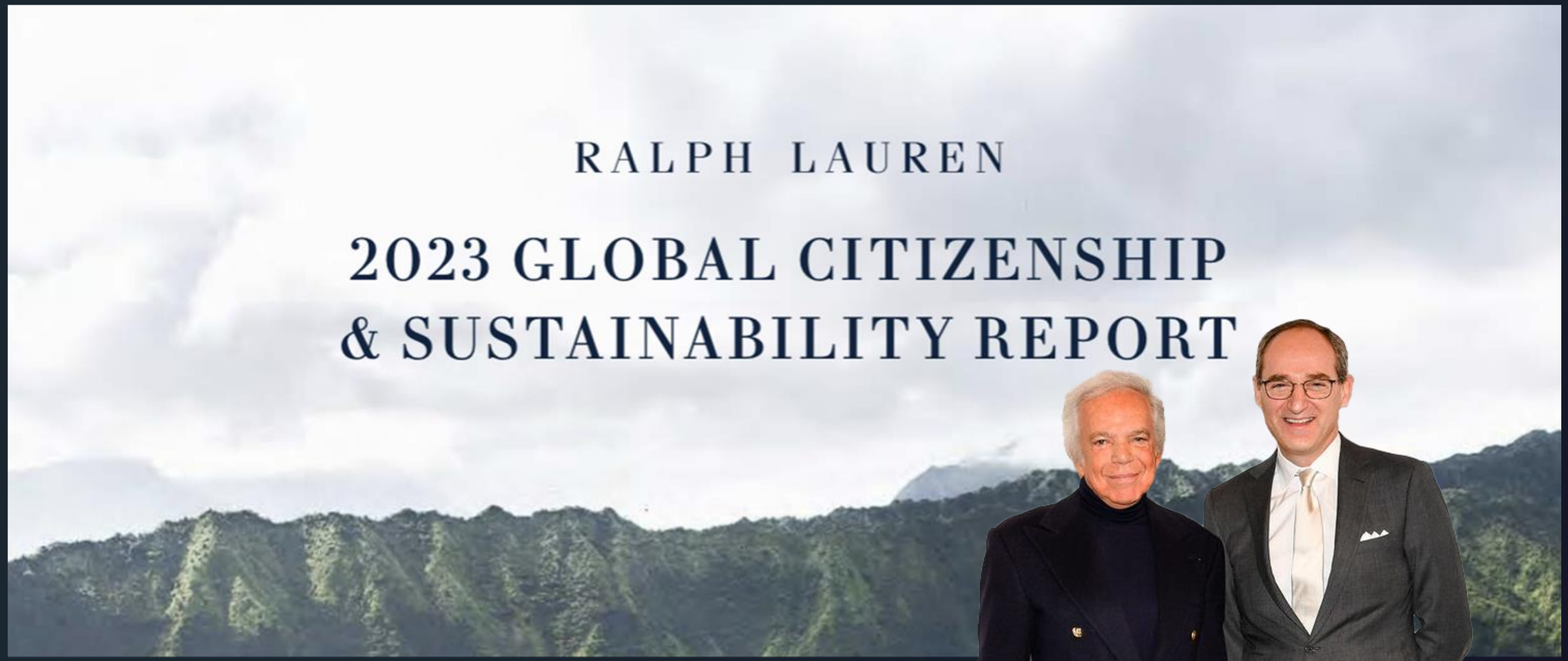
Recycle

Source




Scan Me


$4M saved
47 kg of CO2 eq offset
905 kg of water saved
640 kg of chemicals saved
11550 kg of waste saved
Total weight of received goods: 12000 KG
Stream
Weight in KG
Use
White Cotton
7250
Recycled Fiber, As Is
Mixed Material
3550
Insulation, Infill Material, As Is
Non Woven Packaging
500
Plastic Recycling
Paper
200
Recycled Paper
Plastic Wrap
50
Plastic Recycling
Total:
11550 KG
SAMPLE



Ralph Lauren
President and Chief Executive Officer

Patrice Louvet
Executive Chairman and Chief Creative Officer

aloqia.

Contact Me

www.aloqia.com

@aloqiaofficial

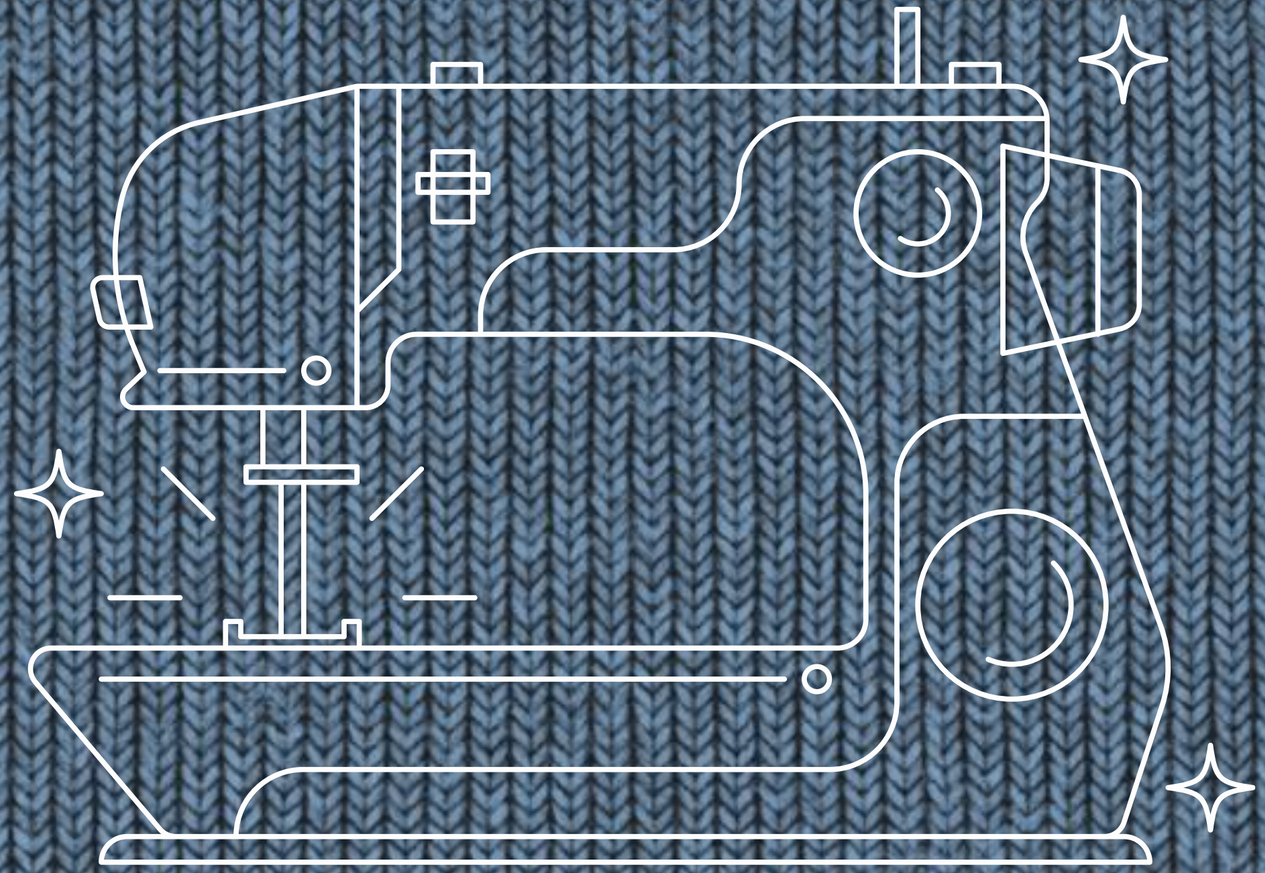
+1 (646) 583 0076

stephanie@aloqia.com

Unraveling the Textile Industry

for a regenerative Washington

Audience Q&As



FOUR-PART
WEBINAR SERIES

Hang Liu, Department of Apparel, Merchandising, Design and Textiles Washington State University

With a background in textile engineering and polymer science, Dr. Liu's research focuses on the development of sustainable and functional textile materials.

Patricia Townsend, Associate Professor and Urban Natural Resource Specialist Washington State University

Dr. Patricia Townsend is an Associate Professor, environmental scientist, and an environment and community outreach specialist with WSU Extension.

WASHINGTON STATE UNIVERSITY

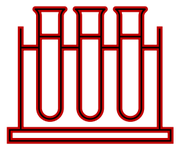
Driving Innovation in Textile Waste Recycling in Academia:

Research, Education, and Collaboration

Hang Liu, Ph.D.
Apparel, Merchandising, Design and Textiles

Patricia Townsend, Ph.D.
Extension

Outline



- **Research** – Innovative Technology
  - Environmentally friendly cotton waste chemical recycling
  - Hotel linen waste recycling

- **Education & Extension** – Building the workforce pipeline & disseminating knowledge
  - Prepare the workforce to fuel the future
  - Disseminate knowledge

- **Collaboration** – Opportunities to engage with academia
  - Research
  - Getting into classrooms
  - Technology commercialization

Research - Project 1

Post-consumer Cotton Waste Chemical Recycling

WASHINGTON STATE UNIVERSITY

Thermal Recycling

X

Mechanical Recycling (Fiber reclamation)

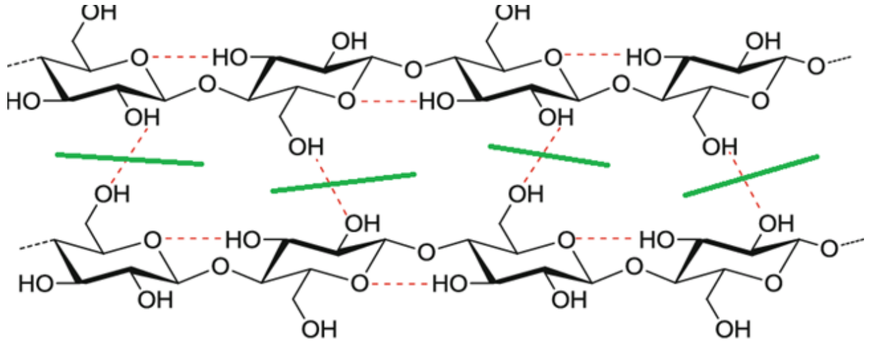
- The tear/wear conditions matter
- Weakens fibers
- Limited number of recycling cycles

Process

Product

Chemical Recycling (Fiber rebuilding)

- Current challenges in solvent selection
  - Toxic (e.g., carbon disulfide)
  - Expensive (e.g., ionic liquid)



Research - Project 1

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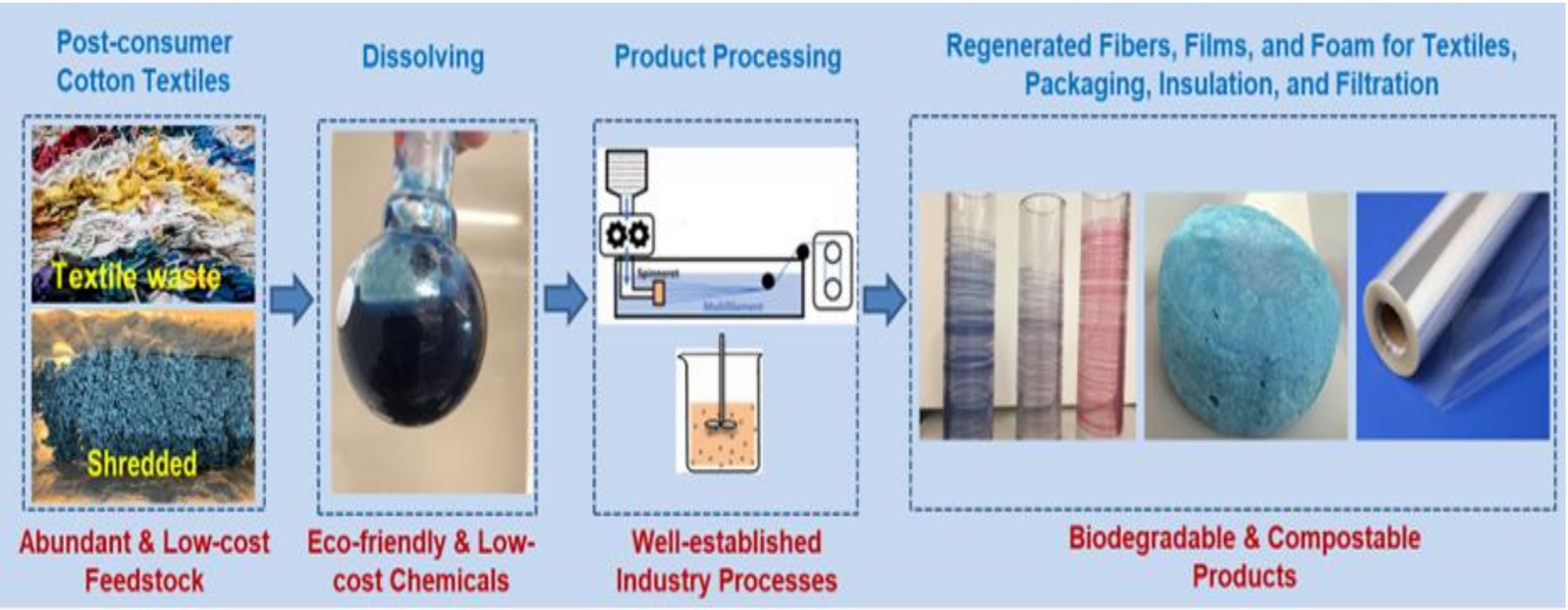
Patented Technology - Environmentally Friendly Cotton Waste Chemical Recycling

Patents issued in the US, China, India, and Europe



Competitive advantages

- Nontoxic and low-cost solvents;
- Process is industrially well-established;
- Can recycle cotton/synthetic blends;
- Dyes in the waste are retained;
- Recycled products are independent of the conditions of the waste.

Research - Project 2

Recycling Waste from the Hospitality Industry

WASHINGTON STATE UNIVERSITY

Motivation -- Total linens in Washington State: 8.3 million lbs.

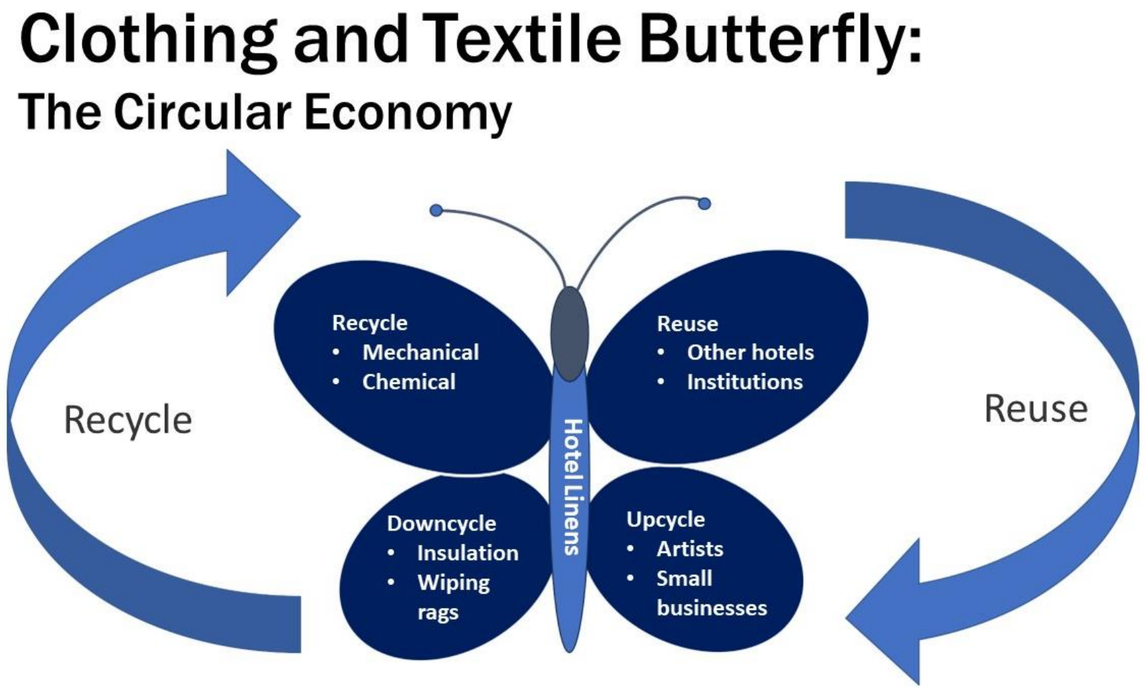
Muckelshoot Hotel, Auburn, WA

Laundry – Sheraton Hotel
Seattle, WA

Research - Project 2

Work completed – hotel survey and interviews

- Most hotels discard their linens in landfills due to stains and tears, some are donated
- Estimate 539,773 lbs. discarded hotel linens per year in Washington State
- Discarded commercial linens create an opportunity



Education

Building the Workforce Pipeline to Fuel the Future

WASHINGTON STATE UNIVERSITY

Sustainability in the Curriculum

- Textile production
- Merchandising, management, & consumer behavior
- Design

Student Research

- Laboratory-based recycling projects
- Undergraduate research internships focus on sustainability
- Recycling design competitions

Industry Engagement

- Sustainability seminar series
- Industry panels
- Industry case studies/class projects

Extension

Translating research into practice

WASHINGTON STATE UNIVERSITY

Extension in Washington

- Research and extension centers
- County offices
- Tribal extension offices

Commercial & Institution Support

- Hospitality
- Healthcare
- Correctional facilities
- University housing

Consumer Education

- Quality and not quantity
- Rewear, reuse, and repair
- Rehome, reinvent, and refashion
- Then…… upcycle, downcycle and recycle

Collaboration

Engaging with Academia

WASHINGTON STATE UNIVERSITY

Why

- Cross-discipline Expertise
  - Material science/engineering
  - Economic analysis
  - Life cycle assessment
  - Marketing and business
- Resources
  - Students
  - Equipment
  - Technology commercialization support
- Connections with the community
  - Community and economic development

How

- Research
  - Collaborated projects/grant proposals
  - Industry sponsored projects
  - SBIR/STTR grant proposals
- Classrooms
  - Class guest speakers
  - Internships
  - Industry-sponsored class projects, competitions, and scholarships
- Technology commercialization
  - Technology licensing

Thank you!

hangliu@wsu.edu

patricia.townsend@wsu.edu

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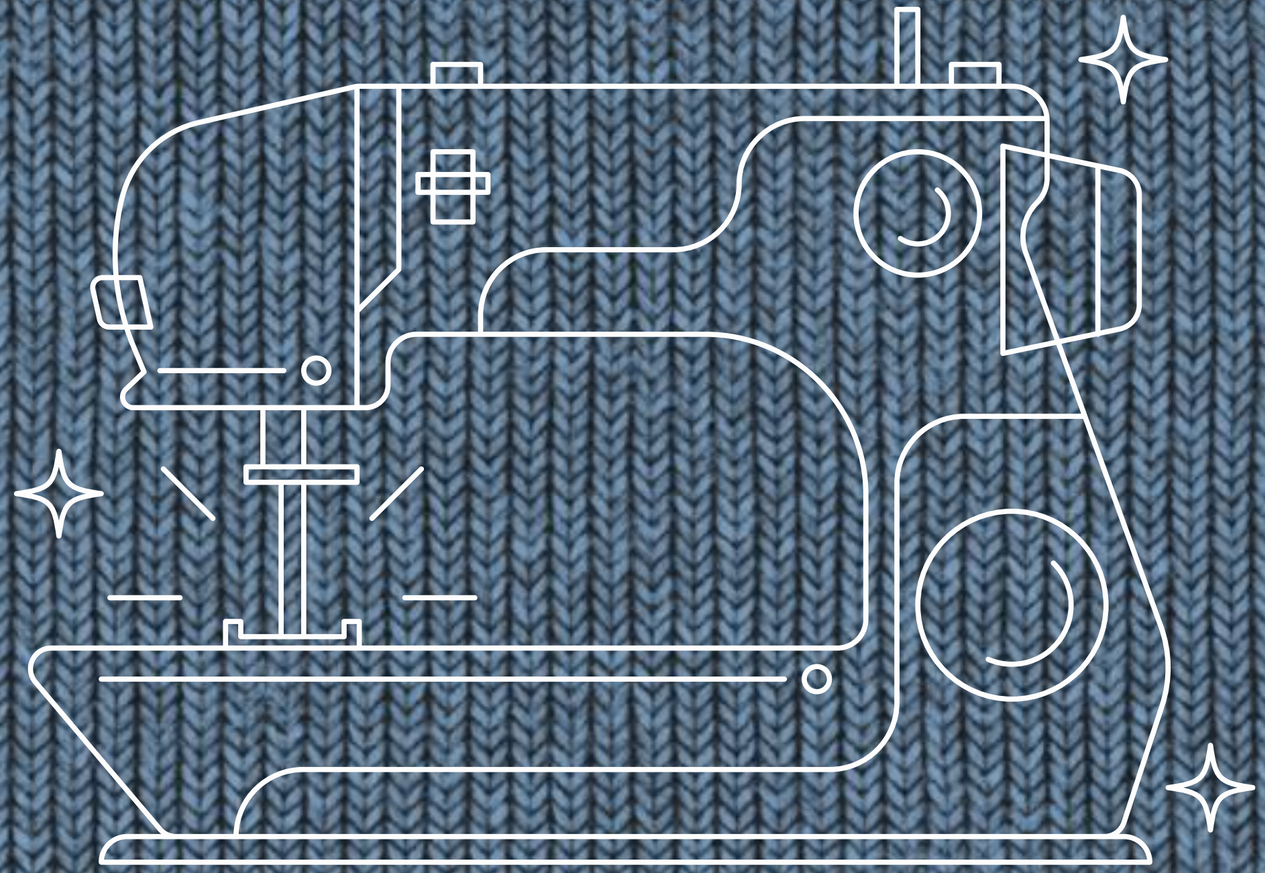

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Takeaways


Unraveling the Textile Industry
for a regenerative Washington
Survey
RMDC QR Code
Final Webinar May 15th
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WEBINAR SERIES