SYFA
Synthetic Yarn and Fabric Association

Synthetic Yarn and Fabric Association
FALL CONFERENCE

ACP X SYFA 2021

SUPPORT PROVIDED BY

Gap Inc.

Walmart org

FOUNDING PARTNERS

Gap Inc.

GIOTEX

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Tencel™ Feels so right

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Mission

To establish systems that will use the embedded value and resources in existing textiles for new products, reducing the millions of tons of textile waste annually going into landfills and thereby supporting the reduction of the industry's environmental impacts.

Theory of Change

The development of knowledge on missing or under-utilized supply chain links and the identification of requirements necessary to connect those links, maps can be developed that will allow the industry to choose among a multitude of paths the right direction for their individual businesses to quickly and efficiently adopt truly circular supply chains. By outlining these roadmaps to include multiple waste streams as raw material sources through waste handlers, sorters and recycling technologies that can link to the traditional textile supply chain the use of virgin resources will be displaced and textile waste will be reduced.

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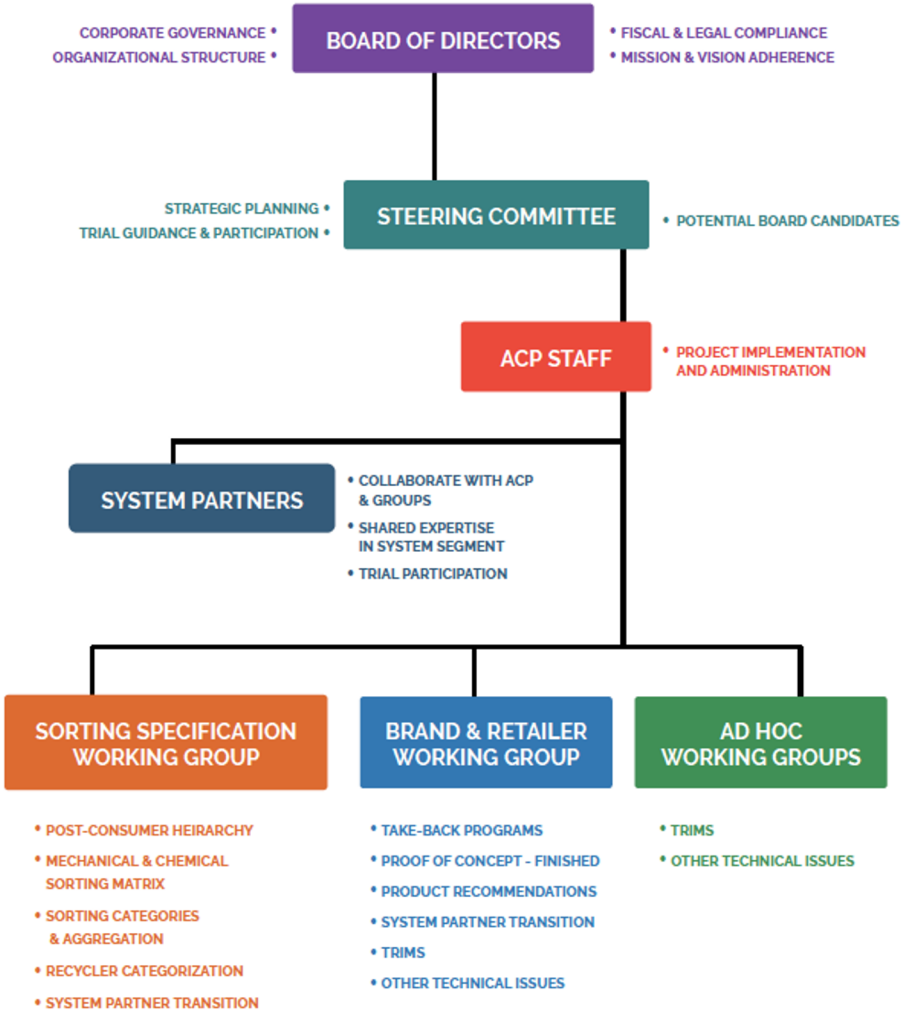
Structured for Collaboration



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Circularity = Connections

ACP Steering Commitee

Eastman | GAP Inc. | Giotex | Gr3n | Lenzing | Milliken | Target
Unifi | VF Corp

ACPE Steering Commitee

Dupont | EOG | GIZ | Inditex
Lenzing | Recover | Recyclatex
Reverse Resources
Tomra | WWF | Zalando

Circularity = Collaborators

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Spent Textiles:
- Collectors
- Sorters
- Preprocessors
- Recyclers

Brand & Retailer:
- Brands
- Retailers
- Collectors

Trial Pods:
- Collectors
- Sorters
- Preprocessors
- Recyclers
- Spinners
- Fabric Mills
- CMT
- Brands & Retailers

Spent post-consumer textiles ->US East Coast (millions of tons)

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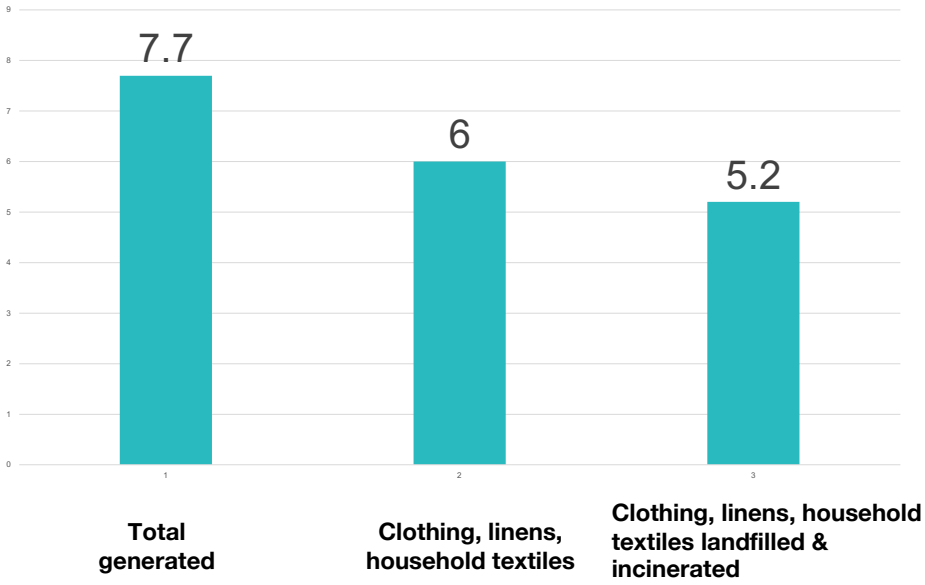

Photo by Alejo Reinoso on Unsplash

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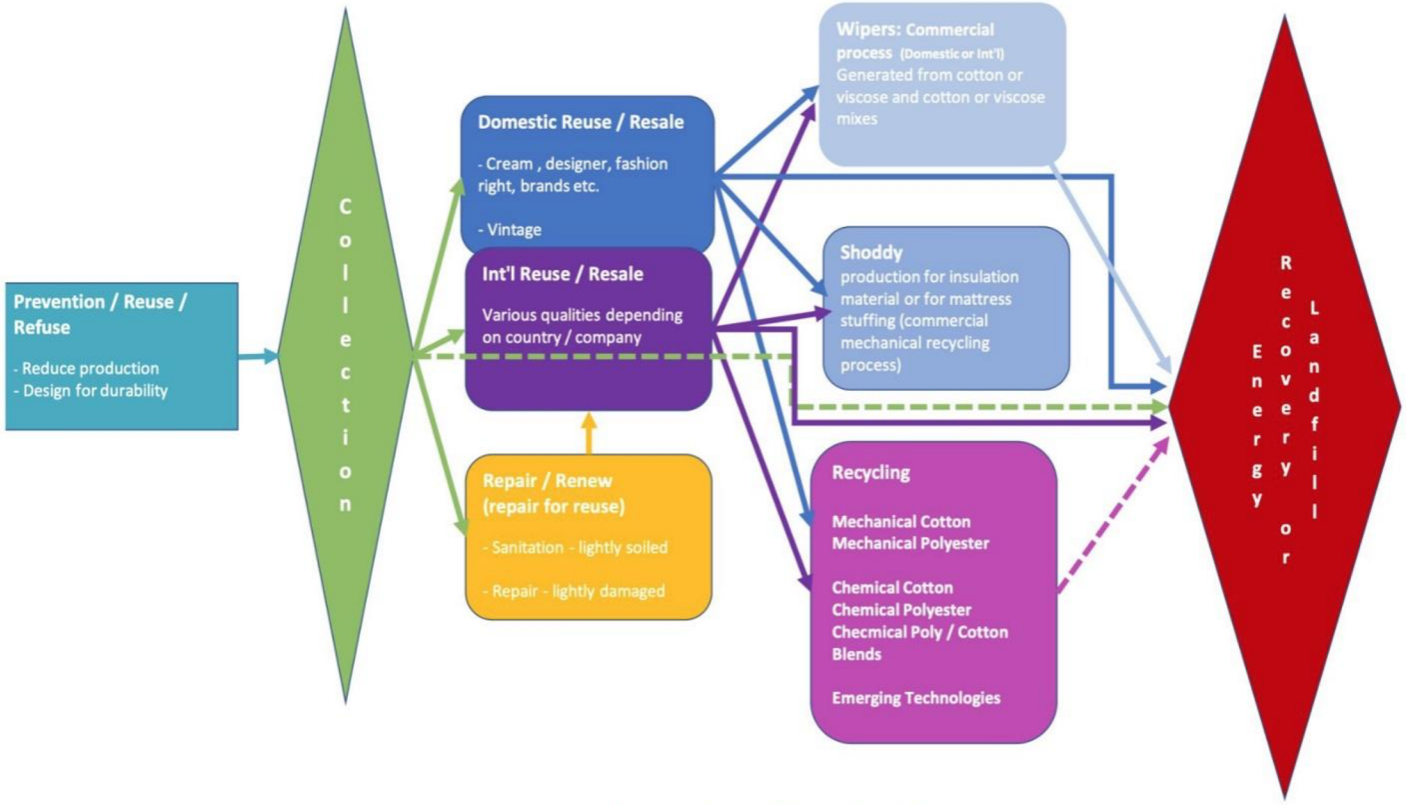
Spent Textile Use Case Hierarchy



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Recycler Matrices

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Mechanical Recycling Matrix

Feedstock Fibers	Acceptable for:		Can include:							Must Consider:			
	Textile-to-Textile	Wipers, Shoddy & Insulation	Elastane	Trims		Pigments/ Prints	Coatings/ Films		Chemistry/ Dyes	Fabric Construc-tion	Color	Full Garments v. Parts	Fabric Scraps
				Plastic	Metal		PET	Other					
100% Cotton	Y	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y
98% Cotton/ 2% Elastane	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y
90% Cotton/ 10% Other	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y
60% Cotton/ 40% Polyester	N	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y
60% Cotton/ 40% Other	N	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y
100% Polyester	Y	Y	N	N	N	N	Y	N	Y	Y	Y	Y	Y
98% Polyester/ 2% Elastane	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	Y
80% Polyester/ 20% Other	N	Y	N	N	N	N	N	N	N	N	N	N	N
60% Polyester/ 40% Cotton	N	Y	N	N	N	N	N	N	N	N	N	N	N
60% Polyester/ 40% Other	N	Y	N	N	N	N	N	N	N	N	N	N	N
100% Viscose	?	?	?	?	?	?	?	?	?	?	?	?	?
60% Viscose/ 40% Other	?	?	?	?	?	?	?	?	?	?	?	?	?

Textile to Textile Recycling Wiper/Shoddy

Chemical Recycling Matrix

Feedstock Fibers	Can Include:						Must Consider:					
	Elastane	Trim		Pigment/ Prints	Coatings/Films		Chemistry/ Dyes	Fabric Construction	Color	White	Full Garments v. Parts	Fabric Scraps
		Plastic	Metal		PET	Other	Y	Y				
100% Cotton	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
98% Cotton/ 2% Elastane	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y
90% Cotton/ 10% Other	Y	N	N	N	N	N	Y	N	N	N	Y	Y
60% Cotton/ 40% Polyester	N	Y	N	N	Y	N	Y	N	N	N	Y	Y
60% Cotton/ 40% Other	Y	Y	N	N	Y	N	Y	N	N	N	Y	Y
100% Polyester	N	N	N	N	Y	N	Y	N	N	N	Y	Y
98% Polyester/ 2% Elastane	Y	N	N	N	Y	N	Y	N	N	N	Y	Y
80% Polyester/ 20% Other	Y	N	N	N	Y	N	Y	N	N	N	Y	Y
60% Polyester/ 40% Cotton	N	Y	N	N	Y	N	Y	N	N	N	Y	Y
60% Polyester/ 40% Other	Y	Y	N	N	Y	N	Y	N	N	N	Y	Y
100% Viscose	?	?	?	?	?	?	?	?	?		?	?
60% Viscose/ 40% Other	?	?	?	?	?	?	?	?	?		?	?
Other												

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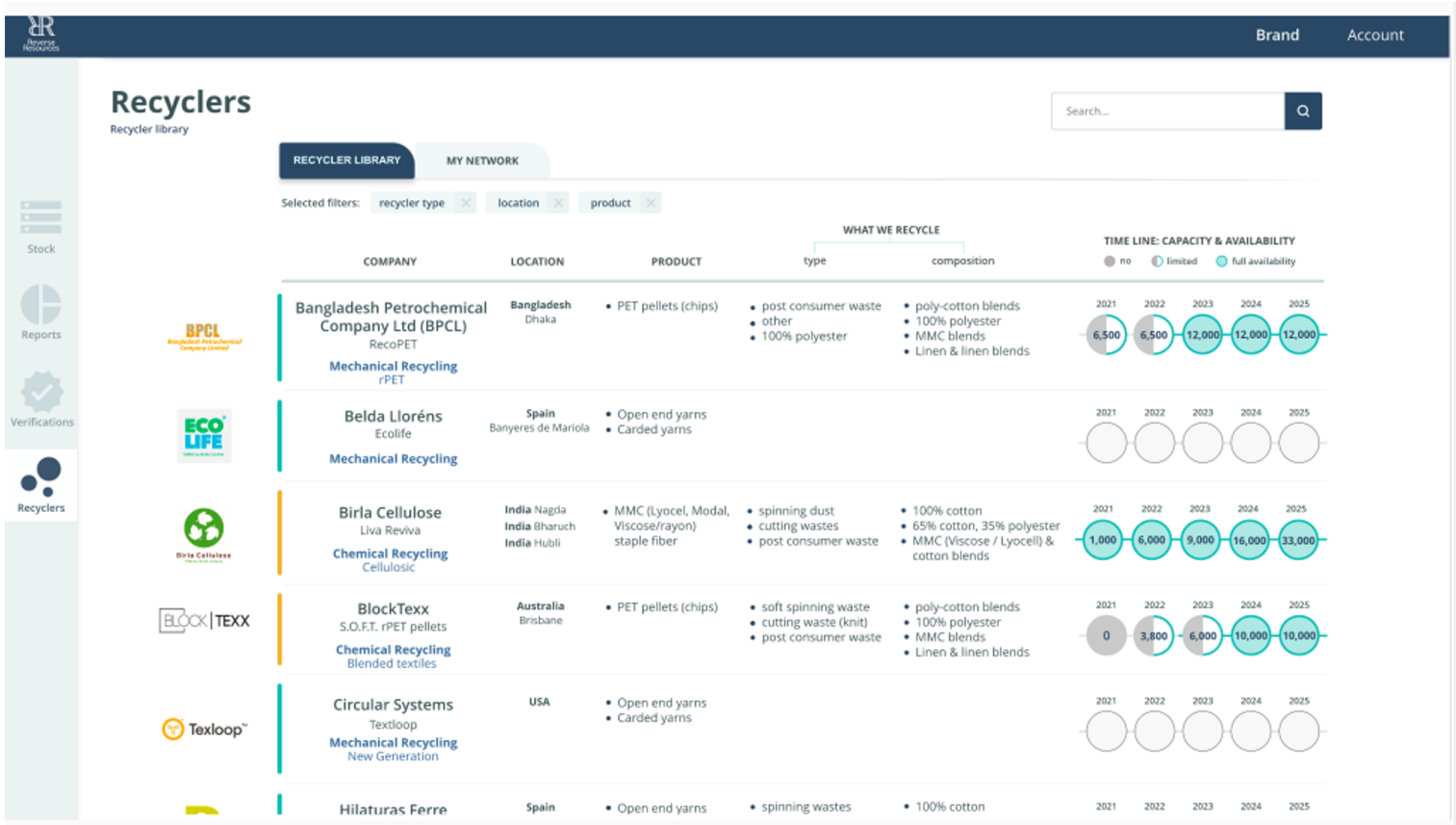
Reverse Resources



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Collaboration = Action

ACP has done an incredible job bringing key stakeholders in the global fashion landscape together for the first time. These conversations have resulted in the joining, in a very real and practical sense, the chains that will make the circular economy. We can see fantastic examples for scalability in circularity in fashion already being put in motion….action is what our industry needs and action is what ACP is doing.

……..Steven Bethel,
President & Partner Bank & Vogue

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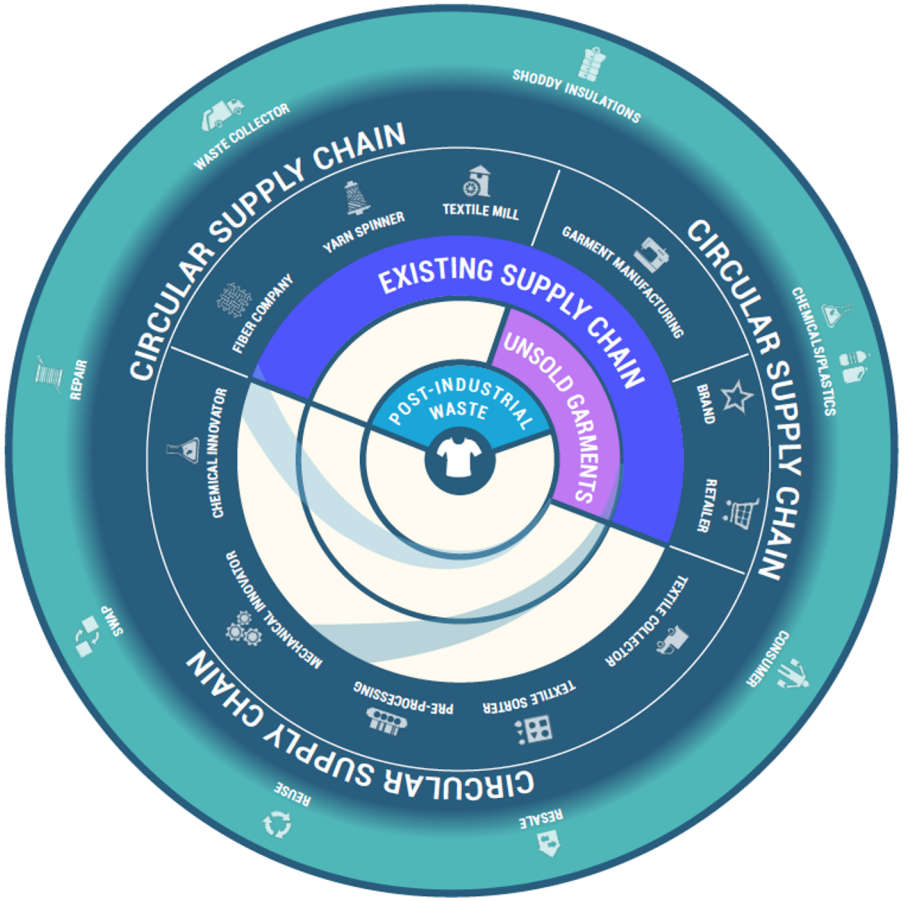
Scope



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System Trial Elements

TRIAL INPUTS

COLLECTION TYPES
Commercial Bin
Contract Commercial/ Industrial
Curbside
Drop-off
Event-based
Mail-in
Residential Bin
Take-back

SORTING RANGES
Whole garments
Mixed color
Mixed construction
Mixed fibers
Knit constructions
Rolled goods
Sorted colors
Yarn waste

SORTING REQUIREMENTS
Sort to grade
Sort to rFeedstocks
Feedstock aggregation

COLOR SORTING GRADES
Mixed color
Dark colors
Light color
White
PC by color group
PI by color group

PREPROCESSING REQUIREMENTS
Trim removal
Right sizing
Shredding
Disassembly
Sanitation
Testing
Feedstock aggregation

FEEDSTOCK TYPES
Post-consumer
Cotton
Polyester
Polyester/Cotton Blends
Polyester/Cotton Blends with <10% other fibers
PET Bottles

Post Industrial
Cotton
Polyester
Polyester/Cotton Blends

Virgin
Cotton
Wood Pulp

RECYCLER TYPES
Chemical Cellulosic
Chemical PET
Mechanical Cotton
Mechanical Poly
Mechanical PET
Semi-Chemical Cellulose

TRIAL OUTPUTS

RECYCLED OUTPUTS
Refibra™
Cellulose Pulp
Staple Fiber
Filament Fiber
PET Monomer
PET Chip
Yarn
Fabric

TEXTILE TYPES
Knits
Jersey
Fleece
Pique

Wovens
Denim
Canvas
Terry

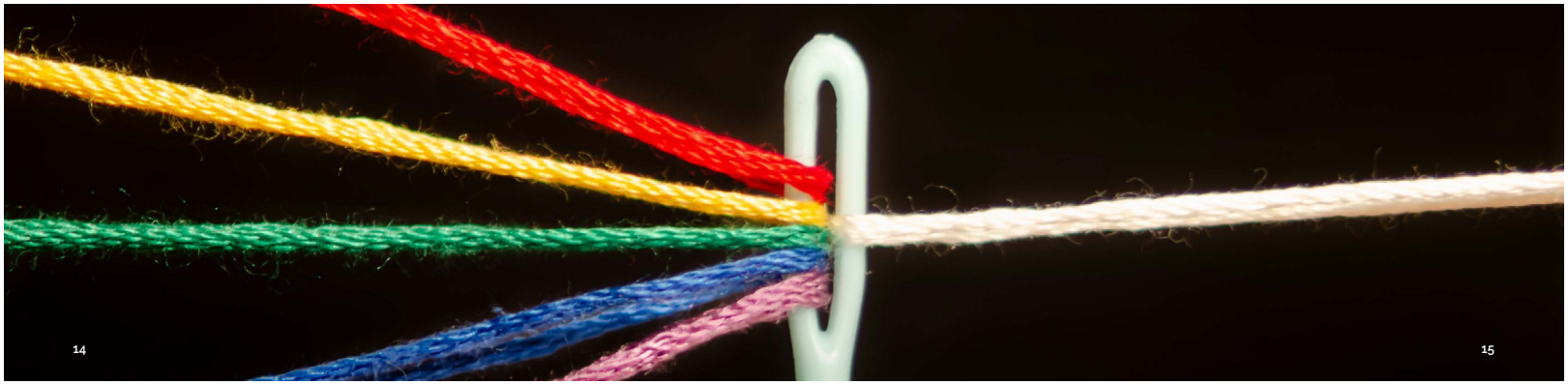
PRODUCT TYPES
T-shirts
Jeans
Fleece
Home Textiles

FIBER TYPES
Recycled
rCotton
rPolyester
rPET Chip
Refibra™

Virgin
Cotton
Polyester
Elastane
Dupont Sorona®
Tencel™
Naia Renew™

YARNS
Knitting
Naia Renew™/Polyester
20/1 Cotton
20/1 Cotton/Polyester
20/1 Cotton/Polyester/Refibra™
150D/78F Polyester

Weaving
8/1 Cotton
10/1 Cotton
10/1 Cotton/Polyester
10/1 Cotton/Polyester/Refibra™



The Basics

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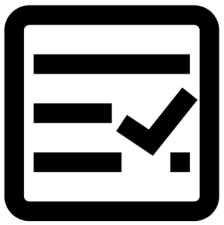
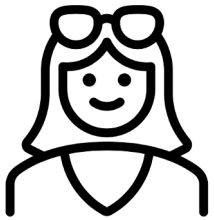


- Feedstocks
  - Post-consumer through take-backs
  - Post-consumer through supply chain
  - Post-industrial through supply chain
  - Virgin

- Trial Outputs
  - Fiber
  - Yarn
  - Fabric
  - Finished Good



- Trial Buy-In Stages
  - Yarn
  - Fabric
  - Finished Good

System Trial **OUTPUT** Categories

- Sorting fractions
- Waste resources
- Recycling capabilities
- Volumes

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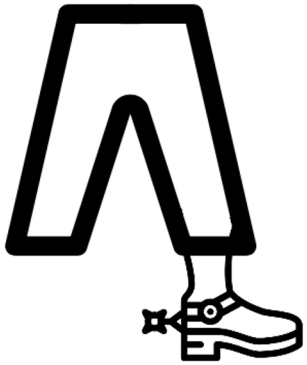
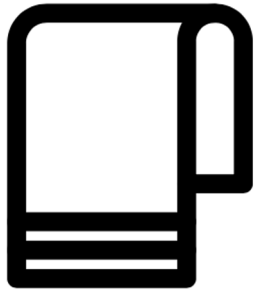
T-Shirts/Fleece

Non-Denim Wovens



Denim



Home Textiles

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Trial Menus

	Proposed Product									Calc'd % Input to Total														
											rCotton		rPoly		rPET Chip		Refibra™			Naia ReNew™				
POD	Trial: Product Description	Tech	Description	w/ Chemical Technology	Recycling Technology	Composition	Yarn Size	Estimated Fabric Weight	Virgin Cotton	%PC-Cotton	%PI-Cotton	%PC-Poly	%PI-Poly	%PC-Bottles	% PC Chemical	Virgin Pulp	%PC-Cotton	%PI-Cotton	Virgin Pulp	Blended Spent	Other	Total
T-Shirt/Fleece	Trial 1A: Dyeable T-Shirt (150D/78F 100% rPET)	Knit/100% Poly Filament	50/50 Bottles/PET Chem	Chem PET	Mechanical PET Chemical PET	100% rPET	150D/78F	140GSM	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
	Trial 4: Dark Heather Overdye T-Shirt 150D/78F 30% rPolyester/70%rPET	Knit/100% Poly Filament	30% Textile inputs - 12% PC, the rest is bottles		Mechanical Polyester Mechanical PET	30% rPolyester/70%rPET	150D/78F	140GSM	0%	0%	0%	30%	0%	70%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 6: Poly Fleece Hoodie (150D/78F 100%rPET)	Knit/100% Poly Filament	50/50 Bottles/PET Chem	Chem PET	Mechanical PET Chemical PET	100% rPET	150D/78F	150GSM	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
	Trial 5: Over-Dyeable Lightweight Activewear T-Shirt (20/1 30% (r)Polyester/30%rPET/40% Naia™ Renew)	Knit- Spun Blend (no cotton)	30% Poly Textile input on Staple 1:1 PC/PI + 30% Bottle The rest is Naia	Chem Acetate	Chemical Blends Mechanical PET Mechanical Polyester	30% (r)Polyester/30%rPET/40% Naia™ Renew	Range Staple Blend or Filament Yarn	150GSM	0%	0%	0%	30%	0%	30%	0%	0%	0%	0%	24%	16%	0%	100%
	Trial 1B 100% Cotton T-Shirt (20/1 100%rCotton Sorted to White or Color)	Knit-100%Cotton	100% PI		Mechanical Cotton	100%rCotton	20/1	140GSM	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 1B 100% Cotton T-Shirt (20/1 100%rCotton Sorted to White or Color)	Knit-100%Cotton	100% PI		Mechanical Cotton		20/1	140GSM	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 1C 100% Cotton T-Shirt (20/1 60%rCotton/40%Virgin)	Knit-100%Cotton	30% PC input 30% PI input 40% Virgin		Mechanical Cotton	60%rCotton/40%Virgin	20/1	140GSM	40%	30%	30%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 12: T-shirt w/ Refibra (20/1 60% rCotton/40% Refibra™)	Knit-Blend (no poly)	15% PC Cotton + 15% PI Cotton- Refibra bumps the PC Cotton up by another 12%	Chem Cellulose	Chemical Cellulosic Mechanical Cotton	60% rCotton/40% Refibra™	20/1	140GSM	30%	30%	0%	0%	0%	0%	0%	28%	12%	0%	0%	0%	0%	100%
	Trial 2: Limited Color Dye T-Shirt (20/1 60%rCotton/40% rPET)	Knit-Blend	Low Post-Consumer Cotton and Poly- but dyeable	Chem PET	Mechanical Cotton (White) Chemical PET Mechanical PET (Bottles)	60%rCotton/40% rPET	20/1	140GSM	0%	30%	30%	0%	0%	36%	4%	0%	0%	0%	0%	0%	0%	100%
	Trial 3: Dark Heather Overdye T-Shirt (20/1 60%rCotton/30% rPET/10%rPolyester)	Knit-Blend	100%PI Cotton/Bottles Trial is about into of 10% PC Polyester		Mechanical Polyester Mechanical PET Mechanical Cotton	60%rCotton/30% rPET/10%rPolyester	20/1	140GSM	0%	30%	30%	20%	0%	20%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 7: Sweatshirt Hoodie (10/1 65%rCotton/35%rPoly) Construction: Need to finalize	Knit-Blend	10% PC Cotton, 2:1 PI:PC, 33% Virgin, 5 % PC Poly, the rest is bottles + trying to add in a nomnal amount of Chem PET	Chem PET	Mechanical Cotton (White) Chemical PET Mechanical PET (Bottles)	32%rCotton/33%Virgin/5%rPolyester/30% rPET	10/1	280GSM	35%	30%	0%	5%	0%	30%	0%	0%	0%	0%	0%	0%	0%	100%
Denim	Trial 8: Black Denim Jean 10/1 Yarn Fabric Composition: (40% rCotton/20% Virgin Cotton/10%rPolyester/26%rPET/ 4%Sorona) WARP	Woven-Blend	Warp 100% Cotton or Cotton /Poly (Black okay?)	Maybe Chem PET	Mechanical Cotton Mechanical Polyester Mechanical PET	Fabric Composition: 40% rCotton/20% Virgin Cotton/10%rPolyester/26%rPET / 4%Sorona	10/1	360GSM	60%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 9: Soft Denim Jean 12/1 Yarn (Fabric Composition: 18%rCotton/28%Virgin Cotton/50%Refibra/4% Sorona)	Woven-Blend	Warp: Cotton/Refibra Blend	Chem Cellulosic	Chemical Cellulosic Mechanical Cotton	Fabric Composition: 18%rCotton/28%Virgin Cotton/50%Refibra/4% Sorona	12/1	360GSM	30%	20%	0%	0%	0%	0%	0%	35%	15%	0%	0%	0%	0%	100%
	Trial 10: Standard Denim Jean 10/1 Yarn Fabric Composition: (36%rCotton/60%Virgin Cotton/4% Sorona)	Woven 100% Cotton	Warp: 100% Cotton heavyweight yarn		Mechanical Cotton	Fabric Composition: 36%rCotton/60%Virgin Cotton/4% Sorona	10/1	360GSM	60%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Non-Denim	Trial 13: Canvas Pant (10/1 50% rCotton/50%Virgin Cotton)	Woven 100% Cotton	Non-Denim Woven		Mechanical Cotton	60% rCotton/ 40%Virgin Cotton	10/1	360GSM	60%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Trial 14: Twill Bottom Weight Pant (12/1 30%rCotton/30%Virgin/100% rPolyester)	Woven-Blend	Non-Denim Woven		Mechanical Cotton Mechanical Poly Mechanical PET	30%rCotton/30%Virgin/10% rPolyester / 30%rPET	12/1	360GSM	30%	30%	0%	10%	0%	30%	0%	0%	0%	0%	0%	0%	0%	100%
Home	Trial 11: Bath Towel (Ground: 65% rPET/ 35%rCotton Loop 100% rCotton)	Woven -Blend	Cotton/Poly Ground Yarn w/ 100% Cotton Loop		Mechanical Cotton Mechanical PET	Ground: 65% rPET/ 35%rCotton	13/1	1.1 lbs.	0%	35%	0%	0%	0%	59%	7%	0%	0%	0%	0%	0%	0%	100%
	Trial 15: Ringspun Cotton Bath Towel (Ground: 13/1 50%rCotton/50%Virgin Loop: 50%rCotton/50%Virgin)	Woven 100% Cotton	1:1 Virgin to PI Cotton Blend		Mechanical Cotton	50%rCotton/ 50%Virgin	13/1	1.1 lbs.	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%
	Trial 16: Bedsheet (30/1 65% rPET/ 35%Naia™ Staple)	Woven-Blend	Fine Gauge Yarn with Naia technology	Chem Acetate	Chemical Blends Chemical PET Mechanical PET	65% rPET/ 35%Naia™ Staple	30/1	124gsm	0%	0%	0%	0%	0%	33%	33%	0%	0%	0%	21%	14%	0%	100%

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Envisioning Circular Systems

NEEDS	TRIAL DEMONSTRATES	FUTURE
Downstream Demand for Feedstocks	Feedstock Availability and Quality	Circular Commercial Products
Standardized Feedstock Fractions	Sorting Capabilities	Consistent Quality Bales
Multiple Paths for Sorted Materials	Paths for Material Flows	Optimized Material Flows
Clearly Defined Costs	Process Costs	Systems-based Costs
Logistics	Transportation Routes	Maximized Coverage and Efficiency

Business Model: Triple Bottom Line

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Economics

- What……
  - are current business models?
  - needs to change?
  - are the considerations?
- Who will participate?

Environmental

- What's included…..
  - GHG?
  - Water?
  - Chemicals?
- How to measure?

Social

- What required…..
  - legislation?
  - local/global alliances?
  - social compliance?
- Who will advocate?

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https://www.acceleratingcircularity.org/stakeholder-registry