



GENERAL RECYCLED

www.generalrecycled.com

VANCOUVER LEDUC VAL-des-SOURCES

***Closed Loop
Recycling of Aramid
Garments at the End of
Their Lifecycle***

Who We Are

- General Recycled is a Public Service Company, specializing in reducing the amount of goods being sent to the landfill while simultaneously producing new fibre, and/or yarns, and/or FR fabrics, reducing carbon footprint in a “closed loop” program

Ownership Group and Facilities

- Ted Parker, Larry Suzuki, Dave Kasper
- Head Office – Burnaby, British Columbia, Canada
- Recycling and Shredding Facility – Val-des-Sources, Quebec
- Recycling Warehouse - Leduc, Alberta

What We Do

- We collect end of life goods from a single source, company or government
- Categorize/separate goods
- Establish a desired fibre formula and plan system speeds unique to that company and their waste
- Work with spinners, weavers and knitters to overcome any production issues and produce a usable product through an existing value chain

Why?

- Experience has taught us that EPR works only when an incentive has been offered
- When a company/government agrees that they want to use recycled fibres in their new product, developed from their end of life workwear, it immediately puts pressure on the complete supply chain to do the same
- The incentive is a sale
- Working with international, publicly traded producers, it is clear that they will not recycle on their own if they think it costs more or interrupts their operations or logistics

Quebec Recycling Facility



Manufacturing Industry Partners Include

- Regitex - Yarn Producer, Saint-Josephe-de-Beauce, Quebec
- Coats - Yarn Producer, USA
- Argentum – Yarn Producer, Mexico
- Oratex - Circular Knitter, dyeing and finishing, Montreal, Quebec
- Teijin Aramid - Meta and Para Aramid fibre supplier
- Kermel - Meta Aramid Solution Dyed fibre supplier
- Yantai - Meta and Para Aramid fibre supplier

The Recycling Process

- Created and developed in Canada
- Patented process and patented product
- Focus on inherent Flame Resistant garments and fabrics
- Clean FR garments are collected from end-users at the end of the garment's life cycle
- Garments/fabric scraps are shredded back into fibre
- Recycled fibre is blended and spun into yarn
- Recycled yarn is woven/knit into FR certified fabrics or used to produce non-wovens

Recover

- Examples of garments produced with fibre that can be recycled include: Nomex IIIA®, Kermel®, Kevlar®, Nomex® MHP, Conex, Twaron, PBI, Tecasafe® Plus
- Limited collection of *treated* cotton and cotton/nylon fabrics
- On-going R&D on *treated* cotton and/or cotton/nylon fabrics and garments
- Recycled aramid garments can be recycled repeatedly

Recover

- All garments must be cleaned to remove residual contamination
- Oil removed in the “dry cleaning” process has been collected and recycled
- Brass zippers and brass snaps are removed and recycled locally prior to shredding garments
- High-visibility FR reflective striping can also be recycled in our process

Cutting System

- Nomex III A scraps processed on carbon blade cutting system



Blending Box

- Fabric cuttings entering the recycling line



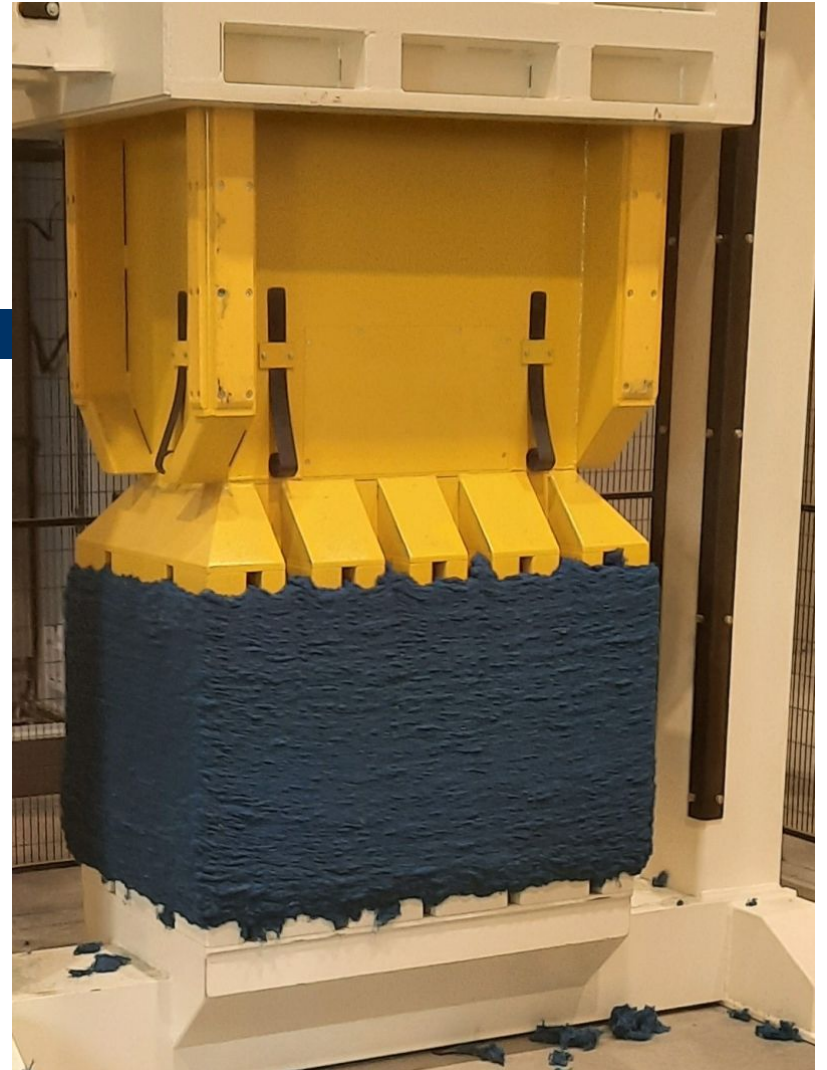
Twin Carding & Opening System

- TCO 1 & 2



Baler

- Our first Recycled Nomex III A fibre bale



Re-use

- Once garments are shredded, the recycled fibre is blended with virgin fibres using GR's patented formula, creating a recycled inherent flame resistant yarn with 20-50% post consumer recycled aramid content
- Recycled yarn is used to weave or knit a variety of fabrics. Fabrics include 4.5 plain weave, 6oz twill, 7oz twill, plaited jersey, athletic fleece, polar fleece, FR cuffs, and non-woven needle punch
- ALL OF OUR RECYCLED ARAMIDS CAN BE RECYCLED REPEATEDLY

Yarn Process

- Recycled Meta aramid fibre sliver



Ring Spun Yarn

Spinning our recycled inherent flame resistant (FR) yarn:

Fibre blend includes using branded and generic Meta and Para aramids, Modacrylic, flame resistant FR Lenzing, and Anti Stat

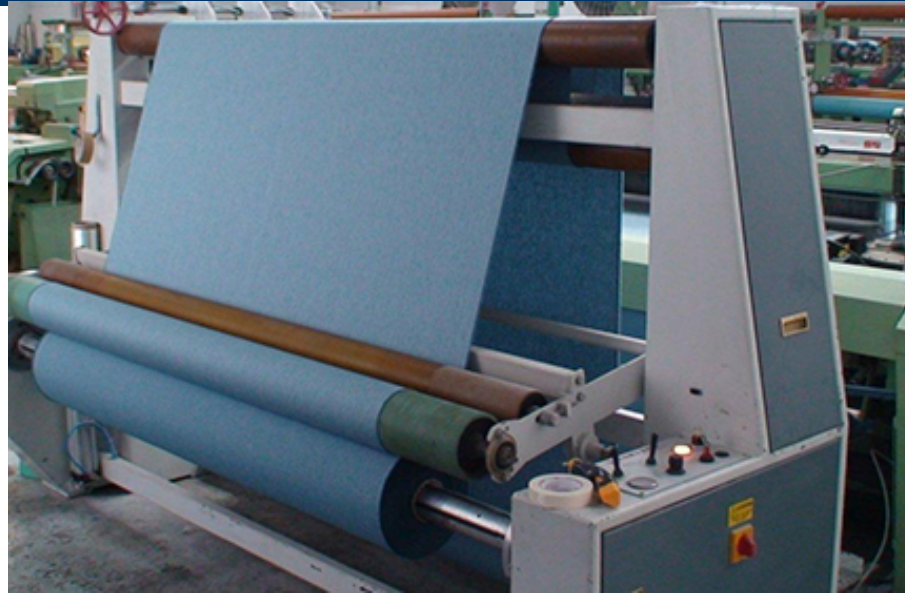


Finished Yarn

Recycled yarn set up on a circular knitting machine, producing recycled fleece, and other base-layer fabrics



Weaving Process



Weaving recycled 2 x 1 twill aramid fabric

Re-dye

- Recycled fabrics are available in piece dyed, bale or solution dyed colours
- Recycled fabrics have a unique appearance



Colour Expectations

- Importance of colour variance



Reduce

- Global demand for Para/Meta aramid production in 2021 estimated at 115-125 thousand tons
- Aramid garments should **NOT** be incinerated (chemical structure is the Aromatic Benzene ring)...currently, landfill is the only option
- Landfill operators are starting to refuse flame resistant aramid garments
- **Garments made from recycled aramids can be recycled repeatedly**
- Disposal problem can be eliminated
- EPR???

Process of Recycling Garments

- GR will help companies identify their current costs associated with disposal...and transfer those costs onto General Recycled
- Garments continue to be dry cleaned/cleaned prior to disposal as they are now
- Accumulate garments for disposal on site, or arrange transport to our Alberta or Quebec facility
- GR will not upset existing value chains. We work with both end-users and their preferred manufacturers to create a “closed loop” FR garment recycling program

Perceived Issues of using Recycled Fibre/Yarns/Fabrics

- Staple fibre length
- Available yarn counts
- Fabric Quality
- Lifecycle Longevity
- Competes directly against sku's that are produced using 100% virgin product

Does it cost more to use recycled garments?

- No new costs are anticipated for companies using recycled FR garments
- It is NOT a race to the bottom on price
- Permanently eliminates the need to send goods to landfill
- Recycled garments can be recycled repeatedly

Compliance to Industry Standards

- Canadian General Standards Board (CGSB) 155.20
- National Fire Protection Association (NFPA) 2112
- CSA Z462...Canadian Electrical Safety Requirements
- National Fire Protection Association (NFPA) 70E...Electrical Safety in the Work Place
- All recycled fabric to be UL certified as needed

3 Second Thermal Insulation Test, ASTM F1930



5 Second Thermal Insulation Test



Some Industries Using Inherent Flame Resistant Garments Include:

- Commercial Laundries
- Liquefied Natural Gas
- Electric Utilities
- Gas Utilities
- Oil Refineries
- Chemical manufacturing
- Rail/Port Authority/Airports/Airlines
- Sawmills/Pulp & Paper
- Firefighting/Wildland Firefighting
- Automotive
- Governments

Environmental Impact

- No need to landfill aramid garments or fabrics any longer
- Waste Management disposal cost savings
- Good corporate citizens
- Environmental stewardship
- Viable and simple “green” initiative for industry at large
- Low carbon footprint using our recycled process

Corporate Sustainability Messaging

(taken directly from their respective websites)

“With four Core Values—Safety and health, Respect for people, Highest ethical behavior, and Protecting the planet—anchoring our commitment to sustainable innovations, we’ve designed and maintained a foundation for long-term growth, connection with local communities, and an environment that attracts the best and brightest talent to help us deliver solutions to our customers. Our Core Values guide every decision about our operations, our products, and our impact. “

“We're committed to working collaboratively to reduce and eliminate our emissions by 2050.”

“Our customers are actively seeking means of reducing resource consumption, eliminating waste and lowering emissions of harmful substances. Every positive step we take with them toward a more sustainable planet carries benefits for our environment and all the living beings on Earth. ”

Questions?

