



GENERAL RECYCLED

a division of Sparlings Sportwear Mfg

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The Four R's of Recycling Flame Resistant (FR) Garments in the Industrial Work-Wear Market Place...

Recover, Recycle, Re-use, Reduce

Ownership Group and Facilities

- Ted Parker/Larry Suzuki/Dave Kasper
- Head Office – Vancouver, BC, Canada
- Recycling and Shredding Facility – Val-des-Sources Quebec
- Recycling Warehouse, Leduc, Alberta
- Shredding availability in Italy and Spain

Manufacturing...Industry Partners Include...

- Regitex...Yarn Producer, Saint-Josephe-de-Beauce, Quebec
- Texonic...Weaver, St. Jean-sur-Richelieu. Quebec
- Oratex...Circular Knitter, dyeing and finishing, Montreal, Quebec
- Textile Monterrey...Weaver and Dye house, Drummondville, Quebec

The Recycling process:

- Created and developed in Canada!
- “Patent pending” 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

Recover

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

Recover

- Recycled Nomex IIIA® (aramid) coveralls ready for shredding



Recycle

- All garments **MUST BE** cleaned to remove residual contamination (dry cleaning is more effective than wet-wash)
- 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 if on garments

Recycle

Recycled Nomex IIIA® fibre blended with virgin fibre, being processed into sliver prior to yarn spinning



Re-use

- Once garments are shredded, the recycled fibre is blended with virgin fibres using GR's unique 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
- At minimum, all fabrics are certified to CGSB 155.20, NFPA 2112, NFPA 70E, PPE 2/HRC 2. Some fabrics include UL certification
- ALL OF OUR RECYCLED ARAMIDS CAN BE RECYCLED REPEATEDLY!

Re-use

Spinning our recycled inherently flame resistant (FR) yarn:

Fibre blend includes using branded and generic Meta and Para aramids, modacrylic, flame resistant FR viscose, and anti stat



Re-use

Recycled Nomex IIIA® aramid yarn set up on a warp beam, preparing to weave fabric



Re-use

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



Reduce

- Global demand for Para/Meta aramid production in 2014 = 74.5 thousand tons...projected to be 115 thousand tons in 2021
- 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 has been eliminated

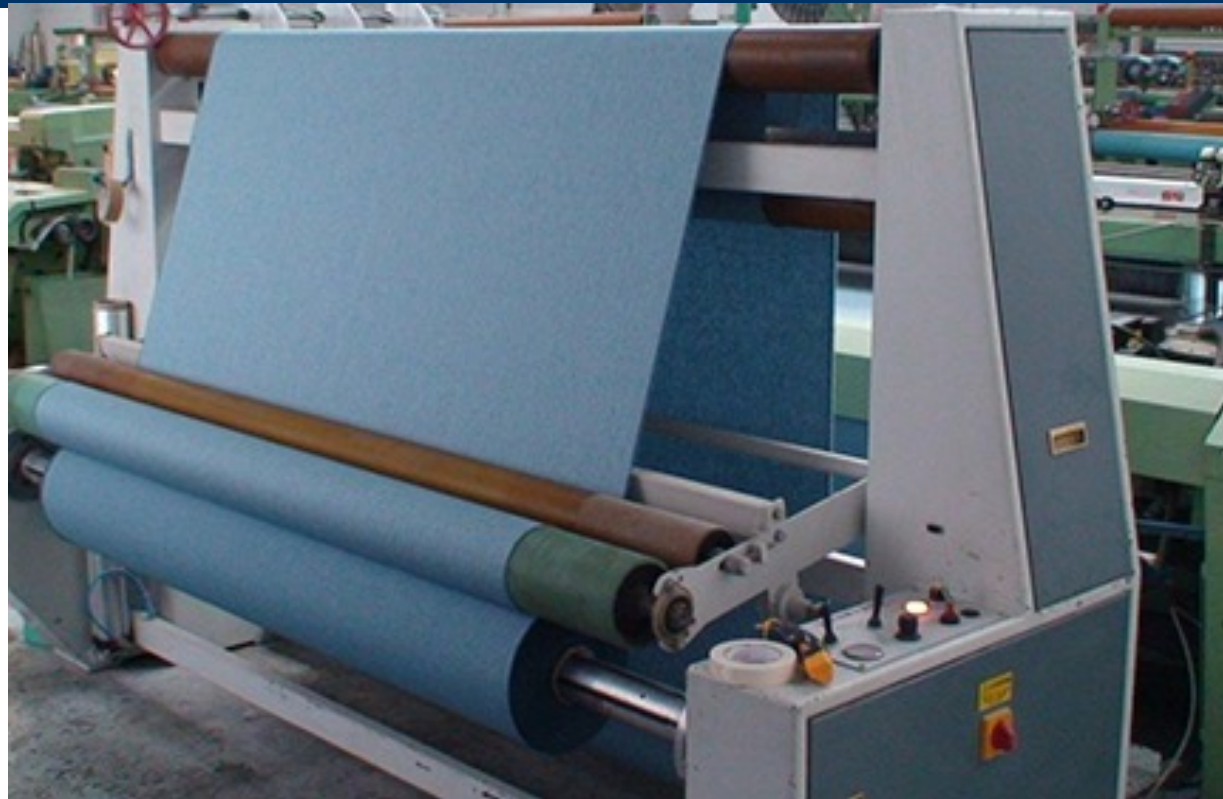
Reduce

Recycled inherent FR aramid fabric is woven using a blend of fibres that include:

- Nomex IIIA®, Conex, Kermel, Arawin,
- Yantai, Modacrylic, FR Viscose, Nylon



Reduce



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



Re-dye

- Textile Monterrey dye-house produces on average 10,000,000 metres of virgin and recycled fabric each year.



Suggested Process of Recycling Garments

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

Does it cost more to use recycled garments?

- No new costs are anticipated for companies using recycled FR fabrics and garments....However, it will require a new way of looking at their disposal problem, factoring in all associated disposal costs, and then incorporating those disposal costs into a new recycled garment program
- It is NOT a race to the bottom on price...virgin aramid fibres, generic or branded, are not cheap...but the program should be no more expensive than a current FR program in place!
- Permanently eliminates the need to send goods to landfill
- Again, 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

VIDEO: Three-Second Thermal Insulation Test



VIDEO: Five-Second Thermal Insulation Test



Industries Using Inherent Flame Resistant Garments

- Liquefied Natural Gas
- Electric Utilities
- Gas Utilities
- Oil Refineries
- Chemical manufacturing
- Rail/Port Authority/Airports
- Airlines
- Sawmills/Pulp & Paper
- Trucking
- Firefighting/Wildland Firefighting ...and all associated contractors

Environmental Impact

- Aramids are 100% non biodegradable
- No need to landfill aramid garments or fabrics any longer
- Recycled garments can be recycled repeatedly
- Waste Management disposal cost savings
- Good corporate citizens
- Environmental stewardship
- Viable and simple “green” initiative for industry at large

Environmental Responsibility

- Most companies using Flame Resistant aramid protective garments have excellent sustainability messaging on their respective websites and promotional materials. None however, mention that they dispose of their 100% non-biodegradable “used” aramid workwear in landfill. There is a lot of work being done within governments and industry on Extended Producer Responsibility legislation. (EPR) We recognize that many countries have no laws or incentives in place that encourages companies to recycle this type of textile waste properly. All companies have at the very least, a moral responsibility to recycle their non biodegradable waste when they know there is a cost effective avenue before them to do so.

Dr. David Boyd

“This is a step in the right direction, applying key principles of sustainability like reduce, re-use and recycle. Every step in the right direction helps.”

**David R. Boyd, Ph.D., J.D.
Adjunct Professor, Resource and Environmental
Management, Simon Fraser University**

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LATEST BOOKS:

[The Right to a Healthy Environment: Revitalizing Canada's Constitution \(UBC Press, 2012\)](#)

[The Environmental Rights Revolution: A Global Study of Constitutions, Human Rights, and the Environment \(UBC Press, 2012\)](#)