

1st Thematic Seminar

"Recycling in textile and waste disposal"

Alcoi, 20th Oct. 2016
@Ágora - Plaça Ramón i Cajal, 6

Event organised with the collaboration of





Wear 2 Technology

Craig Lawrance

Technical Manager at the Textile Centre of Excellence

Event organised with the collaboration of



Wear 2 Technology

“Recycling in textile and waste disposal”



Background

- Patent application pending and filed as WO2013/189956A1
- Patent covers;
 - Overall article disassembly process
 - Yarn properties and composition
 - Electromagnetic heating conditions and equipment design
- Integrated solution; know-how, IP licencing, yarn supply, microwave equipment supply
- Wear trials and seam quality tests conducted with 2 large end users in the UK and passed successfully (Royal Mail and George)

Craig Lawrance

Craiglawrance@textile-training.com

Alcoi, 20th Oct. 2016



Wear 2 Technology

“Recycling in textile and waste disposal”



Overview

- **wear2** process incorporates a unique yarn in selected seams during garment manufacture
- Microwave energy is used to activate the seam separation at disassembly, by degrading the yarn's tensile properties
- **wear2** allows discrete components such as buttons, zips, labels and decorative pockets to be removed with minimal force
- The rest of the garment remains undamaged and complete, ready for re-use
- Alternatively, the entire garment can be engineered to literally come apart at the seams into its constituent components

Craig Lawrance

Craiglawrance@textile-training.com

Alcoi, 20th Oct. 2016

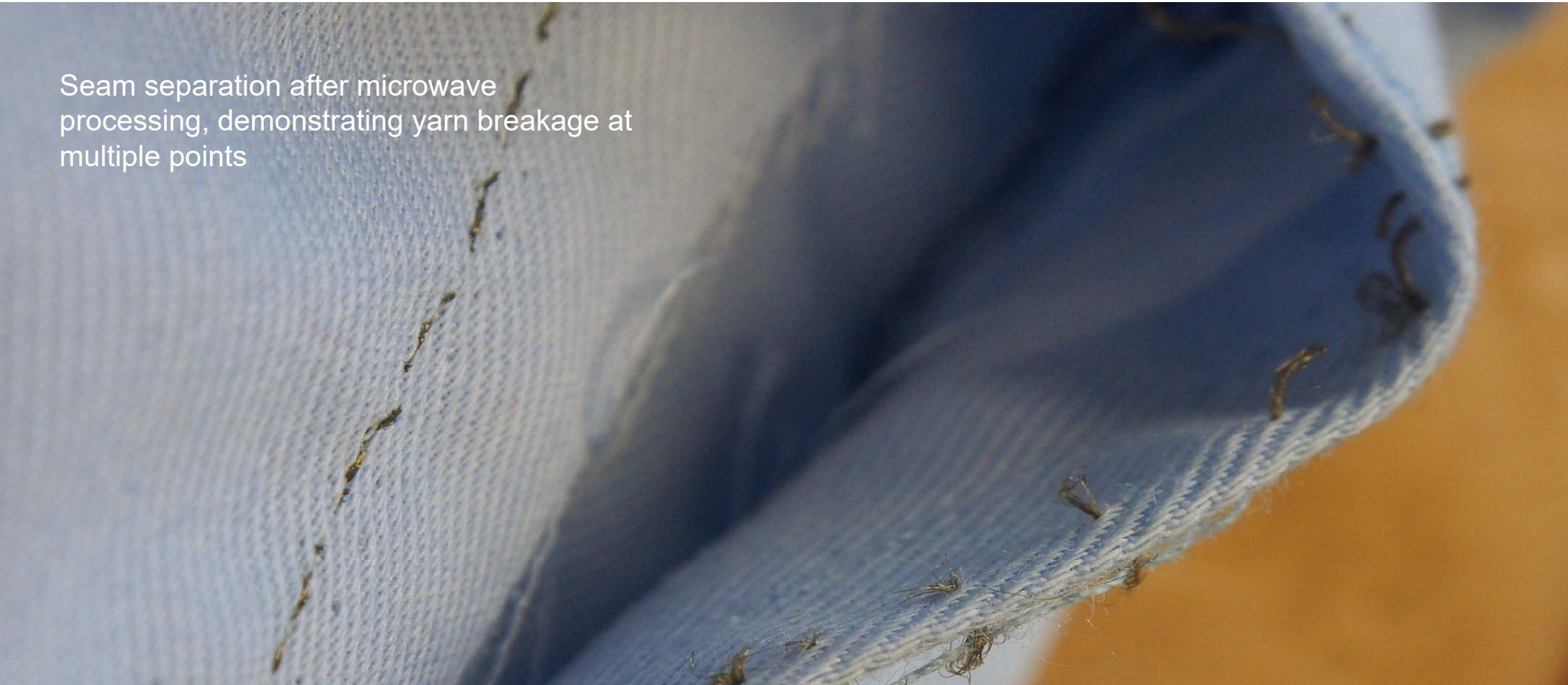




Seam separation after microwave processing, showing that fabric is undamaged



Seam separation after microwave processing, demonstrating yarn breakage at multiple points



Wear 2 Technology

“Recycling in textile and waste disposal”



Benefits

- In place of shredding, incinerator or landfill, **wear2** makes it possible to efficiently de-brand and reuse garments
- Comparison
 - Cost of landfilling clothing: £75 / \$115 per tonne
 - Sale price of recycled cloth: £30 / \$45 per tonne
 - Sale price of re-useable clothing: £600 / \$900 per tonne
- Opportunity for new business models: de-brand, re-brand and re-sell; clothing leasing; repurposing...
- Alternatively, ability to remove contaminants (buttons, zips, jacket linings etc.) allowing for pure fibre to be recovered, of known quality and provenance for reuse in fabric for new garments
- Improved sustainability through reuse, lowering CO₂ emissions and water consumption

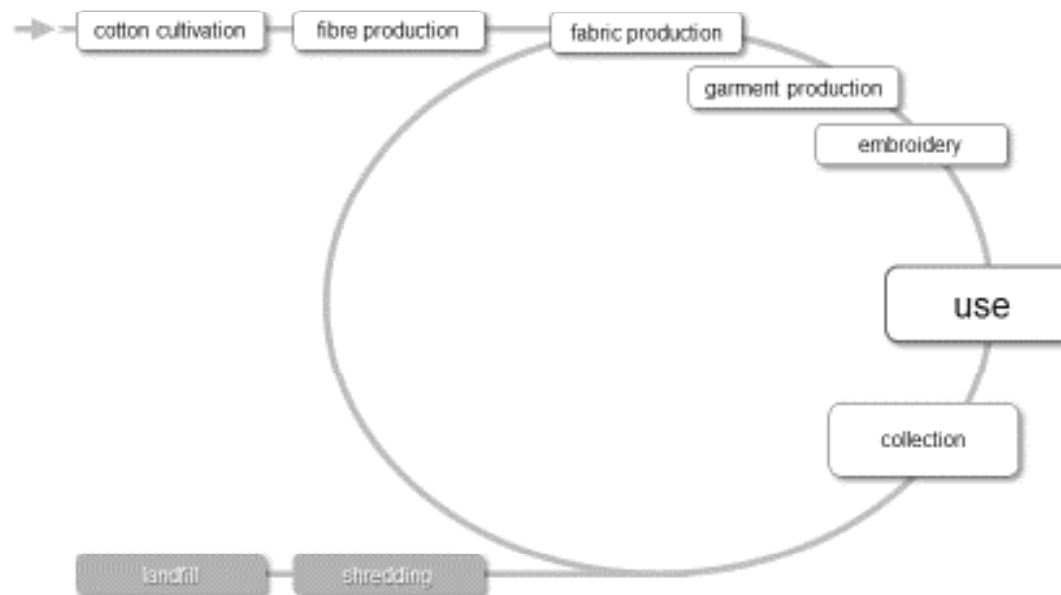
Craig Lawrance

Craiglawrance@textile-training.com

Alcoi, 20th Oct. 2016



life-cycle options; currently

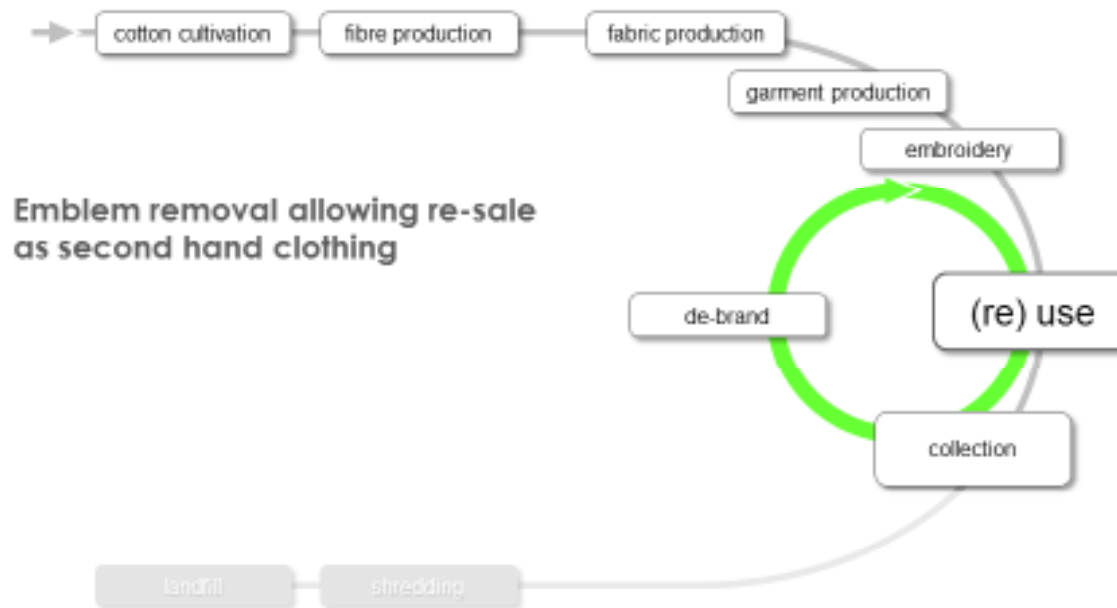


Craig Lawrance

Craiglaurance@textile-training.com

Alcoi, 20th Oct. 2016

life-cycle options; de-brand + reuse

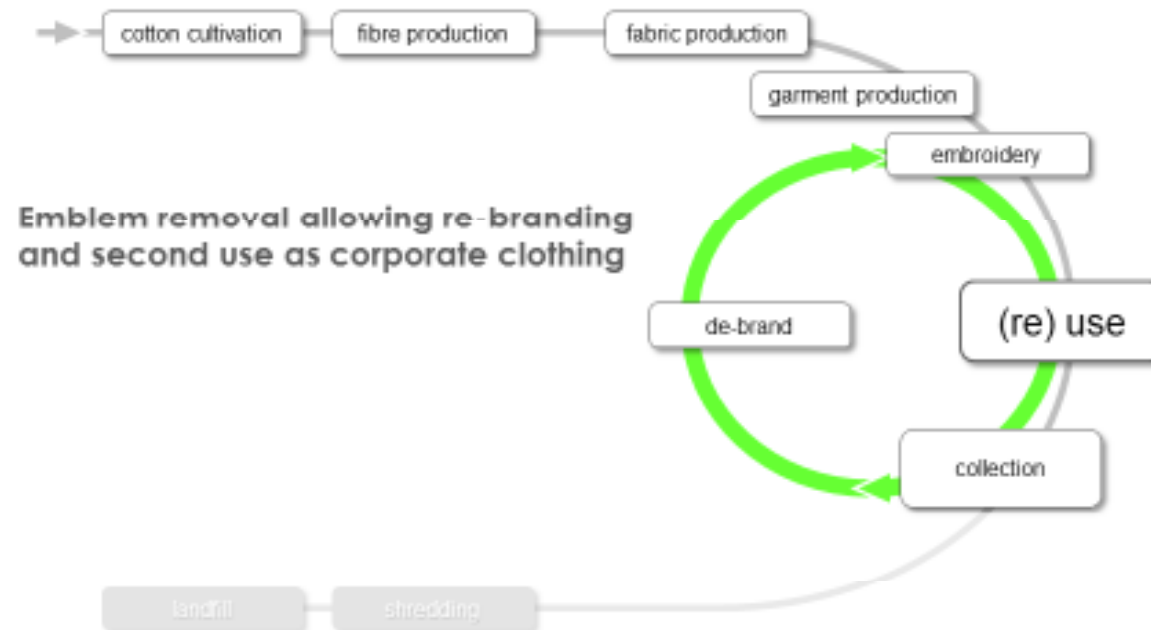


Craig Lawrance

Craiglaurance@textile-training.com

Alcoi, 20th Oct. 2016

life-cycle options; de-brand + re-brand

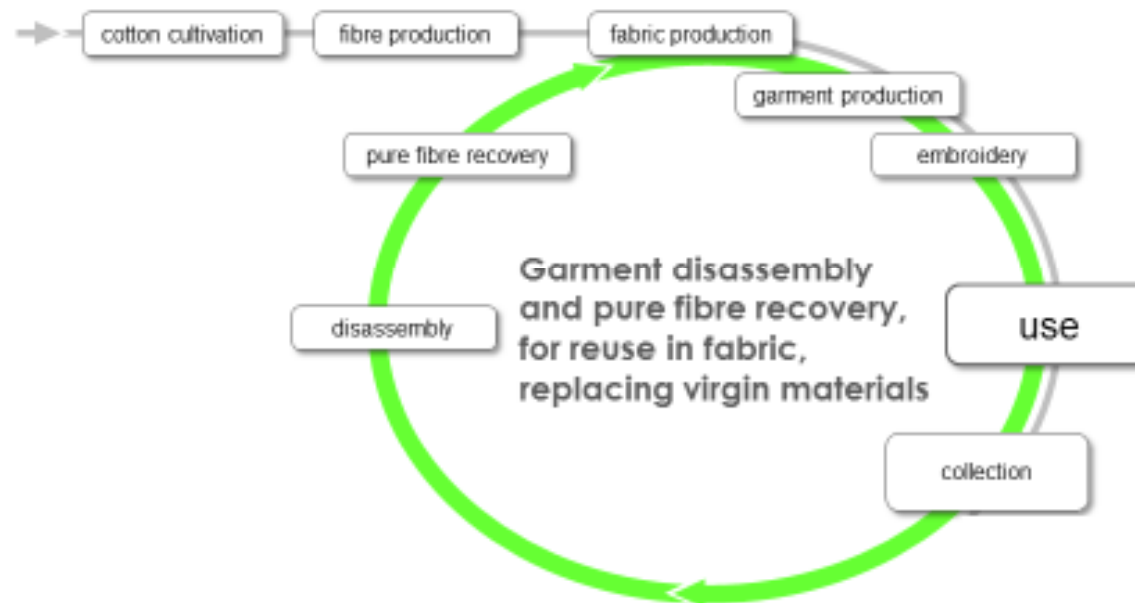


Craig Lawrance

Craiglaurance@textile-training.com

Alcoi, 20th Oct. 2016

life-cycle options; closed-loop fibre



**½ million tonnes of clothing currently
landfilled / incinerated in the UK every year**
WRAP, 'Valuing Our Clothes, 2012

Wear 2 Technology

“Recycling in textile and waste disposal”



Industry demonstration

- Spun representative yarn woven on production looms
 - Demonstrated that mass production is achievable
 - Yarn can be dyed to colour match existing yarn specifications
- Clothing manufacturing trials by George+ Royal Mail uniform supplier in clothing factories in SE Asia
 - Proven yarn compatibility with large volume sewing processes
- Wearer trials by Royal Mail staff of clothing incorporating the technology demonstrated the durability of garments in use
- Garments have passed standard consumer clothing durability trials conducted by George
- Disassembly trials at Oxfam
 - Proven the ability to separate garments back into their component elements

Craig Lawrance

Craiglawrance@textile-training.com

Alcoi, 20th Oct. 2016



Wear 2 Technology

“Recycling in textile and waste disposal”



Yarn

- Process incorporates a unique yarn in selected seams during garment manufacture
- The *wear2* yarn comprises an electrically conductive polymer-metal composite core within a polyester outer sheath
- Microwave energy is used to activate the seam separation at disassembly, by degrading the *wear2* yarn's tensile properties
- Microwave applies energy to generate heat only within receptive materials; cotton, polyester etc. are 'transparent' to MW energy
- Process results in a >80% reduction in seam tensile strength (BS EN ISO 13935-2:1999)

Craig Lawrance

Craiglaurance@textile-training.com

Alcoi, 20th Oct. 2016



Wear 2 Technology

“Recycling in textile and waste disposal”



Disassembly

- Microwave heating is a recognised industrial process technology, widely used in food and beverage processing and advanced manufacturing applications
- For *wear2* application, developed a bespoke, low cost industrial microwave unit purpose designed for the clothing recycling sector
- *wear2* unit operates at microwave power levels (kW per m³) orders of magnitude below the norm for industrial equipment, lower even than domestic kitchen microwaves
- Short cycle time and low power creates a virtuous circle...
 - rapid processing > resilient to buttons, metal zips etc > reduced capital costs > reduced running costs

Craig Lawrance

Craiglawrance@textile-training.com

Alcoi, 20th Oct. 2016



- **wear2** prototype microwave seam disassembly unit
 - Safe to use: multiple CAT3 interlocks, door seal etc. proven in other applications
 - Easy to use: single push button to operate
 - Compact: 2m x 1m footprint, 30A power socket is the only service required
 - Robust with consistent performance: MW generators rated for 20,000hr; constructed from aluminum / stainless steel
 - Energy efficient: low power minimises electricity consumption
 - Demonstrator unit is capable of processing up to 500kg or ca.1,800 garments per hour





1st Thematic Seminar

“Recycling in textile and waste disposal”

Alcoi, 20th Oct. 2016
@Ágora - Plaça Ramón i Cajal, 6

Event organised with the collaboration of

