TextileExchange
Creating Material Change

RRS recycle.com

Webinar #2: How US Textile Recovery Works & Emerging Innovation in Sortation Technologies

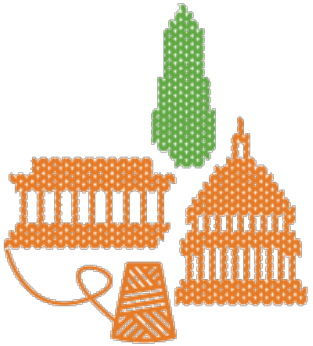
Webinar #1:
The Cost and Environmental Impact of U.S. Textile and Apparel Waste

Webinar #2:
How U.S. Textile Recovery Works and Emerging Innovation in Sortation Technologies

Webinar #3: Weds. Sept. 6th @ 1:00-2:00pm EST
State and Municipal Views on Textile Waste in the U.S.

Webinar #4: Weds. Sept. 20th @ 1:00-2:00pm EST
A Rising Tide of Apparel and Textile Waste - What Brands are Doing and is it Enough?

Go to http://textileexchange.org/events/ to register



TextileExchange
Sustainability
Conference

United by Action

Catalyzing the Sustainable Development Goals in Textiles

Washington, D.C. | October 9-13, 2017

More Information:

http://textileexchange.org/2017-textile-sustainability-conference/

#TExtileConf | #CreatingMaterialChange | #GlobalGoals

Marisa Adler,
Sr. Consultant, RRS

RRS recycle.com

Providing solutions to meet sustainability, resource management and waste recovery goals of clients and their supply chains

ORGANICS MANAGEMENT

WASTE RECOVERY

GLOBAL CORPORATE SUSTAINABILITY

Managing change in a resource-constrained world for 30 years.

Adam Winfield, Simple Recycling

Overview of How Textile Recycling Works

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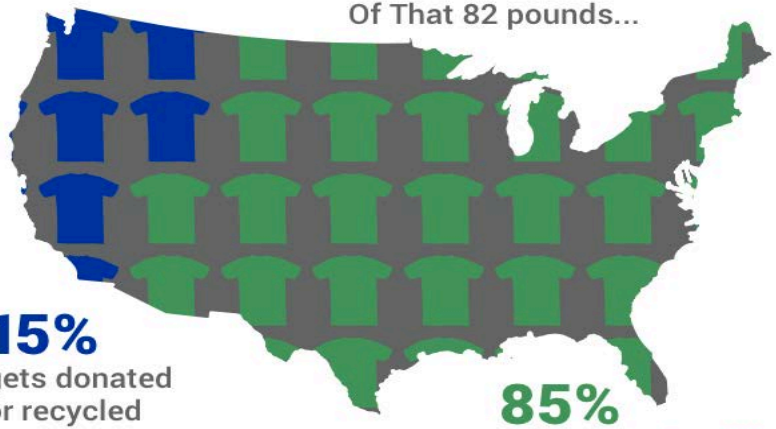
The U.S generates and average of **25 BILLION POUNDS** of textiles* per year.[1]

That's about **82 POUNDS** per U.S. resident.

* Textiles includes clothing, gootwear, accessories, towels, bedding, drapery, etc.

Of That 82 pounds...



15%
gets donated
or recycled
3.8 billion lbs recorvered
through donation/recycling;
(12 lbs. per person.)

85%
goes to our landfills.[2]
(70 lbs. per person)

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Traditional Collection Options:

CAPTURE 15% of materials

- Clothing Donation options:
  - Retail Resale like Goodwill, Salvation Army, Etc
- Clothing Donation and Recycling Drop Boxes:
  - Planet Aid & Many more

CAPTURE 85% of materials

- Trash Can (Waste)

simplerecycling

New & Evolving Collection Options:

Pursuing the 85% of materials entering waste stream

- **Retailer takeback programs**
  - H&M, North Face, Patagonia, Etc.

- **Curbside residential recycling programs**
  - Simple Recycling

simplerecycling

WHAT HAPPENS TO YOUR RECYCLED USED CLOTHING?

Once a resident determines that their clothing, shoes, handbags, or household textiles have reached the end of their useful life, materials are collected by Simple Recycling and collected clothing is sorted and graded for condition.

10-20%

Top quality materials are sold to local thrift stores where they create access to low cost clothing and jobs for local residents.

80%

The vast majority of clothing collected is not resaleable in the U.S. so it is further sorted for international export or broken down for raw materials.

Thrift industry employs nearly 100,000 workers in the U.S. with over $1 billion wages paid. In addition, private sector recyclers create an additional 15,000 to 20,000 jobs nationally.[1]

45%

Reused and Repurposed
Majority exported as secondhand clothing.

30%

Recycled and Converted
Reclaimed wiping rags are used in various ways as industrial and residential absorbents.

20%

Recycled into Fiber
Post-consumer fiber is used to make home insulation, carpet padding, and raw material for the automotive industry.

Only 5% ends up as waste.

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FREE CURBSIDE CLOTHING & HOME GOODS RECYCLING PROGRAM

FREE

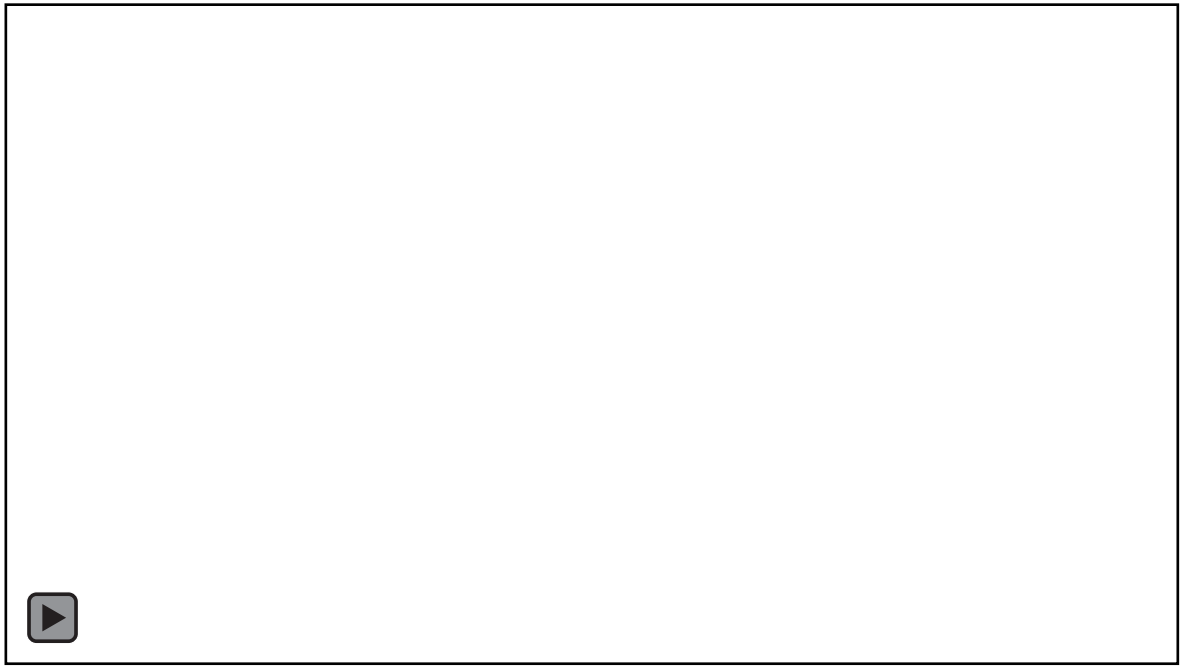
TURN KEY

SIMPLE & EASY

SAVE $ MAKE $

simplerecycling

Curbside Recycling: Simplicity and Convenience



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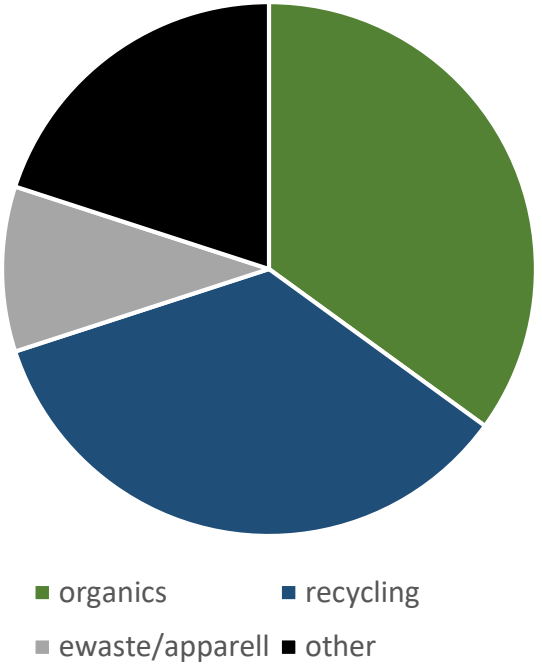
Bob Anderson, Curb My Clutter

CURB MY CLUTTER

THE DIPOSAL OF USED ELECTRONICS AND APPAREL HAS BECOME A MAJOR COST BURDEN AND ENVIRONMENTAL HAZARD FOR MUNICIPALITIES

- Used electronics and apparel represent 10% of the waste stream.
- Municipalities in the **U.S. Spend Over $500m Annually** landfilling used electronics and apparel.
- The used electronics and apparel currently landfilled is is **Worth Billions of Dollars** annually in the recycling and refurbishment market.
- Improper disposal of used electronics is a major environmental hazard.



REVENUE GENERATED FROM RECYCLED ELECTRONICS AND APPAREL

✓ Used electronics and apparel collected for recycling reduces municipal landfill costs.

✓ Used electronics and apparel collected for recycling generates significant revenue.

smart phones: $0-$60

laptops: $10-$60

tablets: $0-$50

sport coats and suits: $10-$15

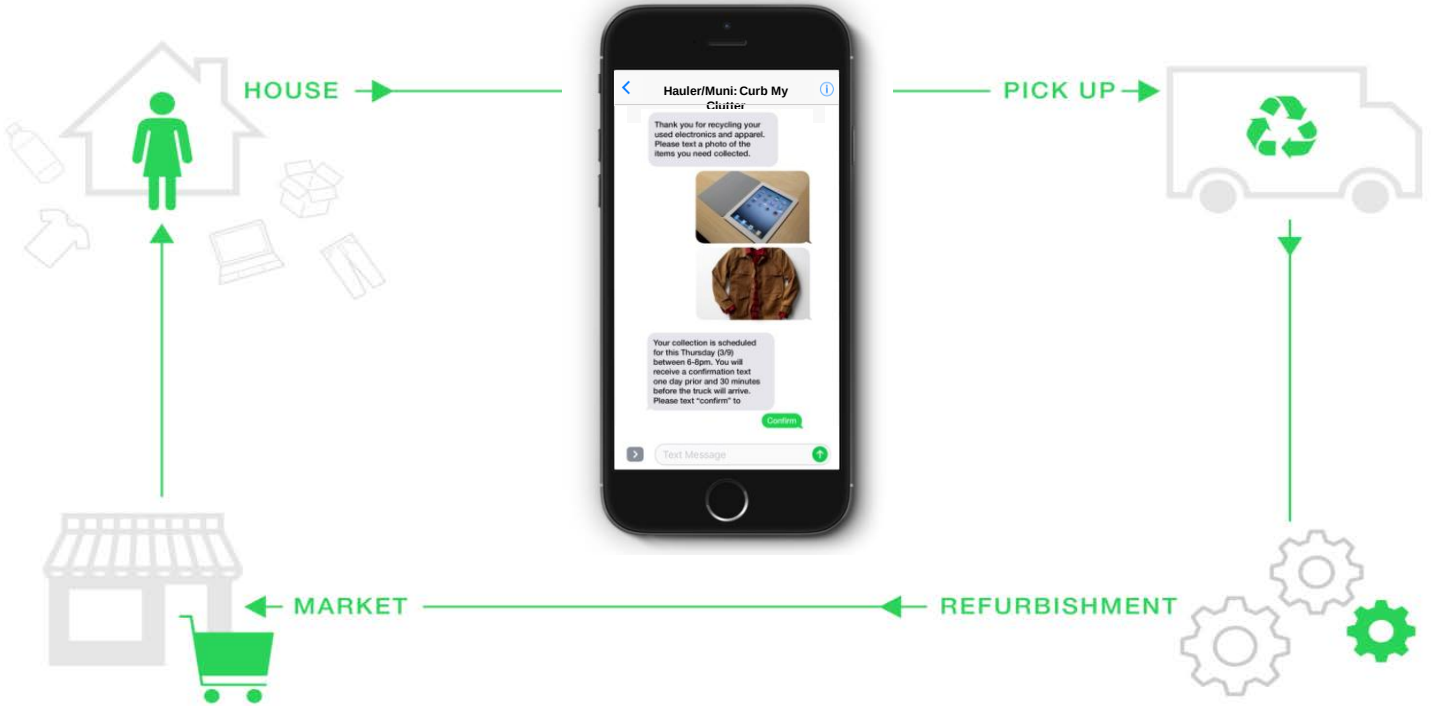
outdoor clothing: $20

jeans: $10

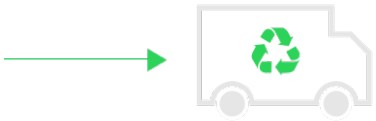
DROP OFF VS CURBSIDE
EARLY DAYS OF RECYCLING
STATE OF DELAWARE COMPARISION

- **15% diversion of textiles**, per the EPA data, is consistent with the early drop off models for **traditional residential recyclables.**
- **As late as 2000 the State of Delaware** was still operating a state wide drop off only (no curbside collection) program for residential recyclables.
- The drop off system captured a **disappointing 5%** of the total residential waste stream.
- **Fast forward to 2016**, after the implementation of the Universal Recycling Law in 2010 requiring haulers to provide every Delaware household with a curbside cart for recycling.
- **Delawareans captured 25.6% a 500% increase in 16 years**.
- **We believe there is a similar opportunity in today's underperforming drop off system for textiles.**

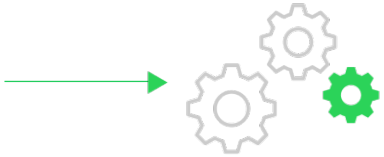
CURB MY CLUTTER IS A CRM APPLICATION THAT ENABLES MUNICIPALITIES AND HAULERS TO COLLECT AND RECYCLE USED ELECTORNICS AND APPAREL



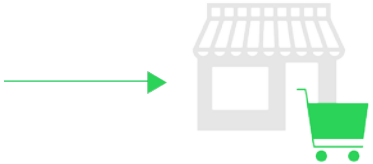
OVERVIEW



CURB MY CLUTTER licenses our software to municipalities and recycling companies to enable efficient collection and recycling of used electronics and apparel.
With access to optimized routing via **Curb My Clutter**, municipalities and haulers utilize existing collection infrastructure (trucks/labor) for collection.



CURB MY CLUTTER manages relationships with local and national
e-waste and textile resellers and recyclers.



CURB MY CLUTTER manages relationships with brands that utilize our software to provide their customers a convenient way to recycle their product, build customer loyalty and gain access the valuable material for their supply chain.

BENEFITS OF THE SOLUTION

1. ROUTING

CMC's advanced routing technology builds optimized routes for the hauler thereby reducing existing collection and landfill costs.

2. INVENTORY MANAGEMENT

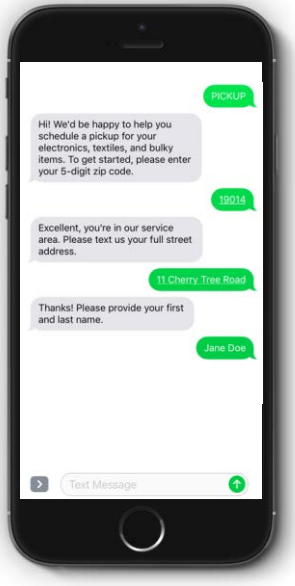
The product images submitted by households enable CMC to identify the highest value markets while avoiding the cost of holding inventory.

3. MARKETS

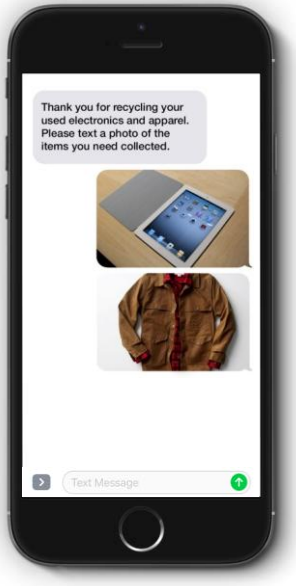
CMC has relationships the largest and the most innovative markets for recycling, refurbishment and resale.

HOW IT WORKS

STEP 1
Text your name & and address



STEP 2
Share a photo of your items

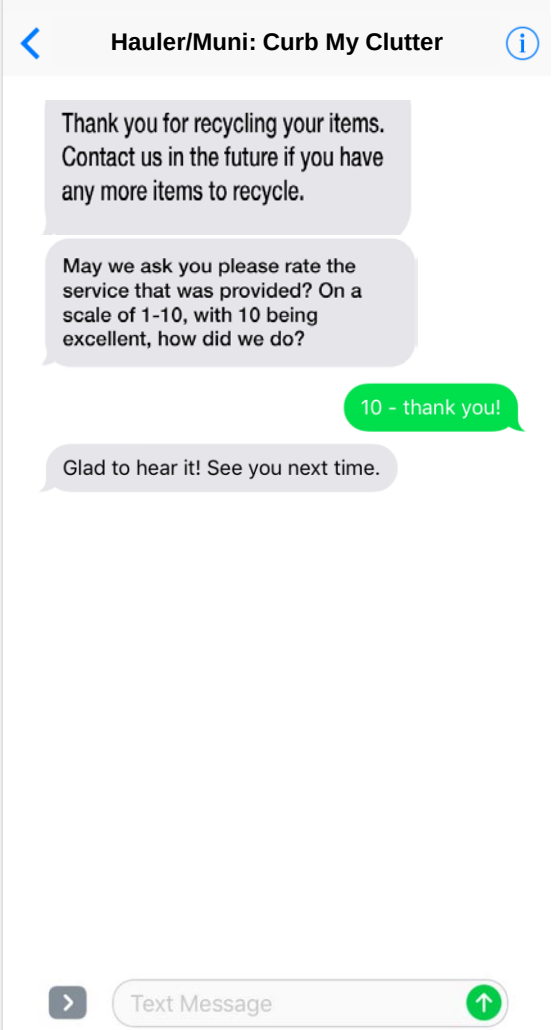


STEP 3
Confirm your collection window

CUSTOMER EXPERIENCE

AFTER PICK UP

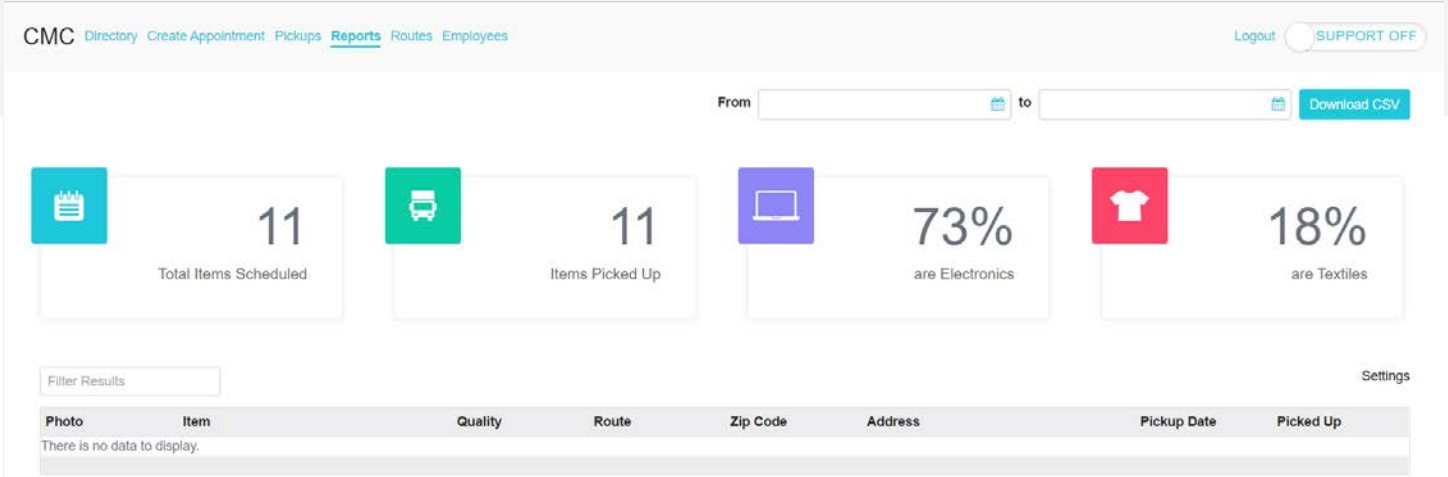
- Follow up to confirm collection
- Satisfaction Survey
- Potential to provide rewards from partners for responsibly recycling!



ADMIN EXPERIENCE

DATA ANALYSIS & REPORTS

- Clear and concise summary dashboard
- Download CSV versions of all reports
- Documentation of all customer interactions

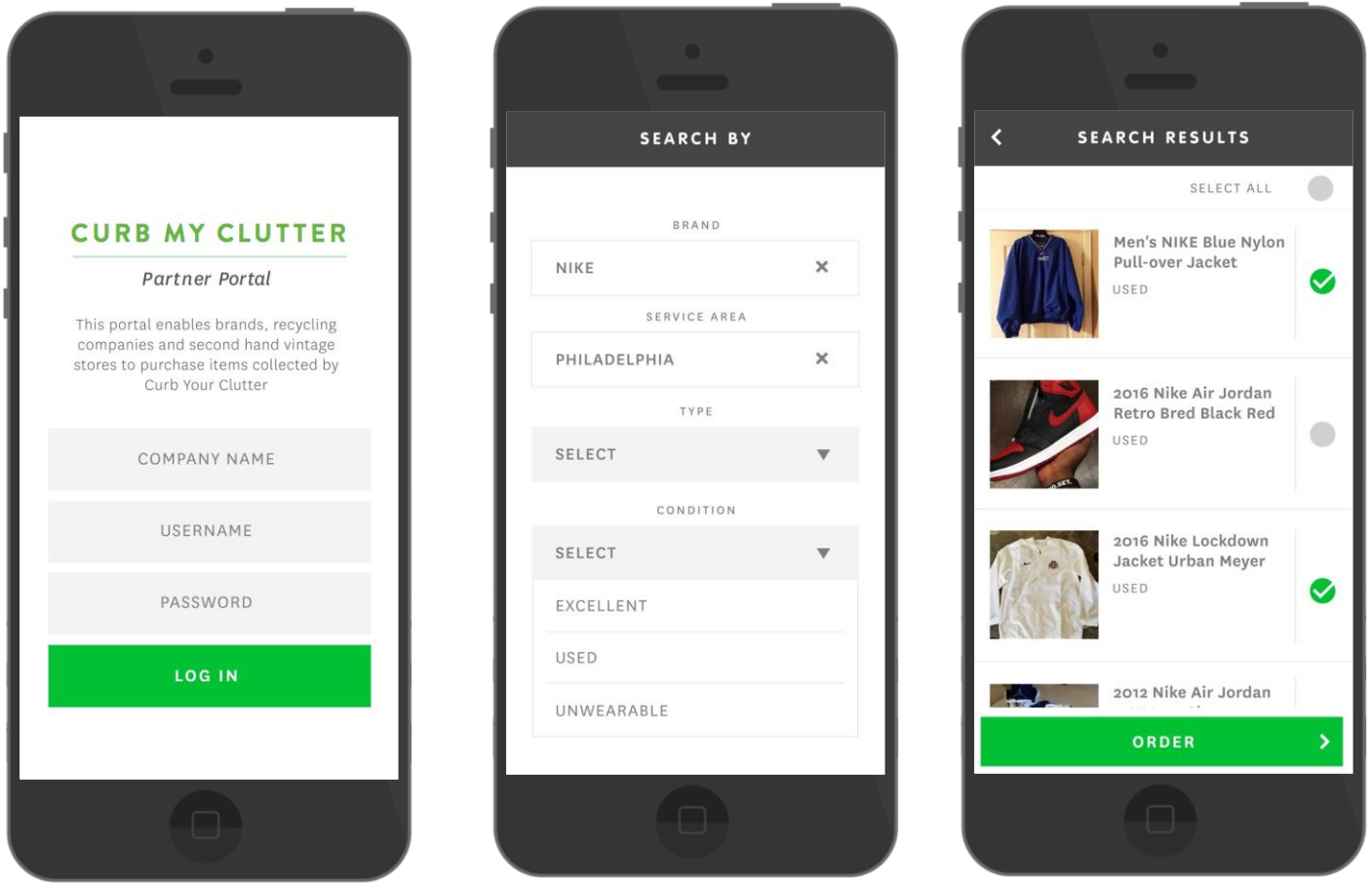


BRAND PORTAL

- Brands view their products being collected and control where they want their used products to be processed.

- Brands gain reports on recycling rates of their products.

- Brands participate in rewards/loyalty program that enables them to build loyalty with existing customer.



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PARTNERSHIPS

Lead investor:

Closed Loop Ventures www.closedlooppartners.com

Strategic Partners:

Nike www.nike.com

ERI www.eridirect.com
Largest electronics recycler in the U.S.

Trans America www.tranclo.com
Largest apparel recycler in the U.S.

CURB MY CLUTTER

László Székely
Tomra Sorting Recycling

SENSOR-BASED TECHNOLOGIES FOR AUTOMATIC TEXTILE SORTING

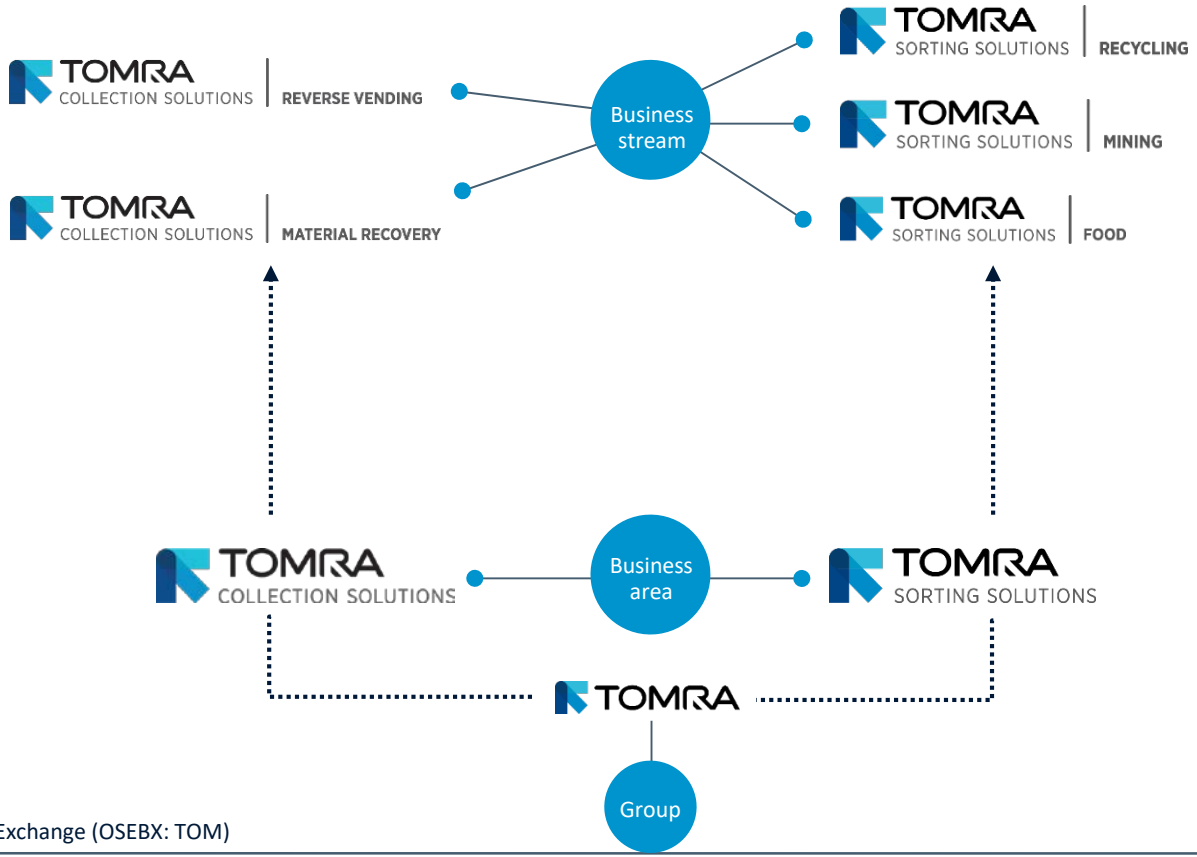
TOMRA SORTING SOLUTIONS | RECYCLING

László Székely
Mülheim-Kärlich
August 2017

AGENDA

- Brief company presentation
- Broad sensor portfolio
- Textile sorting – traditional process, products, main markets
- Operating principle: TOMRA AUTOSORT
- Sensor based textile sorting
- Research project

THE TOMRA GROUP



2800
EMPLOYEES GLOBALLY

710
MILLION EUR REVENUES 2016

Publicly listed on Oslo Stock Exchange (OSEBX: TOM)

115*
YEARS COMBINED INDUSTRY & SORTING EXPERIENCE

PIONEER IN SENSOR-BASED SORTING

Offering cutting-edge technology for industries where automated sorting and processing are key for value creation.

11,300
INSTALLED UNITS

*Based on founding years of BEST Sorting, Commodas, ODENBERG, TITECH and Ultrasort. Not including Compac.

BROAD SENSOR PORTFOLIO

ELECTROMAGNETIC SENSOR (EM)
Electro-magnetic properties like conductivity
and permeability

LED SPECTOMETRY (LED)
Color and spectral properties based on multiple LED light sources in very high optical resolution

NEAR-INFRARED SPECTROSCOPY (NIR)
Specific and unique spectral properties of reflected light in the near-infrared spectrum

VISIBLE LIGHT SPECTROMETRY (VIS)
Specific and unique spectral properties of reflected light in the visible spectrum

X-RAY TRANSMISSION (XRT)
Atomic density irrespective of surface properties and thickness

LASER INDUCED BREAKDOWN SPECTROSCOPY (LIBS)
Elemental composition

X-RAY FLUORESCENCE (XRF)
Elemental composition

INFRARED TRANSMISSION (IRT)
Density and shape properties by light absorption

IR CAMERA (IR)
Heat conductivity and heat dissipation

COLOR CAMERA (COLOR)
Color properties measured in very high optical resolution

LASER REFLECTION/FLUORESCENCE (LASER)
Structural, elemental and biological properties by reflection,
absorption and fluorescence of laser light

TEXTILE SORTING – TRADITIONAL PROCESS

More than **70%** of the global population has a demand for used clothing and textiles.

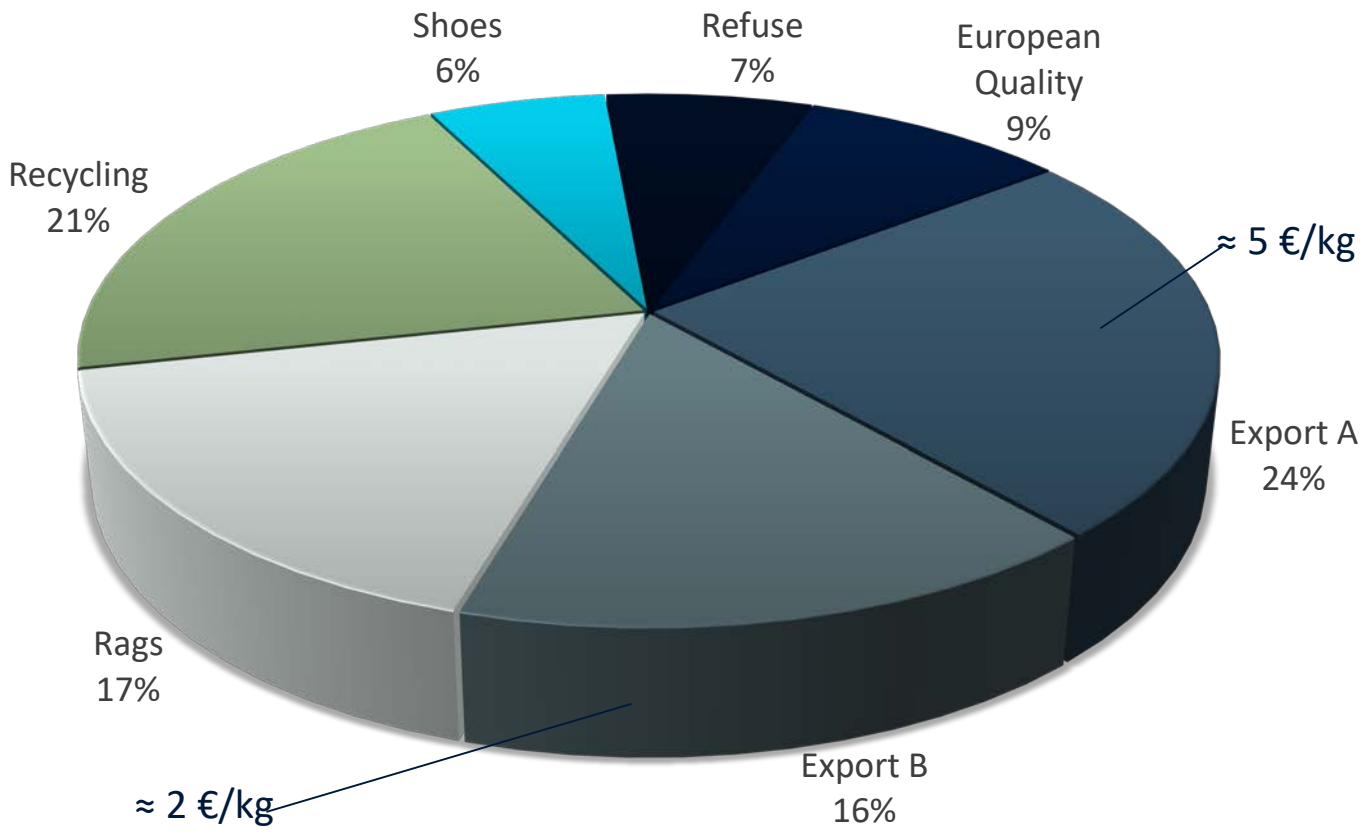
The bags with selective collected textiles consist of **70%** women's clothing and **6%** household material! **Price 400-800 €/t.**

Dispatch – unloading → **Pre-sorting** → **Post-sorting** → **Packing** → **Dispatch-uploading**

Source: Gebotex

Experienced workers can sort up to **3.000 kg/d** (average: **2.500 kg/d**)

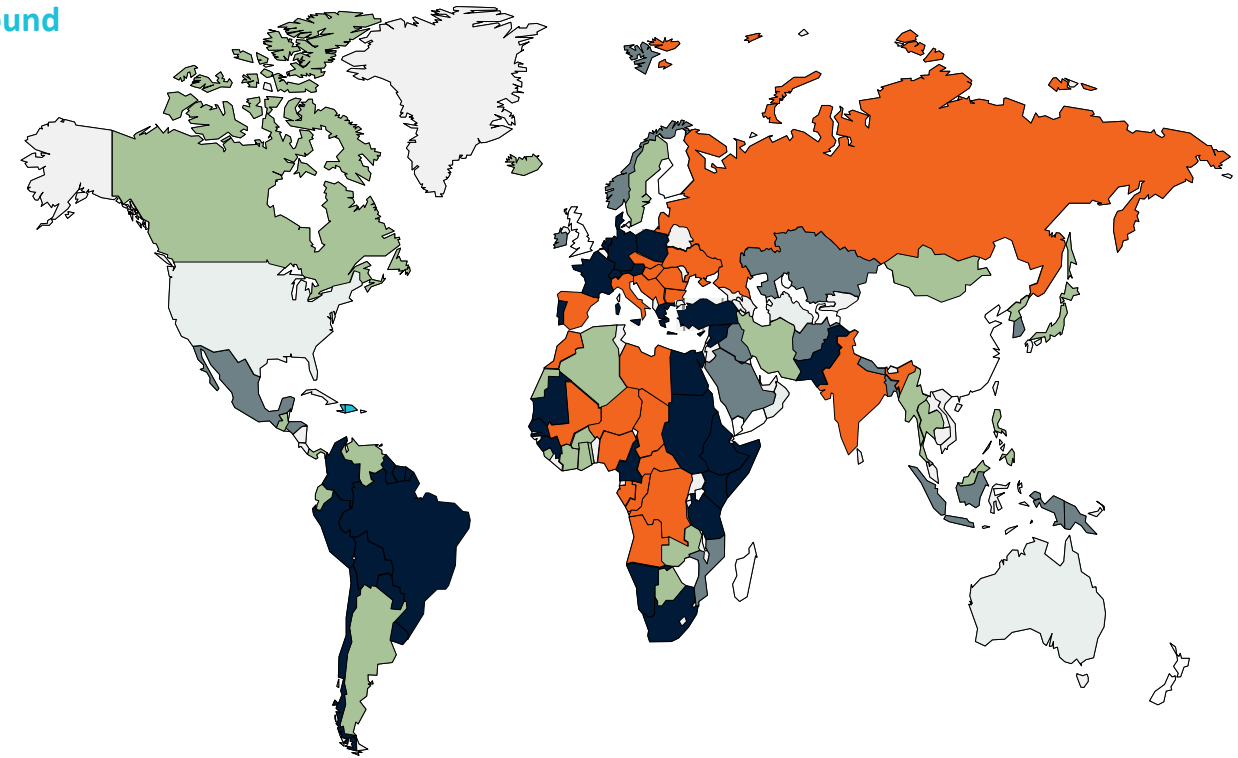
TEXTILE SORTING – PRODUCTS



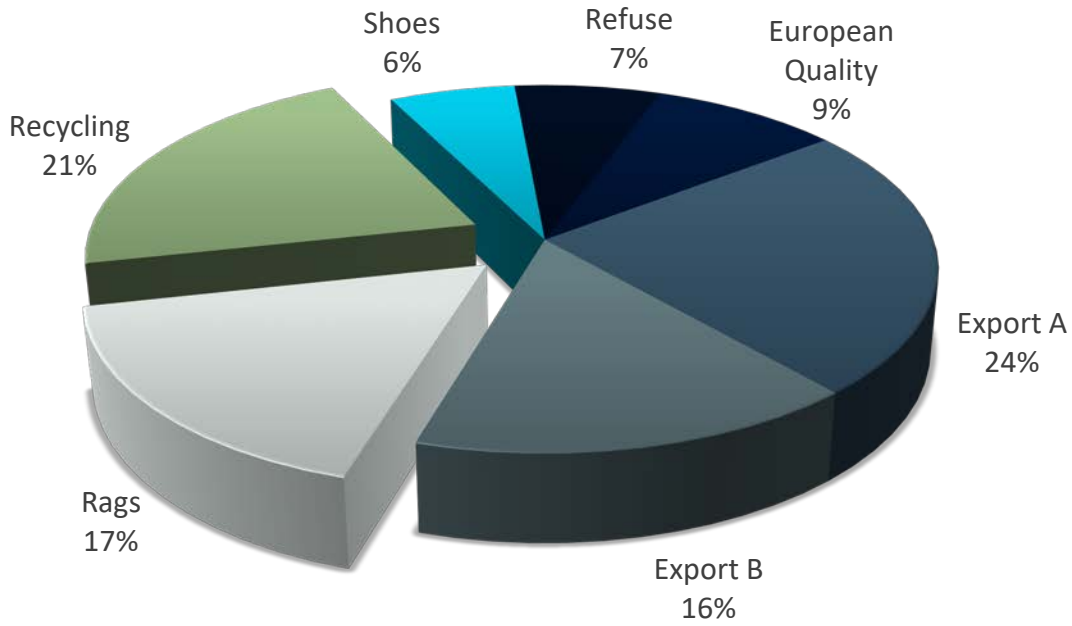
TEXTILE SORTING – MAIN MARKETS

The sorted products are sold around the world, primary markets:

- East, West and South Africa
- India, Pakistan
- Eastern Europe and Russia
- South America

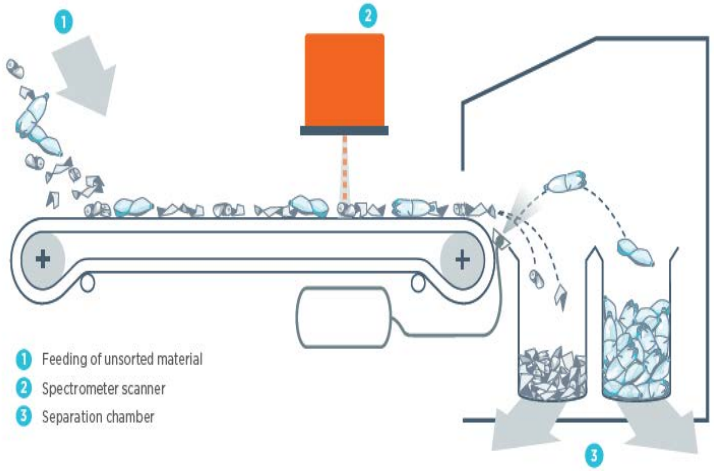


TEXTILE SORTING – PRODUCTS WITH POTENTIAL FOR TSS



Textiles which cannot be used in its original form is shipped to recycling companies and recycled into cleaning rags or ground into fibers for use in carpet underlays, mattresses or as filler.

TECHNOLOGY TOMRA AUTOSORT – OPERATING PRINCIPLE



- The incoming material (1) is evenly distributed on the conveyor belt.
- Innovative FLYING BEAM® technology (2) focuses only on the area of the conveyor belt that is being scanned.
- Extremely fast and highly reliable NIR sensors (2) take in the specific infrared spectra of various objects with a very high optical resolution.
- Can distinguish between different plastics, textile, paper and organic.

TEXTILE SORTING – FIRST TRIALS

The aim of the first test was to check the possibility of generating the fractions as follows:

Cotton +70%,

White cotton +70%

100% Wool

100% Polyester

100% Polyamide

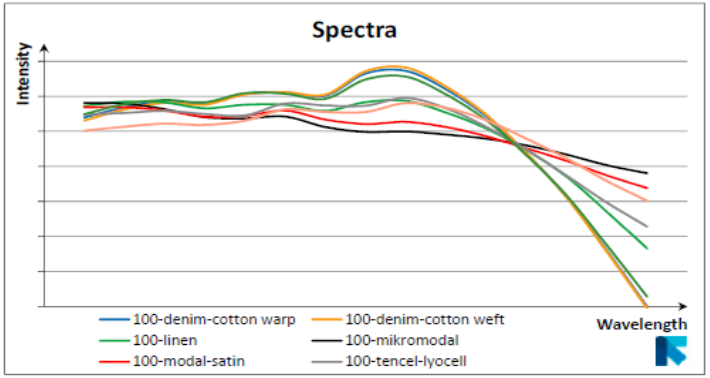


Figure 5: Spectra of man-made cellulosic (normalized)

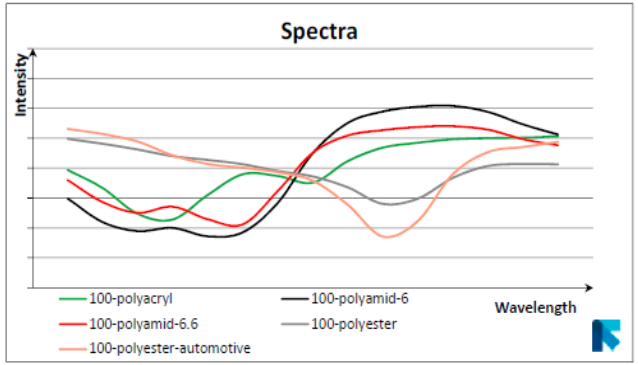


Figure 6: Spectra of synthetic polymers (normalized)

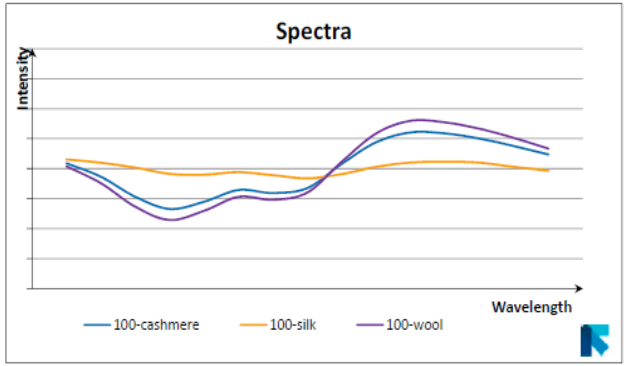


Figure 7: Spectra of protein fibers (normalized)

TEXTILE SORTING – PROJECTS AND PARTNERS

Project SIPTex:

IVL Swedish Environmental Research Institute, Sweden

H&M Hennes & Mauritz, Sweden

Boer Group, Netherlands

Returtex, Sweden

Municipality of Malmö, Sweden

…

Project TRASH 2 CASH:

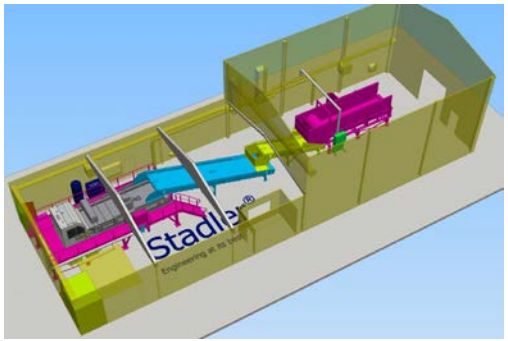
SP Technical Research Institute of Sweden

SOEX Group, Germany

Tekstina, Slovenia

…

RESEARCH PROJECT – LONG-TERM TEST IN SWEDEN



Sorting plant equipment:

Integrator: Stadler
Feeding: BRT
Optical Sorting: AUTOSORT [NIR1-VIS] [HR-2.000] [X-L] VB 400/12.5

RESEARCH PROJECT – SORTED FRACTIONS

Successful detection and sorting:

- 100% cotton
- 100% white cotton
- >90% cotton
- >80% cotton
- >90% white cotton
- 100% blue jeans cotton
- 100% polyamid 6.6
- 100% polyamid 6.0
- >80% polyamid
- 100% polyester
- >90% polyester
- 100% wool
- >90% cellulose
- 100% polyacryl

www.tomra.com/recycling


Q&A

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WEBINAR SERIES

Webinar Topic	Date/Time
✓ **Webinar #1:** The Cost and Environmental Impact of U.S. Textile and Apparel Waste	Wednesday, Aug 9, 2017, 1-2pm ET
✓ **Webinar #2:** How U.S. Textile Recovery Works and Emerging Innovation in Sortation Technologies	Wednesday, Aug 23, 2017, 1-2:15pm ET
Webinar #3: State and Municipal Views on Textile Waste in the U.S.	Wednesday, Sept 6, 2017, 1-2pm ET
Webinar #4: A Rising Tide of Apparel and Textile Waste - What Brands are Doing and is it Enough?	Wednesday Sept 20, 2017, 1-2pm ET

CONFERENCE

Washington D.C. 2017 | TextileExchange Sustainability Conference	Monday-Friday, October 9-13, 2017

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