Valorization of Urban Waste

Torsten Müller – Fraunhofer ICT
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1. EU Waste Framework

Source: EU RIC 2018
2. Collection Systems

Two systems:
1. **SHARED**: Residents can bring out waste at any time
   a. Collection areas
   b. Drop-off station
   c. „Umweltmobil“ for hazardous substances

Source: KSJ Jena

Source: stadt-salzburg.at

Source: ledwerkstatt.ch

Source: UBA
2. Collection Systems

2. Individual: The generators need a suitable container and must store the waste on their property until it is collected.
   a. Block collection
   b. Curbside collection systems
   c. Door to door collection
   d. Yard collection

Bulky waste collection under discussion:
- Waste tourism
- Dirty roads
- Wrong waste fractions

Collection card can be filled twice per year and the waste owner gets an individual date.
2. Collection Systems

Collection frequency
- Depended from materials
- With smart systems variable and only once the container is full

Separate collection of:
- Packaging
- Paper and cardboard
- Organics and garden waste
- Batteries
- Hazardous materials like paints, oils, medicine etc.
- Glass
- Clothes
- Domestic trash

- Bulky waste
- Construction waste
- WEEE
- Light bulbs
- End of Life Vehicles
- Wood
- Metal
- Tires
- Christmas trees...

Source: dortmund.de

Source: bazonline.ch
3. Collected fractions - Packaging

![Image of collected packaging waste]

Source: Gemeinde Ense

![Image of collection bins]

Source: Minden-Xpress.de

### LIGHT WEIGHT PACKAGING CHARACTERISATION SHEET

**Type of Characterisation:**
- Entry into Plant
- Rejected waste from Plant

**Characterisation Result:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET</td>
<td>48.12</td>
</tr>
<tr>
<td>Natural HDPE</td>
<td>3.00</td>
</tr>
<tr>
<td>Colour HDPE</td>
<td>20.00</td>
</tr>
<tr>
<td>PVC</td>
<td>-</td>
</tr>
<tr>
<td>Film (except single-use bags)</td>
<td>15.00</td>
</tr>
<tr>
<td>Film single-use bags</td>
<td>10.00</td>
</tr>
<tr>
<td>Other plastics</td>
<td>35.00</td>
</tr>
<tr>
<td>Steel</td>
<td>30.00</td>
</tr>
<tr>
<td>Aluminium</td>
<td>2.85</td>
</tr>
<tr>
<td>Beverage cartons</td>
<td>36.69</td>
</tr>
<tr>
<td>Wood</td>
<td>-</td>
</tr>
<tr>
<td>Unselected materials (*):</td>
<td></td>
</tr>
<tr>
<td>Organic matter</td>
<td>16.12</td>
</tr>
<tr>
<td>Garden and pruning remains</td>
<td>0.08</td>
</tr>
<tr>
<td>Cellulose</td>
<td>0.04</td>
</tr>
<tr>
<td>Textiles</td>
<td>5.47</td>
</tr>
<tr>
<td>Wood non-packaging</td>
<td>-</td>
</tr>
<tr>
<td>Wood commercial/industrial packaging</td>
<td>-</td>
</tr>
<tr>
<td>Glass (containers)</td>
<td>3.14</td>
</tr>
</tbody>
</table>

**Characterisation Location:** P5 XXX

**Characterisation Company:** YYY S.A.

**Source:** Ecoembes
3. Collected fractions – Packaging

- PET → transparent good recyclable
- HDPE → recyclable
- BC → separation in paper, plastic and aluminum fraction
- Metal fractions (mainly Alu, Steel) are recycled
- Paper and cardboard → recycled
- Wood →
- Glass → recycling according to its colour
- Amongst others film, black plastics and mulit-layer materials are incinerated
3. Collected fractions – Paper

Source: Newportpaper.com
Source: Newportpaper.com

Source: Chemistry Stack Exchange
3. Collected fractions – Organics

Different sources:
- Garden residues
- Kitchen residues
- Park residues
3. Collected fractions – Construction

Controlled demolition and separation of fraction already at site
• Wood
• Bricks
• Concrete
• Asphalt

Used in:
• Recycling concrete or asphalt
• Drainage layers
• Landfill construction
• Road construction

Source: Baustoffrecycling Bayern
Shredding and mechanical or hand separation of different fractions:

- Printed circuit boards → copper smelter recovery of metals
- Plastics → ABS, PP, PC recycling
- Cables → Copper, aluminum, PVC recycling
- Batteries, condensators, ferrous and none-ferrous metals
3. Collected fractions - Batteries

Source: Stadt Gütersloh

Source: Umicore
3. Collected fractions – Light bulbs

1. Shredding of light bulbs
2. Separation into:
   • Glass
   • Metals
   • Electronics
   • Mercury bearing powder
3. Distillation of the powder
   • Pure mercury → new lamps
   • Lamp phosphors → REE recovery

Source: relightitalia.it
3. Collected fractions – Domestic waste

Dependent from the city and the waste management plan of the federal state

• Pre-treatment
  1. Dry the waste
  2. Sort valuable materials from dry fraction

• Incineration
  • Volume reduction
  • Separation of metals and glass
  • Ash is currently used to fill up old mines or in road construction, but many projects running to use the contained metals (e.g. REE and other industry metals)
3. Collected fractions - ELV

- 473,000 ELV in Germany (2015)
  - 87.7% material recycling
  - 95.8% incl. energy recovery
- 1.1 Million used cars are exported → 800,000 in Europe
- Large spare part market → TEAR 1 sell refurbished parts

- Problems through FRP
  - Broken shredders
  - Incineration plants don’t accept material
- Increasing part complexity through hybrid materials
- Increasing number of batteries in the cars (up to 50 in a Porsche Cayenne)

Source: Toyota Europe
Any Questions?

Torsten Müller
Fraunhofer ICT
Phone: +49 721 4640 394
Torsten.mueller@ict.fraunhofer.de
www.ict.fraunhofer.de

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