Recycling options for different fractions

Mag. Eva Maria Kassl
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  - Plastics
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- Other recyclable fractions
Requirements of recycling
Product life cycle
Requirements of recycling

Separate collection

- The sorting of recyclable fractions from the municipal solid waste has still little prospect of success
- Separate collection is very important for the recycling
- We distinguish between two collection lines:
  - Commercial and industrial collection systems
  - Municipal collection systems
    (connector between household and recycler/disposal)
### Requirements of recycling
Recovery plants in Austria

<table>
<thead>
<tr>
<th>Plant types – incl. internal company facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal treatment facilities (excl. incineration plants for municipal solid waste)</td>
<td>96</td>
</tr>
<tr>
<td>Incineration plants for municipal solid waste</td>
<td>11</td>
</tr>
<tr>
<td>Physico-chemical treatment facilities</td>
<td>38</td>
</tr>
<tr>
<td>Treatment plants for specific waste (end-of-life cars, plastics, fats and frying oil, chemicals, batteries, etc.)</td>
<td>93</td>
</tr>
<tr>
<td>Treatment plants for WEEE</td>
<td>40</td>
</tr>
<tr>
<td>Shredder plants</td>
<td>9</td>
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<tr>
<td>Treatment plants for demolition and construction waste</td>
<td>375</td>
</tr>
<tr>
<td>Biotechnical treatment facilities for pre-processing of residual waste and other waste (MBT)</td>
<td>16</td>
</tr>
<tr>
<td>Plants for aerobic biotechnical treatment of separately collected biogenic waste, green waste, etc. (composting facilities)</td>
<td>442</td>
</tr>
<tr>
<td>Plants for sorting separately collected waste materials and other waste</td>
<td>189</td>
</tr>
<tr>
<td>Plants for recovery separately collected waste materials</td>
<td>49</td>
</tr>
<tr>
<td>Plants for anaerobic biotechnical treatment (biogas facilities)</td>
<td>133</td>
</tr>
<tr>
<td>Landfills</td>
<td>665</td>
</tr>
</tbody>
</table>

Data source: Federal Waste Management Plan 2011 (draft)
Recyclable Fractions
Waste from households and similar establishments

Recovery 1,163,000 t
Recovery 18,000 t
Recovery 250,000 t

Data source: Federal Waste Management Plan 2011 (draft)
Waste Paper

- The waste paper is used in the paper plan as a raw material for production of recycled fibre.
- The quality of the fibre is important for recycling.
- On average, a fibre can be recycled 15 times before it is no longer usable for the paper production.
- 50% of raw material used by the European paper industry is waste paper.
- Paper is the most recycled product in Europe.
- Europe has a recycling rate of 66.6%.
Waste Paper
Interesting data from Austria

- Recovered paper utilization rate 2007 (average 45.1%)
  - Newspaper 88.1 %
  - Printing and writing papers 16.1 %
  - Tissue paper 96.2 %
  - Packaging papers 66.7 %
  - Folding cartons and paperboard 84.2 %

- Numbers of recycling plants: 14
Waste Paper
The recycling process

1. Sorting to the different qualities
2. Fibrillation in the “pulper”
3. Purification of undesirable materials (metal, plastics, etc.)
4. Deinking (removal of printing inks), depending on desired paper quality
5. Paper pulp is removed through sieves, that sorted, purified and concentrated
6. Production of new paper
Waste Paper

Data source: Grüner Punkt
Glass

- Bottle-to-Bottle-Recycling
- The used and collected glass is the most important resource for the production of new glass packaging
- Recovered glass utilization rate
  - of white glass: 60 %
  - of amber glass: 70 %
  - of green glass: 90 %
- Glass can be recycled again and again in high quality
- Glass recycling rate in Austria: 84 %
Glass
The recycling process

Separation of iron particles with magnetic separator → Separation of larger foreign material by hand → Reduction of size to 15 mm in the crusher

Filtering of foreign materials which are slighter than glass → Collection of opaque materials with optical methods → Sorting by hand

Separation of residual ferrous materials by magnetic separators → Final check → Fusion and production of the new glass
Glass

Data source: Grüner Punkt
Plastics

- There are more than 200 types of plastics
- In the household are a multiplicity of plastics:
  - PE Polyethylene (plastic foil)
  - PP Polypropylene (ketchup bottle)
  - PS Polystyrene (yoghurt cup)
  - PVC Polyvinylchlorid (floor cover)
  - PET Polyethylenterephtalat (water bottle)
  - HDPE High Density Polyethylene (cleanser bottle)
  - EPS expanded Polystyrene (Styrofoam packaging)
  - Compound-plastic (beverage packaging)
Plastics

- Only pure materials are used when recycling by melting
- Thermoplastics have the greatest possibility of recycling (because of their multiple thermal deformability)
- Facts of PET to PET in Austria
  - 8 of 10 PET bottles are separate collected
  - 2/3 of all collected PET bottles are recycled
  - Beverage packages consist of 30 % recycled PET
Plastics
The recycling process

- Sorted plastic fractions
- Crushing
- Washing
- Separated by sink-float method
- Mechanical/Thermal drying
- Granulation
- Recyclate
Plastics

Data source: Grüner Punkt
Plastics
The new products of the different plastic recyclates

<table>
<thead>
<tr>
<th>Recyclate</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE recyclate</td>
<td>- Bags</td>
</tr>
<tr>
<td></td>
<td>- Pipes</td>
</tr>
<tr>
<td></td>
<td>- Buckets</td>
</tr>
<tr>
<td>HDPE recyclate</td>
<td>- Cleanser bottle</td>
</tr>
<tr>
<td></td>
<td>- Pipes</td>
</tr>
<tr>
<td>PET recyclate</td>
<td>- PET bottles (PET to PET)</td>
</tr>
<tr>
<td></td>
<td>- Foil</td>
</tr>
<tr>
<td></td>
<td>- ...</td>
</tr>
<tr>
<td>PS/PP recyclate</td>
<td>- Flower pot</td>
</tr>
<tr>
<td></td>
<td>- Office supplies</td>
</tr>
<tr>
<td>EPS recyclate</td>
<td>- Thermal insulation</td>
</tr>
</tbody>
</table>
Plastic recyclates
WEEE

- WEEE stands for Waste Electrical and Electronic Equipment
- Collecting mass 2009 in Austria: 9.32 kg/capita.a
- Collecting categories incl. the proportion of the total mass:
  - Large appliances: 22.16 %
  - Small appliances: 26.99 %
  - Cooling appliances, refrigerators and freezers: 19.54 %
  - Display screen equipment incl. CRT: 25.17 %
  - Gas discharge lamps: 1.14 %
WEEE

- Average of the output fractions:

- In electrical equipment may be present up to 1,000 different substances

Data source: EAK-Austria, 2010
WEEE
Recycling potential

Metals pure
iron, non-ferrous metals (copper, aluminium)
- mechanical treatment and separation process
  - Steel plant
  - Iron works, copper words, etc.

Metals mixed
Copper mixed fraction, copper precious metal fraction
- Mechanical treatment
  - Copper works
  - Recovery of precious metal fraction

CRT glass
- CRT glass production
  - Other processes

Plastics
- Plastic production
  - Other recycling processes
  - Energetic recovery
# WEEE
## European WEEE-Directive

<table>
<thead>
<tr>
<th>Collection and treatment categories</th>
<th>Equipment categories pursuant to Annex 1</th>
<th>Recovery targets related to the average weight per appliance</th>
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<th>Recovery targets related to the average weight per appliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rate of recovery in %</td>
<td>Rate of re-use and recycling for components, materials and substances</td>
<td></td>
<td>Rate of recovery in %</td>
</tr>
<tr>
<td><strong>Large appliances</strong></td>
<td>Large household appliances (excluding cooling appliances, refrigerators, freezers and air conditioner appliances)</td>
<td>80</td>
<td>75</td>
<td>Display screen equipment, including appliances with cathode-ray tubes</td>
<td>IT and telecommunications equipment—screens (with cathode-ray tubes, LCD and plasma screens)</td>
</tr>
<tr>
<td></td>
<td>IT and telecommunications equipment (excluding display screen equipment)</td>
<td>75</td>
<td>65</td>
<td>Consumer equipment—TV sets (with cathode-ray tubes, LCD and plasma screens)</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Large lighting equipment (excluding gas discharge lamps)</td>
<td>70</td>
<td>50</td>
<td>Monitoring and control instruments—screens</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Large electrical and electronic tools</td>
<td>70</td>
<td>50</td>
<td>Small household appliances</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Large toys, leisure and sports equipment</td>
<td>70</td>
<td>50</td>
<td>IT and telecommunications equipment (excluding display screen equipment)</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Automatic dispensers without refrigerating devices</td>
<td>80</td>
<td>75</td>
<td>Consumer equipment (excluding display screen equipment)</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Large medical devices</td>
<td>-</td>
<td>-</td>
<td>Small lighting equipment (excluding gas discharge lamps)</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Large monitoring and control instruments</td>
<td>70</td>
<td>50</td>
<td>Small electrical and electronic tools</td>
<td>70</td>
</tr>
<tr>
<td><strong>Cooling appliances, refrigerators and freezers</strong></td>
<td>Cooling appliances, refrigerators and freezers as well as air conditioner appliances</td>
<td>80</td>
<td>75</td>
<td>Small toys, leisure and sports equipment</td>
<td>70</td>
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<td></td>
<td>Automatic dispensers with refrigerating devices</td>
<td>80</td>
<td>75</td>
<td>Small medical devices</td>
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<td></td>
<td>Large medical devices</td>
<td>-</td>
<td>-</td>
<td>Small monitoring and control instruments</td>
<td>70</td>
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<tr>
<td></td>
<td>Large monitoring and control instruments</td>
<td>70</td>
<td>50</td>
<td>Gas discharge lamps</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Gas discharge lamps</td>
<td>-</td>
<td>80</td>
<td>Lighting equipment (gas discharge lamps)</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: WEEE Ordinance
WEEE
Biowaste

Data source: MA 48, Vienna
Biomass Biodegradable Waste Processing Plant

- Pre-Treatment
- Anaerobic digestion
- Tunnel composting
- Compost refining
- Electricity production
Biowaste
Biodegradable Waste Processing Plant
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Biowaste

- Marketing channels for compost in Vienna
  - Agriculture/farming (approx. 30,000 tpa)
  - Hand-out to Viennese population (approx. 10,000 tpa)
  - Soil/humus production (approx. 1,000 tpa)

Data source: MA 48, Vienna
Recyclable fractions

The following fractions are also recyclable:

- **Metals**
  - Metal packaging (e.g. cans)
  - Metal household scrap
- **Wood**
  - Wood packaging
  - Bulky wood
- **Textiles**
- **End-of-life Vehicles**
Thank you for your attention!

I welcome your questions, suggestions or comments!