Training School
Recyclability of Packaging Products
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Ecopaperloop
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Content

• Packaging Recyclability Method
• Typical Results
EcoPaperLoop
PACKAGING Recyclability Method
Typical Packaging Products

Non-paper components
- e.g. “window foils”
- e.g. composite materials

Glued Parts
- e.g. Hotmelts or adhesive stripes

→ A Problem for Recovered Paper Processing?
Challenges of Recycling

- For good recyclability, products have to be:
  - Repulpable – important for all types of paper products
  - Adhesives have to be removable – important for all types of paper products and additionally
  - Deinkable – important for all graphic paper grades

→ Test Methods: Simulated Stock Preparation
Method for the Recyclability Evaluation of Packaging Products

- High amount of sample material
- Disintegration step with practical relevance
- Objective evaluation of non-paper components
- Objective evaluation of flake content, sticky potential and sticky size distribution
- Evaluation of fibre yield
Recyclability Test for Packaging Products (5th Draft)

Prepared Packaging Product 480 g b. d.

- LC Disintegration (c = 4 %, t = 5 min)
  - 11.5 l Fresh Water
  - 40 °C

- Coarse Screening Ø 10 mm

- Coarse Reject

Mass Measurement

Yield

- Flake Content
  - ZM-V/18/62 Brecht-Holl 0,7 mm Ø

- Ash-Content
  - 525 °C

- Fibre suspension (Homogenised)

- Macrostickies
  - INGEDE Method 4 // 100 µm

- Handsheets
  - 60 g/m²

Macrosticky Content
Major Equipment

LC Disintegration  Coarse Screening  Flake Content & Sticky Evaluation
Sample Preparation

NEEDED TO CALCULATE ADHEREND RATIO

Weigh the sample

Cut glued parts

Cut sample

Weigh glued parts
Adherend Ratio

- If a packaging product has to be divided, use the adherend ratio to maintain the correct ratio between adherend and non adherend material.

- Calculation of the Adherend Ratio:

\[
X_{\text{Adherend}} = \frac{m_{\text{Adherend}}}{m_{\text{PackagingSample}}} \times 100 \text{ [%]}
\]
Pulping

- 480 g oven-dry sample material
- 4 % stock consistency → water amount has to be calculated regarding dry content
- 40 °C water temperature
- 5 min disintegration time
Coarse Screening

Reject could be removed easily and objectively, near to industrial standard
Coarse Screening

1. Outlet-valve is closed
2. Start the stirrer with 200 rpm
3. Fill in the disintegrated material (for 1st screening)
4. Smooth rotating for 3 s
5. Open the outlet valve and drain the device completely

→ free fibres are removed without high shear forces
Coarse Screening

5. Close the outlet valve again
6. Fill in 12 l tap water (for 2nd screening)
7. Smooth rotating for 3 s
8. Open the outlet valve and drain the device completely
Coarse Screening

9. Free fibres attached to the screening plate or surface of device are sprayed out using approx. 2 l tap water
10. Transfer the reject on the screening plate to a weighted box
Determination of Flake Content
Determination of Flake Content (I)

Prepare 5 filters

5 x 2 g oven-dry sample material

Dilute to 800 ml

Screening plate: 0,7 mm hole diameter
Start the device with 0.1 bar water pressure at a water flow of 3.33 l/min. Fill in the sample gently within 25 s. Fill in the leftover within the next 5 s.
Determination of Flake Content (III)

Stop the water flow and screening process after 5 min

Remove screening plate and wash the flakes into beaker

Drain the flakes over a filter
Determine the Flake Content (IV)

Dry the filter for 10 min (92 °C), e.g. between two papers in a RK-Dryer

Weigh the filters

Drying oven for 24 h (105 °C)
Macroscopic Test
Macrosticky Test (I)

4 x 10 g oven dry sample material are screened over a 100 µm slotted plate (10 l/min, 5 min, 480 double-pass)

Fill in the sample directly
The reject is washed into a beaker and transferred to a paper filter
The filter is dried, the sticky material is attached (Silicone paper as cover)
The filter is dyed (Silicone paper as cover)
Macrosticky Test (III)

Sticky particles are contrasted by using alumina powder

Contrasting with alumina powder

Drying, 92 °C, 10 min
Macrosticky Test (IV)

Visual inspection to remove/mark other white material (e.g. plastics)
Image analysis with DOMAS system to get macrosticky area
Further steps

**Yield**

- The yield describes the usable solid stock material which passes the coarse screening step

\[ \text{Yield} [\%] = \frac{\text{Packaging Product used [g b.d.]} - \text{Coarse Reject [g b.d.]} }{\text{Packaging Product used [g b.d.]} } \times 100 \% \]

**Ash Content**

- The ash content describes the inorganic content after incineration (525 °C) of the solid stock material which passes the coarse screening step. By using the ash content a fibre yield could be calculated

\[ \text{Fibre Yield} [\%] = \frac{(100 \% - \text{Ash Content [\%]}) \times \text{Yield [\%]}}{100 \%} \]

**Handsheets**

- Handsheets of the accept from sticky evaluation are prepared for a visual inspection of the optical properties of the stock
Typical Results
Samples

Folding Boxboard

Corrugated Board

Liquid Packaging
Comparison of different products
Comparison of different products

Flake Content in %

- Corrugated Board: 8.9
- Folding Boxboard: 1.1
- Liquid Packaging: 11.7
Comparison of different products

![Bar chart showing comparison of Macroscopic Area in mm²/kg Product for different products: Corrugated Board, Folding Boxboard, and Liquid Packaging. The chart displays Total Area and < 3,000 μm categories. Corrugated Board has values of 1713 and 1713, Folding Boxboard 1362 and 1362, and Liquid Packaging 1033 and 1033.]
Typical Packaging Products
Possible Results for Sticky Area

Macro-Sticky Area in mm²/kg

<table>
<thead>
<tr>
<th>Product</th>
<th>Total Sticky Area</th>
<th>Sticky Area &lt; 3 000 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugated Board A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(with adhesive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrugated Board A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(without adhesive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrugated Board B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(with adhesive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrugated Board B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(without adhesive)</td>
<td></td>
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</tbody>
</table>
Example of a Recycling Friendly Packaging Material
Thank You!

For further information contact

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