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2. Product Mixtures, Preparation, and Testing
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Motivation
Current survey on deinkability of different print product categories belonging to the relevant mass of paper in 1.11.00 (sorted graphic paper for deinking)

Boundary Conditions
No tests of single print products but tests of print product categories with 3–13 different samples

Test Method
Deinkability test according to INGEDE Method 11 (new version of January 2018)

Assessment
Assessment of deinkability score according to EPRC (version of January 2017)

Depending on the ash content of the paper mixture to be deinked the pulping is performed at:

- 15 % solid consistency at \( \leq \) 20 % ash
- 12 % fibre consistency at > 20 % ash

For each deinkability test a disintegration trial in the Hobart pulper was performed to determine the ash content of the print product mixture
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Selected Print Product Mixtures

- 4 Offset Coldset Newspaper Mixtures
- 8 Rotogravure Magazine Mixtures
- 5 Offset Heatset Magazine Mixtures
- 6 Offset Heatset Advertising Material Mixtures
- 3 Rotogravure / Offset Heatset Catalogue Mixtures

In total: 26 Mixtures
Sample Composition of the Test Material

- MEM (Mass Equivalent Mixtures)
  From each print product the same weight of sample was used:
  - Mixtures 1–17
  - Mixtures 23–26

- SEM (Sample Equivalent Mixtures)
  All sample material was torn down to pieces of 2 x 2 cm², and the sample to be deinked was taken from this material after careful mixing:
  - Mixtures 18–22

How to get a Representative Sample of MEM from Print Products?

- Typically by opening the magazine in the middle
- Cutting one “strip” over the whole magazine
- Width of the “strip” determine its mass
- The sample includes a representative amount of the cover material (if it was investigated)
- The mixture is mass equivalent for each magazine
Additional Tests
(besides INGEDE Method 11)

- Foaming behaviour, COD, and PCD of UP samples
- Extra UP handsheets for dirt specks
- Filter pads after 6 min flotation time for optical characteristics
- Filter pads after 9 min flotation time for optical characteristics
- Foam mass, consistency, and ash for total yield & fibre yield after 6 min flotation time
- Foam mass, consistency, and ash for total yield & fibre yield after 9 min flotation time
- Handsheets DP (only after 12 min flotation) for measurement of tensile and tear (Brecht-Imset)
- Fibre length distribution UP & DP
- All ash values subdivided into clay and carbonate shares

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### Newspaper Mixtures (1)

| MIX 1 | Offset coldset BILD news  
Mixture from 10 printing locations in Germany |
| MIX 2 | Waterless offset coldset news from Cortina printing machines  
Mixture of 9 European newspapers |

### Newspaper Mixtures (2)

| MIX 3 | Offset coldset regional news  
Mixture of 10 newspapers from various publishers in Germany |
| MIX 4 | Offset coldset nationwide news  
Mixture of 7 news from various publishers in Germany |
Deinkability Results
Newspapers – Brightness Development

Deinkability Results
Newspapers – Score
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MIX 5: 13 rotogravure magazines on SC paper without varnished covers
MIX 7: 5 rotogravure magazines on SC paper with dispersion varnished covers
MIX 8: MIX 7 without the dispersion varnished covers
**Rotogravure Magazine Mixtures (2)**

| MIX 6: 3 rotogravure magazines on LWC paper without varnished covers |
| MIX 9: 3 rotogravure magazines on LWC paper with dispersion varnished covers |
| MIX 10: MIX 9 without the dispersion varnished covers |

**Rotogravure Magazine Mixtures (3)**

| MIX 11: 5 rotogravure magazines on LWC paper with UV varnished covers |
| MIX 12: MIX 11 without the UV varnished covers |
Deinkability Results
Rotogravure Magazines – Luminosity

Luminosity Increase:
20.7 20.0 19.6 19.9 20.8 21.4 21.9 21.8

Deinkability Results
Rotogravure Mags. – Yield Development

Mix 5: SC, Mag., Roto.
Mix 7: SC, Mag., Roto., w. Disp.
Mix 8: SC, Mag., Roto., w/o Disp.
Mix 6: LWC, Mag., Roto.
Mix 9: LWC, Mag., Roto., w. Disp.
Mix 10: LWC, Mag., Roto., w/o Disp.
Mix 11: LWC, Mag., Roto., w. UV
Mix 12: LWC, Mag., Roto., w/o UV

Fibre Losses, %

Rotogravure Magazines

Mix 5: SC, Mag., Roto.
Mix 7: SC, Mag., Roto., w. Disp.
Mix 8: SC, Mag., Roto., w/o Disp.
Mix 6: LWC, Mag., Roto.
Mix 9: LWC, Mag., Roto., w. Disp.
Mix 10: LWC, Mag., Roto., w/o Disp.
Mix 11: LWC, Mag., Roto., w. UV
Mix 12: LWC, Mag., Roto., w/o UV

LWC-Paper
SC-Paper
Deinkability Results
Rotogravure Magazines – Dirt Specks

Deinkability Results
Rotogravure Magazines – Score
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Offset Heatset Advertising Material Mixtures (1)

MIX 18: 8 deliveries “Einkauf Aktuell”, Postage service 250–500 g weight each, predominantly SC paper and newsprint

MIX 19: Advertisements from 5 different food groceries with Blue Angel ecolabel. SC paper, LWC paper, improved newsprint
<table>
<thead>
<tr>
<th>Offset Heatset Advertising Material Mixtures (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIX 20: Advertisements from 4 different food groceries without Blue Angel ecolabel, SC paper, newsprint, FSC ecolabel</td>
</tr>
<tr>
<td>MIX 21: Advertisements from 4 different electronic stores, predominantly newsprint</td>
</tr>
</tbody>
</table>

| MIX 22: Advertisements from 7 different furniture stores, predominantly SC paper |
| MIX 23: High quality advertisements from 8 different companies, LWC paper |
Deinkability Results
Offset Advertisement – Score

Deinkability Results
Offset Advertisement – Luminosity
Deinkability Results
Reason for Discolouration of Mix 23

Mix 23
(35 g each product)

Mass of HUNKE cover in Mix 23 was only 1.1 %

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All Samples – Score

Deinkability Results
All Samples – Filtrate Darkening
Deinkability Results
All Samples – DP Colour Area

Deinkability Results
All Samples – Luminosity
Deinkability Results
All Samples – COD (UP)

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Summary I

- All conclusions refer to tests of print product mixtures, not to single product tests as in the past. Nevertheless, the assessment according to the EPRC Scorecard was applied.
- The majority (25 of 26) of print product mixtures passed the test. This makes obvious that the applied Scorecard is very fair.
- Good deinkability test results received 24 print product mixtures with a scoring range between 75 and 100 score points (average: 92).
- Deinkability results of the print product mixtures “Newspapers” represent the lowest level with respect to deinked pulp luminosity. The newspaper mixture from waterless offset presses (Cortina) perform best in this mixture category.

Summary II

- Best deinkability results in terms of deinked pulp luminosity and ink elimination are obtained from offset as well as from rotogravure print products on LWC papers in the print product mixture categories “Magazines” and “Catalogues”.
- Deinkability test results of print product mixtures on SC papers in the category “Magazines” are in terms of luminosity a little bit lower than mixtures of LWC papers.
- Lowest dirt speck area of DP is obtained for rotogravure mixture categories “Magazines” and “Catalogues”, independent from paper grade. Not yet clarified are the variations in DP dirt speck area of the mixture category “Offset Magazines”.
- Actually there is no clear indication that dispersion or UV coated covers effect very strongly the dirt speck area of DP.
The deinkability test results of the print product mixtures “Advertisements” are determined by the paper grades used and the amount of ink applied. Advertisement on newsprint provides lower deinkability results in terms of luminosity compared to that on SC or LWC papers.

The print product mixture “Electronic Advertisement” (MIX 21) passed the test with the result “Fair Deinkability” but with too low fibre yield. By reduction of the flotation time to 6 minutes the required yield was achieved with optical characteristics still above the threshold.

The print product mixture “High Quality Advertisement” (MIX 23) failed the test due to too high filtrate darkening (ΔY = 23). Reason was a dark blue dyed cover of one single advertisement which contributes only to 1,1 % by mass in the total mixture.

Additional flotation time (from 6 to 12 min) increases especially fibre losses (+8 % on average; Min–Max: 3–12 %) and ash losses (+4 % on average; Min–Max: 1–7 %).

For all tested print product mixtures after 6 min flotation time the final brightness obtained is 98 % on average (in minimum 96 %).

COD increases by paper grade from newsprint & SC to LWC paper.

A general statement based on the results of the project is: The main constituents of sorted graphic paper for recycling (1.11.00) show good deinkability.
Thank you for your attention!

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