INGEDE Methods: From Industry Procedures to International Standards

Dennis Voss, Andreas Faul
International Association of the Deinking Industry (INGEDE)

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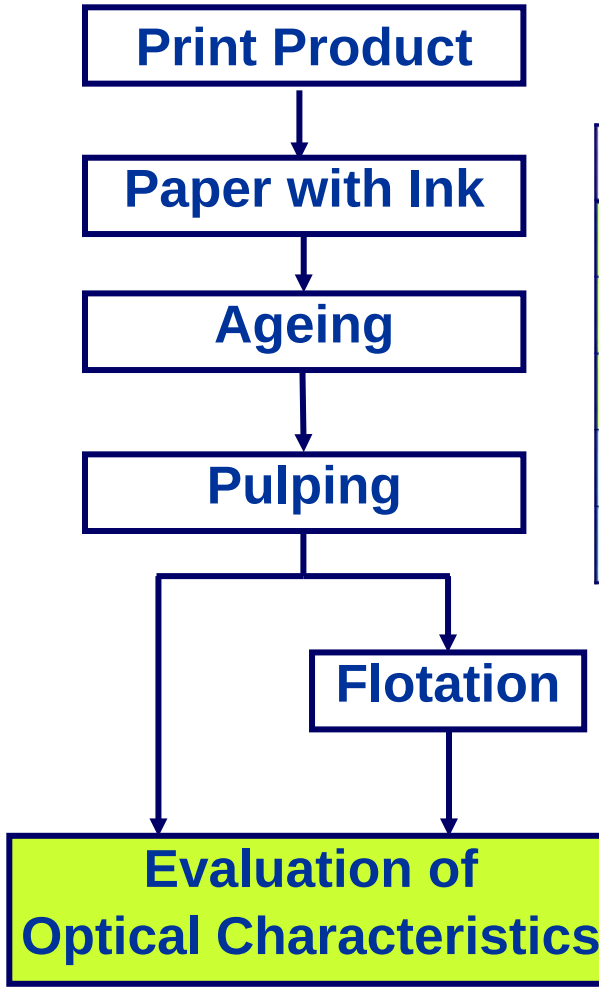
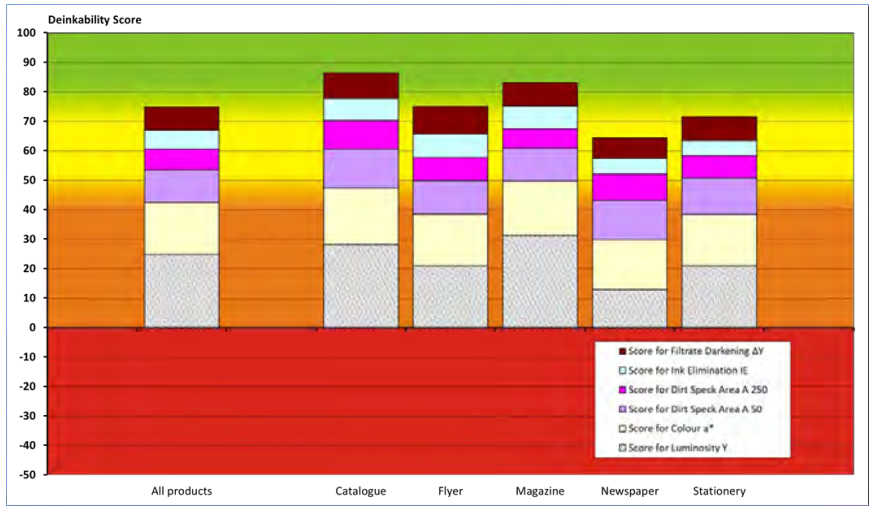
The Historic Path of Key INGEDE Methods

- INGEDE Method 4: **Analysis of Macrostickies in Pulps**
  - First edition **1997**, revisions 1999, 2011, **2013**
- INGEDE Method 11: **Assessment of Print Product Recyclability – Deinkability Test –**
  - First edition **2001**, revisions 2007, 2009, 2012, **2018**
  - EPRC Deinkability Scorecard **2008**, 2009, **2017**
- INGEDE Method 12: **Assessment of the recyclability of printed paper products – testing of the fragmentation behaviour of adhesive applications**
  - First edition **2001**, revisions 2009, **2012**
  - ERPC Removability Scorecard **2011**, **2017**

A Spot on Deinkability: INGEDE Method 11



Objectives	Evaluated Parameters	
High Reflection	Luminosity Y of Deinked Pulp	Quality Parameters
High Optical Cleanliness	Dirt Area A of Deinked Pulp (in two size class categories >50 & >250)	
No Color Shade	a* Value of Deinked Pulp	
High Ink Removal	Ink Elimination IE	Process Parameters
No Discoloration of Process Water	Filtrate Darkening ΔY	



Parameters are measured

Compared with an Assessment Scheme to Scores

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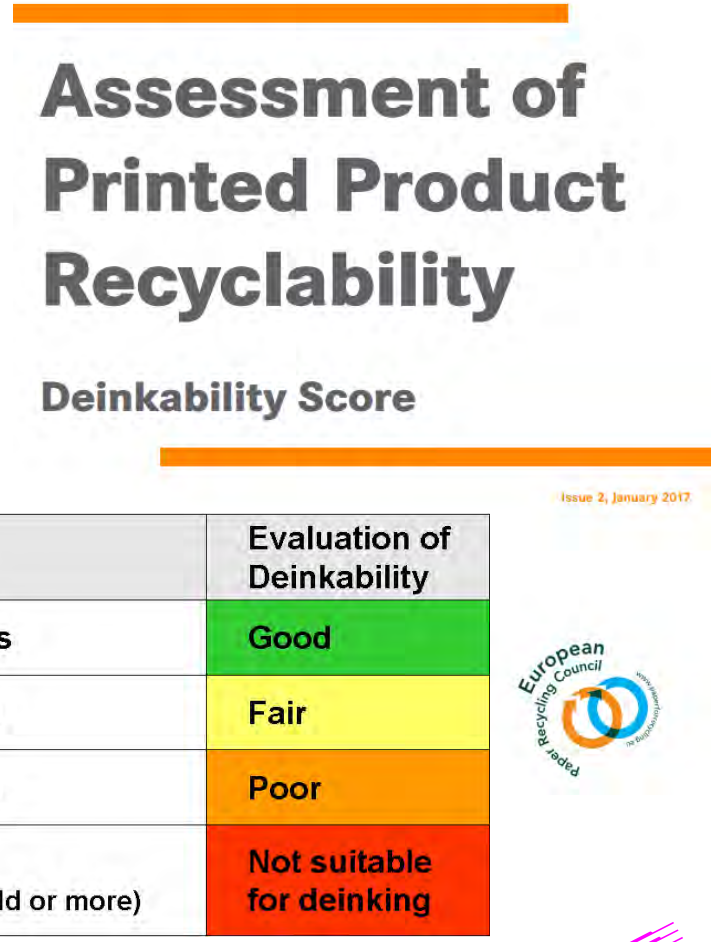
Assessment of Deinkability «Deinkability Score»

- Focus on essential process steps.
- Target values are less demanding than industrial requirements.
- European deinkers feel comfortable with the assessment giving an indication of the behaviour during the process.
- More detailed assessment would lead to a more complex and expensive test.



Score	Evaluation of Deinkability
71 to 100 Points	Good
51 to 70 Points	Fair
0 to 50 Points	Poor
Negative (fails one threshold or more)	Not suitable for deinking

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From Industry to ISO

- **INGEDE Method 11** first published in 2001
- INGEDE Method 11 transferred to a DIN document: **DIN SPEC 55700** in 2016
- DIN SPEC 55700 used as a basis for **ISO 21993** in 2020.

ISO 21993 and INGEDE Method 11

- Similar approach and process steps
- **INGEDE Method 11** has a full coverage of ISO 21993,
  - with the exceptions to a slight difference in the pulping consistency (when the ash content is < 20%) and the quantity in the pulper.
- **INGEDE Method 11** is more precise than ISO 21993,
  - e. g. definitions of a certain filter paper, disintegration equipment “Hobart Pulper” and image analysis systems DOMAS and Simpatic.
- INGEDE Method 11 contains measurement of Ink Elimination IE
  - IE is needed for the current «Deinkability Score»

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Key features of INGEDE Method 11 and ISO 21993

- Laboratory scale indicator how a print product will behave in an industrial deinking process
- Alkaline pulping, single loop flotation, no screening step
  - (all non-paper material and adhesive applications are removed during sample preparation)
- Tests do not require unprinted paper

- Outlook: Method is also interesting for white packaging, therefore a treatment of complex products has to be enabled

Main activities in ISO standardisation

- ISO 21993 – **Deinkability test** for printed paper products
  - Published in January 2020
  - Document is based on INGEDE Method 11
  - Project leader Andreas Faul
- ISO 21896 - **Decolouration test** of dye coloured paper products and paper products printed using dye inks
  - Published in March 2020
  - Project leader Benjamin Fabry
- ISO 21331 – **Guidance** for assessing the **deinking performance** of printed paper products
  - Published in November 2020
  - Project leader Laurel Brunner

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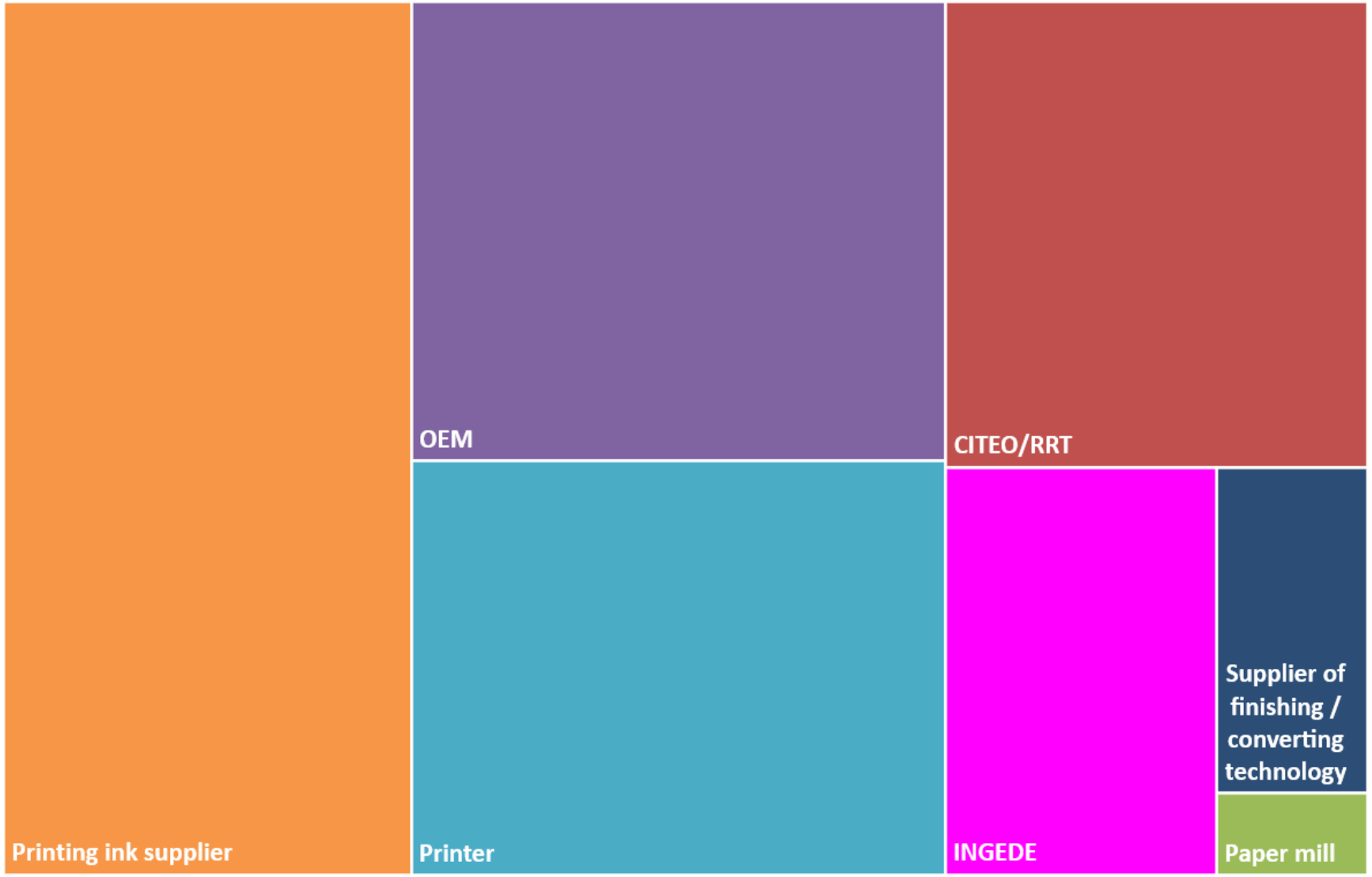
Testing by INGEDE Method 11
Clients



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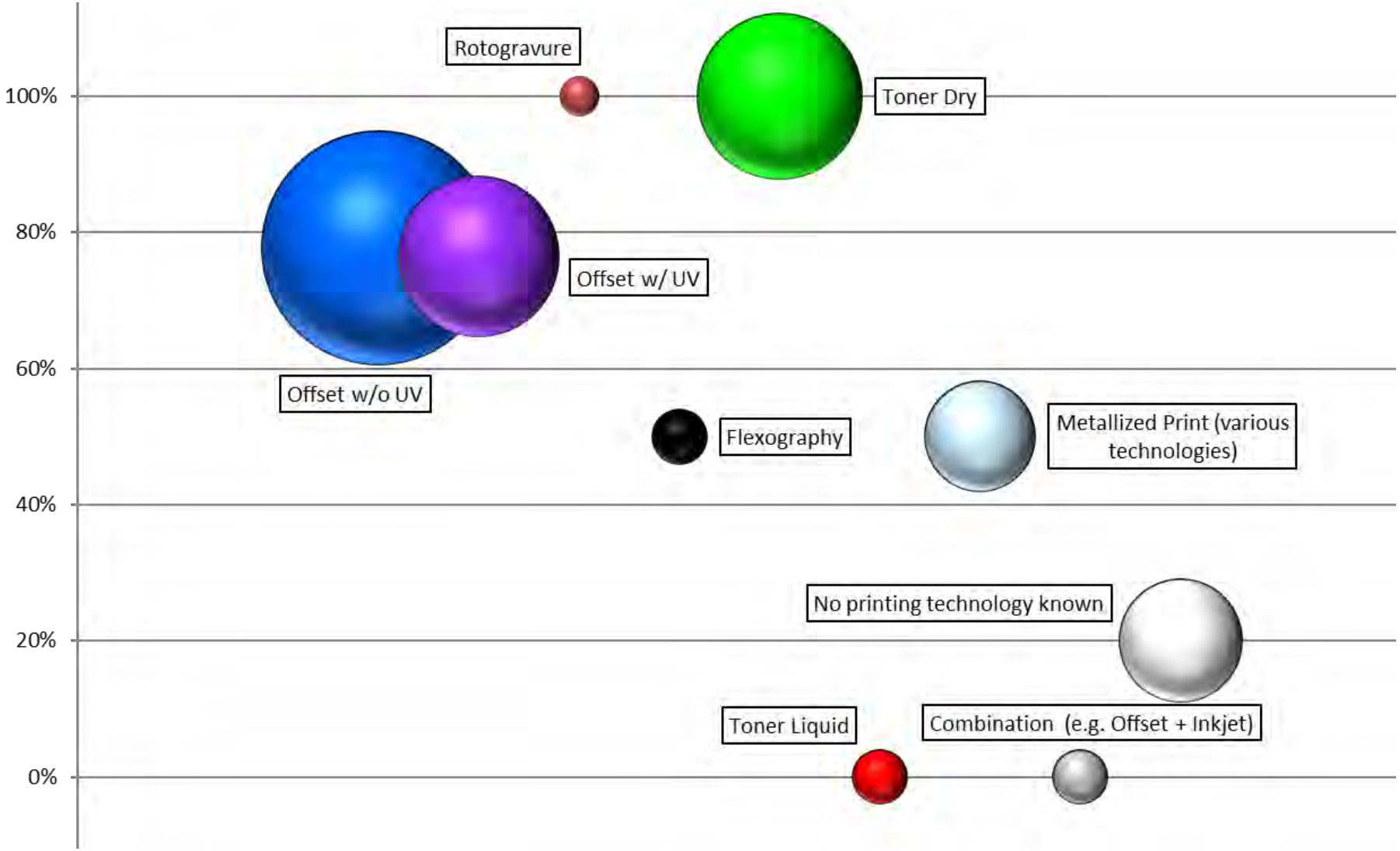
Testing by INGEDE Method 11

Share of positive results



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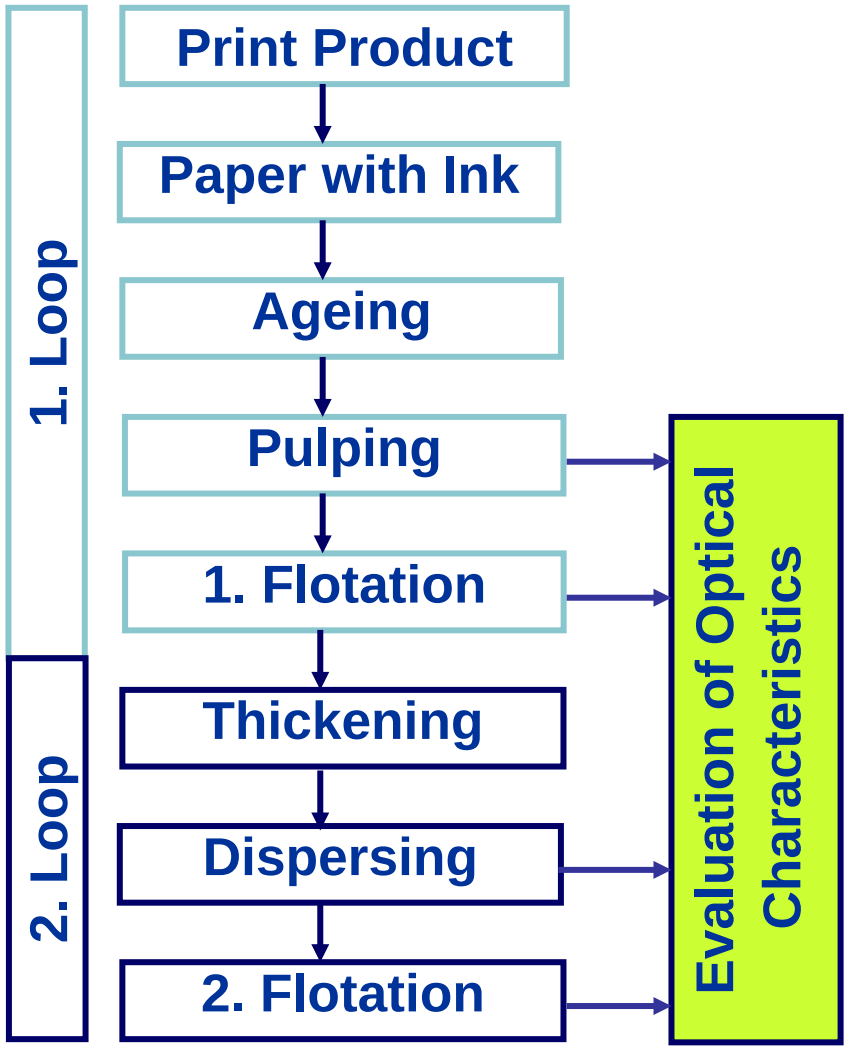
2-Loop-Simulation



- The 2-Loop-Method is seen as a process simulation and should be fixed as INGEDE Method 15
- But: Needs **4 times the time** of INGEDE Method 11.
- For an assessment, other target values than for INGEDE Method 11 are necessary and depending on product grade quality requirements.
- Based on Simulation developed by PMV in the IGF 18288 N-Project 2017.

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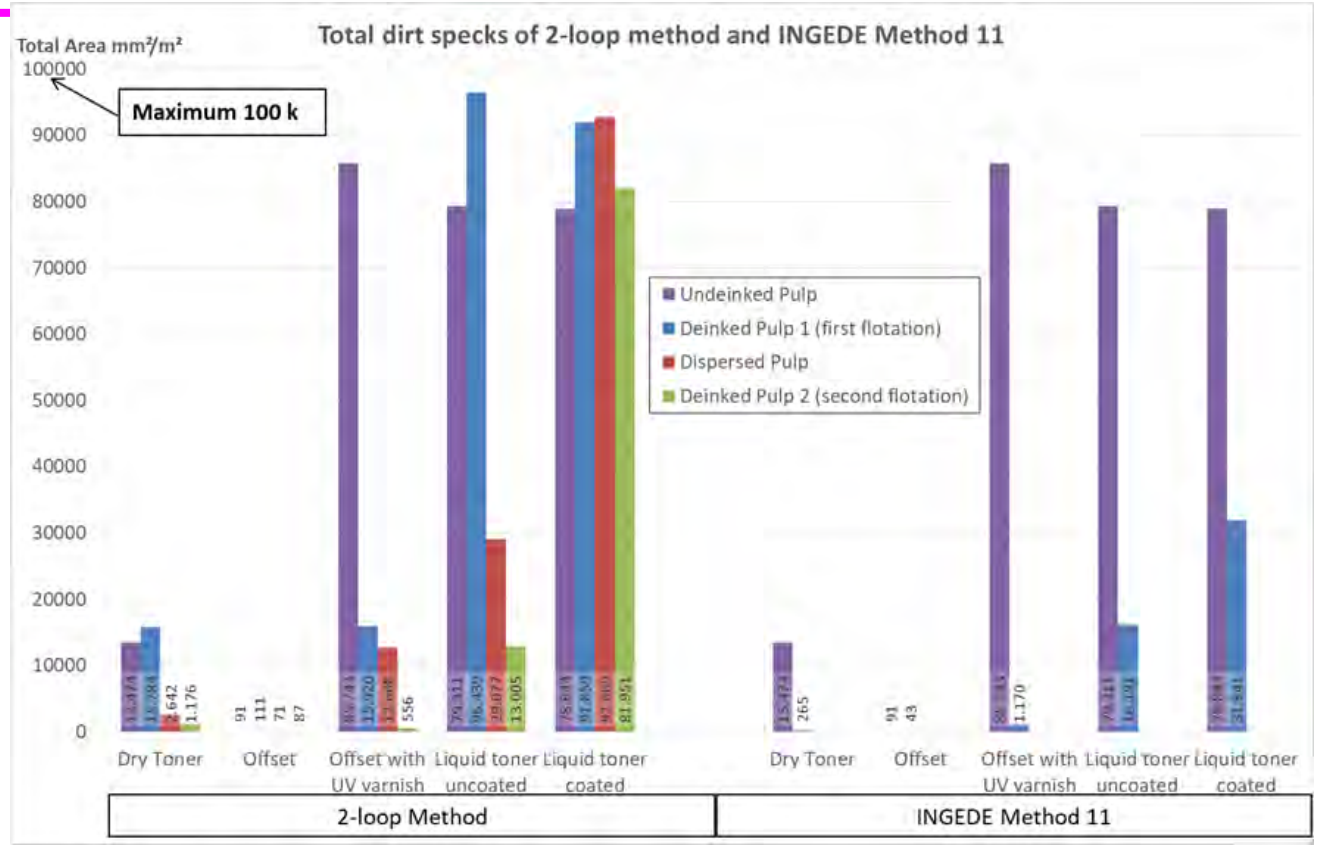
1-Loop-Test & 2-Loop-Simulation (INGEDE Project 164 20)

- The critical products – UV varnished and liquid toner – remain critical disregarding the method
- Results from tests with INGEDE Method 11 are often better than the ones with the 2-loop method

Main reason: Hyperflotation in INGEDE Method 11



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A Future Path: Packaging Recyclability

- Keep white fibres within the graphical Loop
- Suitable (white) packaging papers should be allowed in graphical PfR qualities
- Suitable (white) packaging papers should fulfil the requirements regarding
  - Removability of Stickies (INGEDE Method 12)
  - Deinkability (INGEDE Method 11)
- INGEDE Method 11 and 12 might need to be extended
  - regarding **chemical ingredients** (Barrier Coating)
  - regarding **COD load** (Barrier Coating)
  - **Pre-Treatment** / Screening (Lamination)

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Thank you very much for your attention!

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INGEDE. We are the Deinkers.

INGEDE Office

Gerokstr. 40
74321 Bietigheim-Bissingen
Germany

Phone +49 7142 37522-21
Fax +49 7142 37522-20
Mail office@ingede.org

INGEDE Public Relations

Oetztaler Str. 5 B
81373 München
Germany

Phone +49 89 769-2332
Fax +49 89 769-2338
Mail info@ingede.org

www.ingede.org

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1-Loop Test & 2-Loop Simulation

	INGEDE Method 11	2-Loop method
Sample preparation	72 h drying cabinet 60° C, cut to 2x2 cm pieces	equal
Pulping	20 minutes, Hobart pulper	equal
Pulper chemistry	0,3 % NaOH, 0,9 % sodium silicate, 0,7 % hydrogen peroxide, 0,8 % oleic acid (NAOH and sodium silicate half of standard dosage due to pH)	equal
Storage	1 h drying cabinet in closed container @ 45 °C (deviation to INGEDE Method 11)	1 h water bath @ 45 °C
Flotation 1	c = 0,8%, t=12 minutes, 2 litres make-up water	c = 0,8%, t= 6 min, w/o make-up water
Dewatering	n/a	CEPA laboratory centrifuge LS, 4500 rpm, screen basket 11 µm (water fed forward)
Dispersing	n/a	Cavimix 1031, c = 29%, t = 2 min, T = 70 °C, M = 200 g_{otro}
Chemicals Flotation 2	n/a	0,2 % NaOH, 0,3 % oleic acid (otro pulp)
Flotation 2	n/a	c = 0,8%, t = 4 min, w/o make-up water

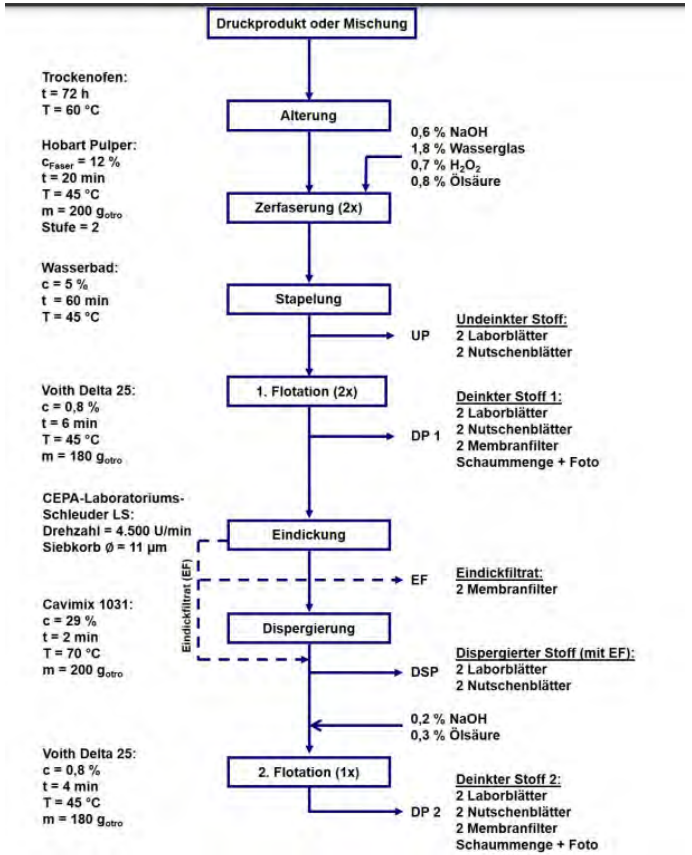

Abbildung 9: Aufbereitungsschema der 2-Loop Methode

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