

Deinking Grades of Paper for Recycling – What determines the quality?

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Abstract

The quality of paper for recycling can be described in several aspects. One is the “purity”, a combination of the composition and the absence of contamination. Other major criteria are the physical properties and the recyclability of the paper products of which a consignment consists.

The purity is a function of the proper handling of the paper for recycling which should not be a difficult task in case of industrial material, e. g. originating from print shops. With post-consumer material, the system of collection and subsequent sorting plays an important role.

Physical properties are mainly depending on the base papers whereas recyclability is in connection with the printing method and the converting materials used.

INGEDE monitors quality levels and trends by means of statistics of members' data assembled by the INGEDE Office as well as regular testing work by institutes. These activities refer to both process examinations and product testing on recyclability. Results of these investigations will be shown as well as some specific mill experiences.

Keywords

Paper for recycling, collection, sorting, recycling process, INGEDE, ink, deinking, deinkability, recyclability, contamination, quality

Altpapier für Deinking – Was bestimmt die Qualität?

Deinking Grades of Paper for Recycling – What determines the quality?

PTS-CTP Deinking Symposium
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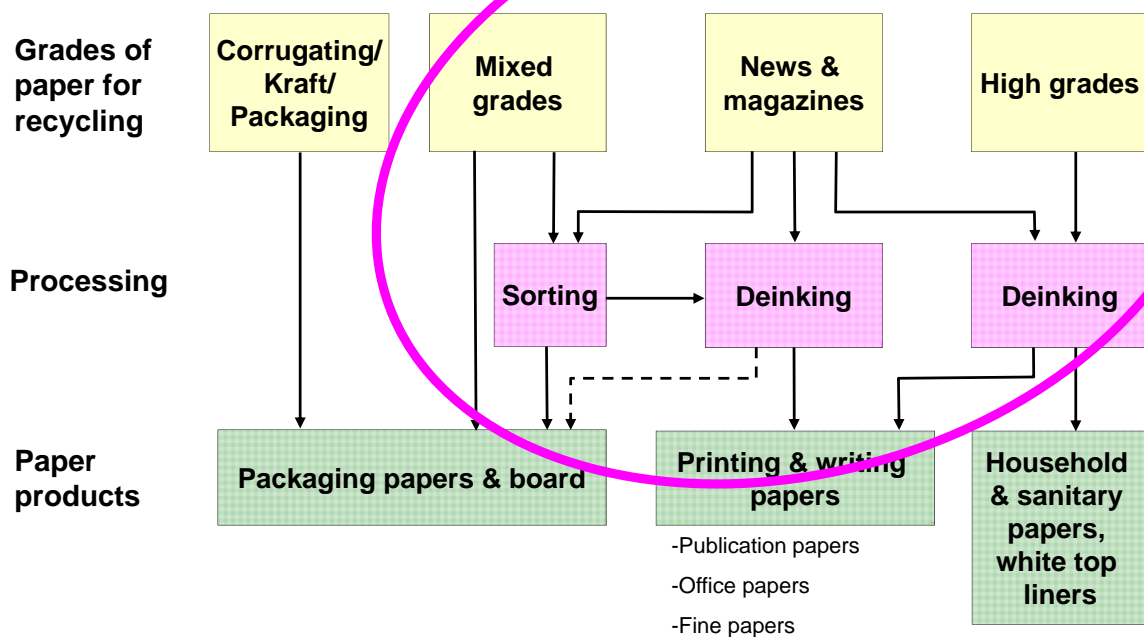
Andreas Faul, Manfred Geistbeck, Anne-Katrin Klar



Quality aspects of deinking grades



Paper for recycling and paper products



Deinking grades of paper for recycling



- According to the new EN 643, there are 40 grades potentially intended for deinking
- The quality focus is on:
 - Newspaper and magazines (1.09.00, 1.11.00)
 - Office papers and coloured letters (2.05.00, 2.05.01, 2.06.00, 2.06.01)
 - Medium and high grades, usually from print shops – multigrade and multi printing (2.13.00, 3.10.00, 3.10.01)

Composition – Requirements

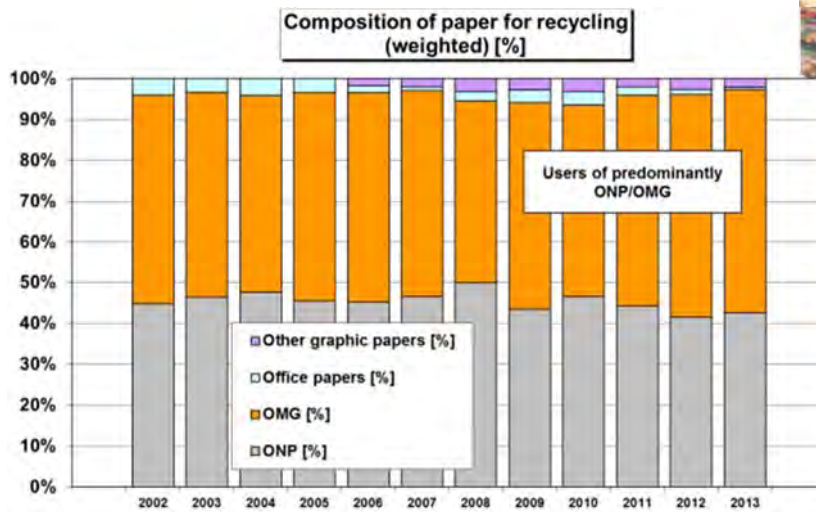


- EN 643 clearly defines the composition of each grade
- Examples (in short form):
 - 1.11.00: At least 30% newspaper and 40% magazines, both together minimum 80%, the rest other graphic papers
 - 2.05.00: Typical office papers, minimum 60% woodfree, no carbon and carbonless papers, less than 10% unbleached fibres, less than 5% newspapers and packaging
 - 3.10.00: Woodfree coated papers with light printing, no wet strength, no mass coloured papers



Composition of 1.11.00 and similar

- ONP: 41 to 50% (yearly avg.)
- OMG: 47 to 51% (yearly avg.)



- Composition of ONP/OMG grades is mainly depending on reading habits

Prohibited materials

- **EN 643 definition:** *Any materials which represent a **hazard for health, safety and environment**, such as **medical waste, contaminated products of personal hygiene, hazardous waste, organic waste including foodstuffs, bitumen, toxic powders and similar***
- **EN 643 requirement:** *not permitted at all*



Composition – Unwanted material



- **Definition** according to EN 643:
 - **Non-paper components**
 - **Paper and board detrimental to production**
 - **Paper and board not according to grade definition**
 - **Paper products not suitable for deinking**
- **Requirements** (grade specific):
 - **2 to 3% in post-consumer material**
(2% in office papers, 2,5% in 1.11.00)
 - **Usually 1% in pre-consumer material**
(e. g. multi printing)
 - **Usually 0,5% in converters' material**
(e. g. cuttings and shavings)

Non-paper components



- **Definition** according to EN 643:
 - **Metal**
 - **Plastic**
 - **Glass**
 - **Textiles**
 - **Wood**
 - **Sand and building materials**
 - **Synthetic materials**
 - **Removable by dry sorting**
- **Requirements: Max. 0,5 or 1,0%**
(grade specific; deinking grades)

Non-paper components (and non-pulpable material)



Waste container in a plant sorting paper for recycling from household collection



Plastic cards in the coarse reject of a deinking plant

Mill experience: Increase of coarse rejects



- **Coarse rejects:**
Non-paper components and sorting drum rejects
- **Similar sourcing / suppliers over reporting period**

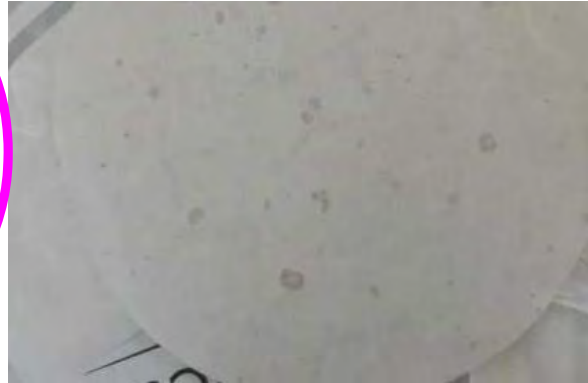
Paper and board detrimental to production

Background:

- Paper and board which need a special treatment process, e. g. wet-strength, compounds
- In EN 643: Group 5 grades



Ream wrap in a bale of sorted coloured letters (2.06)



Laboratory handsheet of ream wrap paper

Paper and board not according to grade definition

- Major daily issue for deinkers

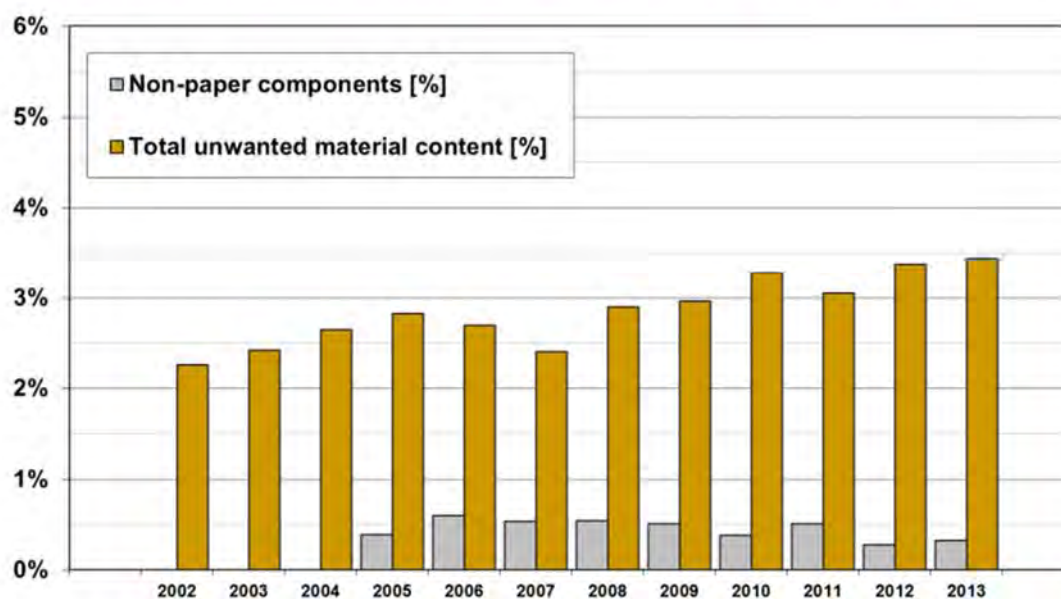


Unbleached material in sorted paper from households



Corrugated box in a bale of office paper

INGEDE statistics on non-paper components and total unwanted material



- **Non-paper components stable**
- **Total unwanted material increasing**

Influence of collection and sorting (1)

Commingled collection:

- High level of non-paper components in collected material
- Needs sophisticated sorting system
- Danger of cross-contamination
- Highest sorting costs and relatively low yield of deinking grades
- Critical issue: broken glass



Material before sorting

Influence of collection and sorting (2)

Paper and board collection:

- High level of packaging in collected material
- Needs sorting
- State-of-the-art automatic sorting has a low yield of deinking grades



Influence of collection and sorting (3)

Separate graphic paper collection:

- In the ideal case no additional sorting necessary
- Impurities lower than paper and board collection

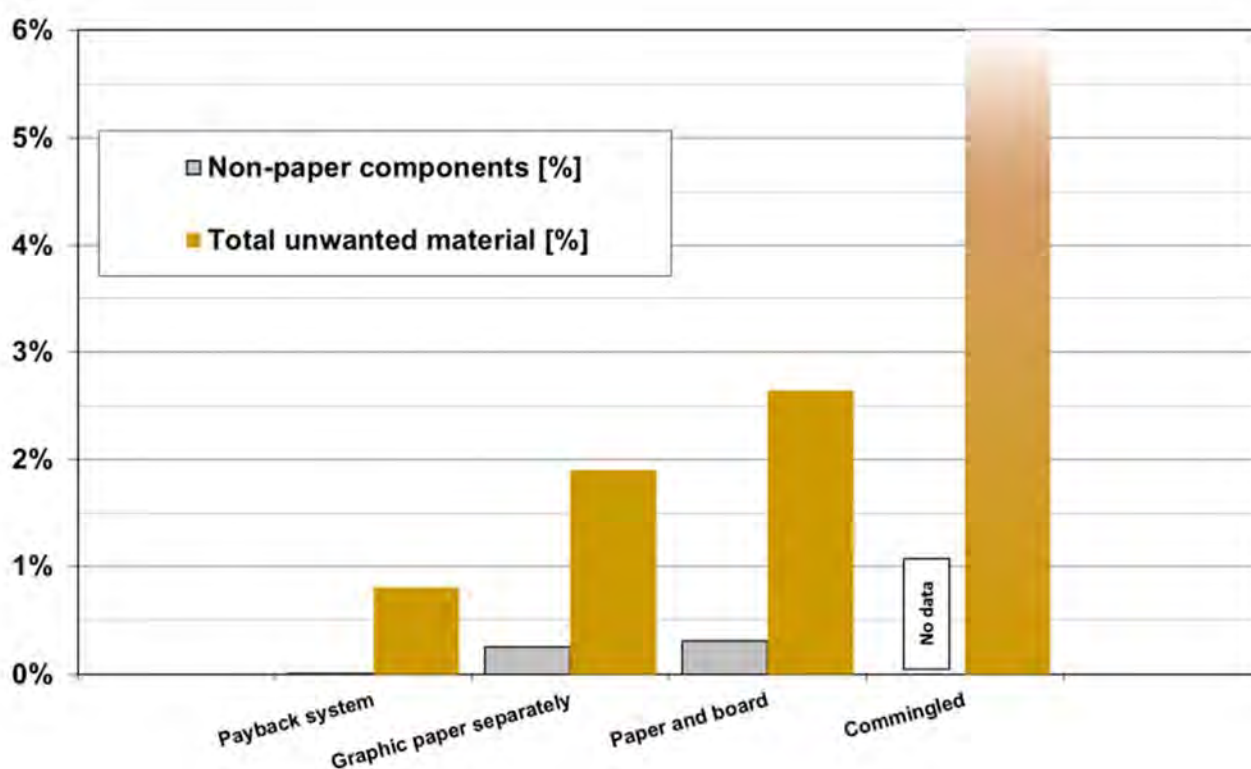


Traditional kerbside bundle collection



Quality control at collection point of payback system

Influence of collection and sorting (4)



Critical substances

- **Mineral oils** from printing inks and other sources are not a major issue for most users of white paper for recycling but can affect certain applications
- **Bisphenol (A)** – in thermographic paper
- **DIPN** – in NCR paper
- **Diisobutylphthalate** – is/was in use as softening agent in adhesives
- ...

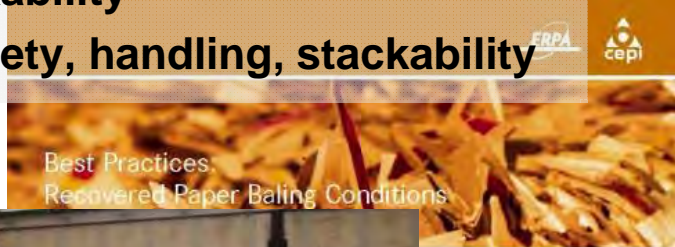
Moisture

- Requirement in EN 643: max. 10%
- Moisture is mainly a commercial issue
- Exception:
Paper for recycling is extremely wet



Form of delivery – Loose and baled paper for recycling

- Loose material ⇒ normally not an issue
- Bales
 - Size ⇒ Handling, stackability
 - Quality of wiring ⇒ Safety, handling, stackability



and stored in a safe and cost-efficient manner. The use of metal wires to be promoted in the future". If one exists.

id.

ty: "Big Bales"
ons of the bales:
between 1m and 2.50m
nd width: between 0.75m and 1.25m
from 7 00 kg and more
ure: optimum weight to be loaded on
ould be the maximum legally permitted,
kgs

corner of XIE

Form of delivery – Shredded paper for recycling



- Shredding happens more often than necessary (e. g. newspapers)
- Filter dust from shredding is sometimes “re-baled”
- Shredding offers the possibility to hide unwanted papers
- Shredding reduces fibre length and strength as well as deinking performance



Think before you shred! – Campaign of the European Recovered Paper Council



THINK BEFORE YOU SHRED!

Shred only documents with sensitive information!

Shredding shortens paper fibres – recycling whole pieces keeps the fibres long, strong, and ready to be made into new paper. Improve recycling by putting non-sensitive papers straight in the recycling bin. It's easy!

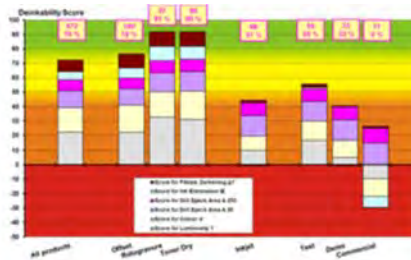


Aspects of recyclability



For a good recyclability, print products have to be:

- Repulpable ⇒ Issue with wet-strength papers and with compounds
- Deinkable



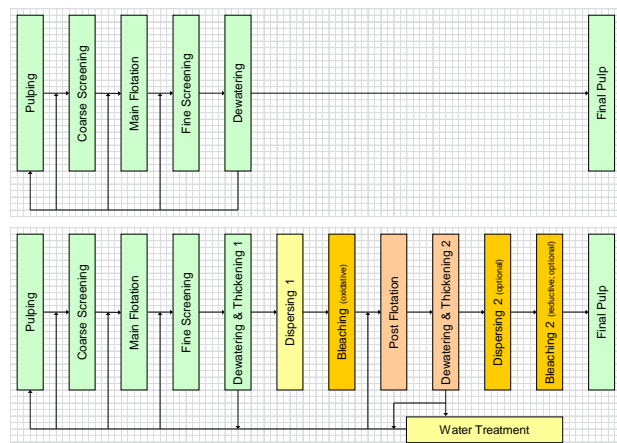
- Adhesive applications must be removable
- Critical substances have to be avoided



Changes in the deinking process design



- Deinking in the 1970s
- Deinking today (for improved paper grades)
- Process modules became more sophisticated
- Reasons
 - Higher quality of deinked pulp necessary
 - Higher tolerance against paper products with insufficient recyclability (ink, adhesive applications)



Impact of low or insufficient deinkability

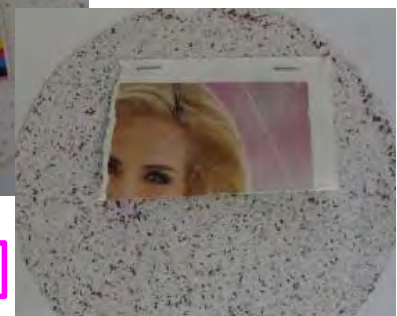
- **Long term**
 - Process adaptation to compensate – more equipment, chemicals, energy, losses
 - Increased filtrate darkening
 - ...
- **Short term (= quality defects)**
 - Low brightness \Rightarrow caused by waterbased flexography
 - Dirt specks \Rightarrow caused by HP Indigo, UV, varnish, ...
 - Discolouration \Rightarrow possibly caused by rotogravure

Mills experience: Dirt specks (1)

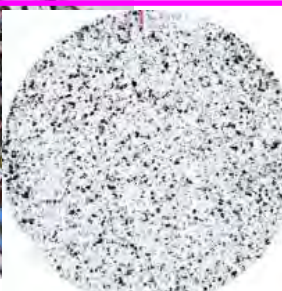
non-critical



critical

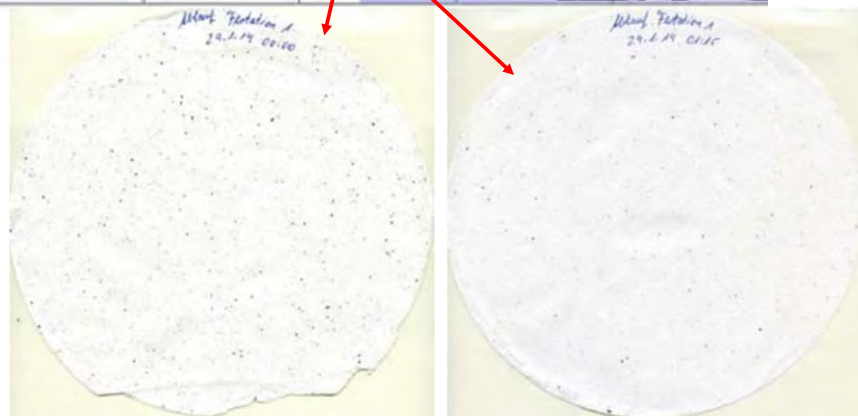


critical: before and after laboratory flotation



Mills experience: Dirt specks (2)

Online dirt speck sensor after main flotation



Mills experience: Dirt specks (3)

Nearly identical tattoos after laboratory pulping



Responsibilities

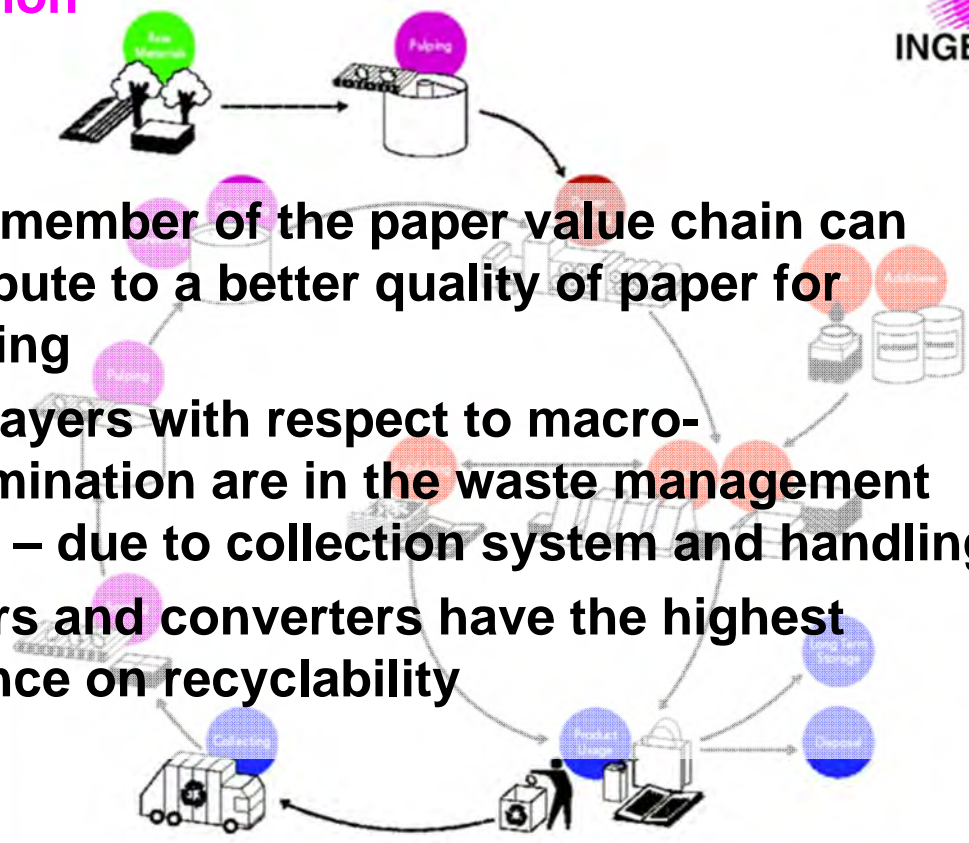


	Paper producer	Publisher, printer, converter	Consumer (private, business)	Municipality (collection system)	Collector, sorter, trader (pre-consumer)	Collector, sorter, trader (post consumer)
Composition				◆	◆	◆
Non-paper components			◆	◆	◆	◆
Unwanted papers			◆	◆	◆	◆
Prohibited material			◆	◆	◆	◆
Critical substances		◆			◆	◆
Recyclability	◆	◆			◆	
Moisture		◆	◆	◆	◆	◆
Form of delivery		◆			◆	◆
Physical properties	◆				◆	◆

Conclusion



- Every member of the paper value chain can contribute to a better quality of paper for recycling
- Key players with respect to macro-contamination are in the waste management sector – due to collection system and handling
- Printers and converters have the highest influence on recyclability



The motor block is reality!



Thank you very much for your attention!

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INGEDE International Association of the Deinking Industry



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