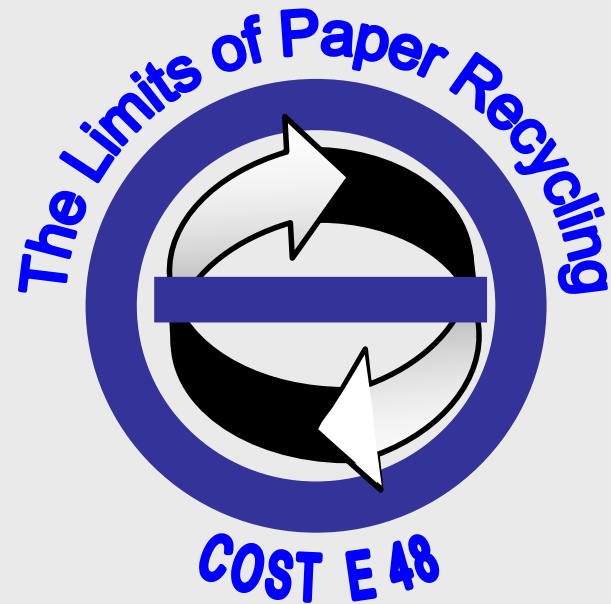


Graphic Paper recycling – markets and quality requirements



COST E48 Final Conference

6 May 2009 • Munich

Andreas Faul

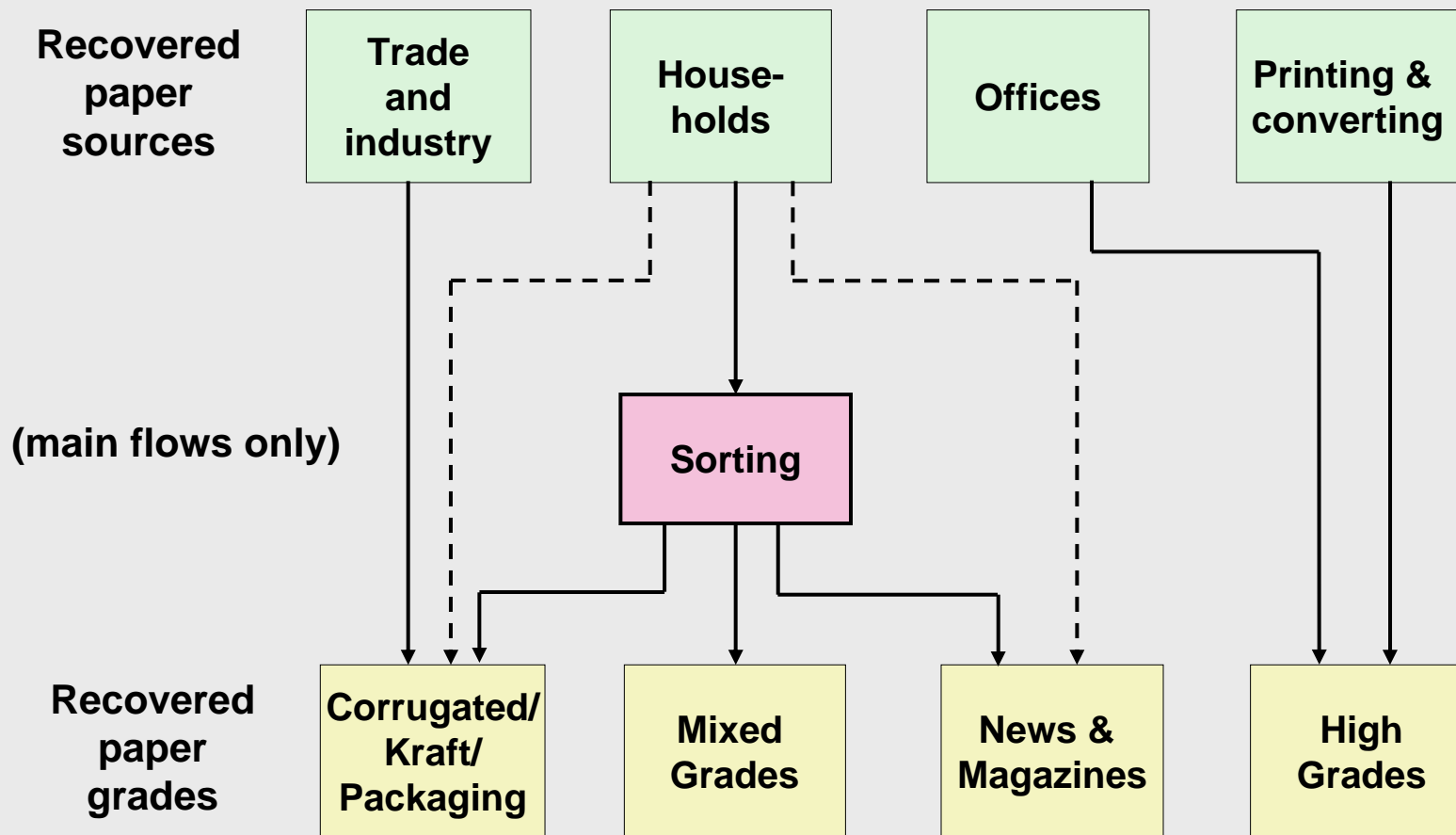
Contents



- **Sources and uses of recovered paper**
- **Quality data of deinking grades**
- **Update on the assessment of deinkability**
- **Work on the removal ability of adhesive applications**



Recovered paper sources and flows



000 tonnes 2007

9 930

20 378

14 076

5 247

Figures: CEPI

EN 643 grades
(main grades
only)

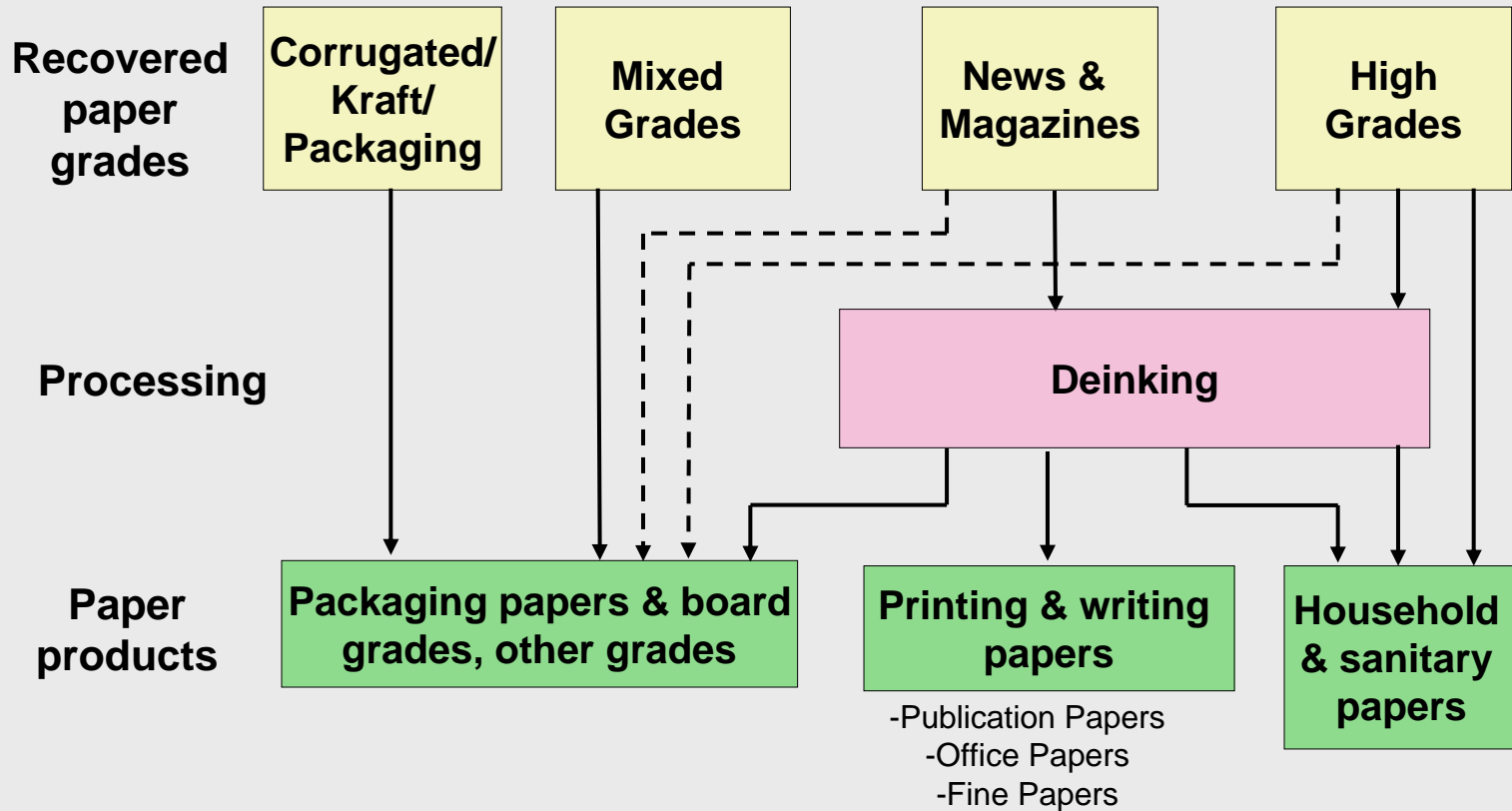
1.04
1.05
4.03

1.01
1.02

1.06
1.11
2.01

2.03
to
3.19

Recovered paper and paper products



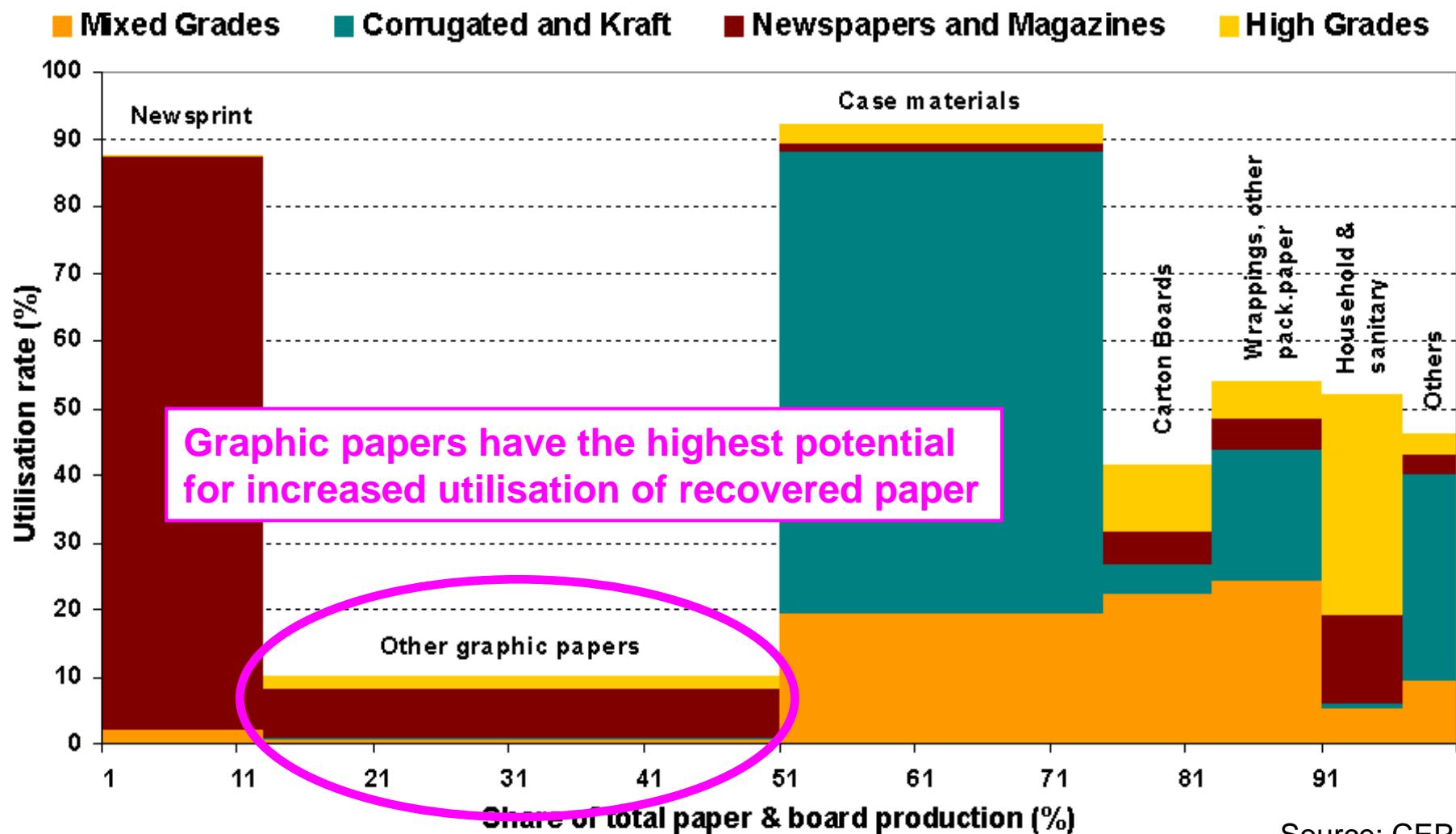
RP utilisation
000 tonnes 2007

32 856

13 332

3 443

Recovered paper utilisation by sector in CEPI countries 2007



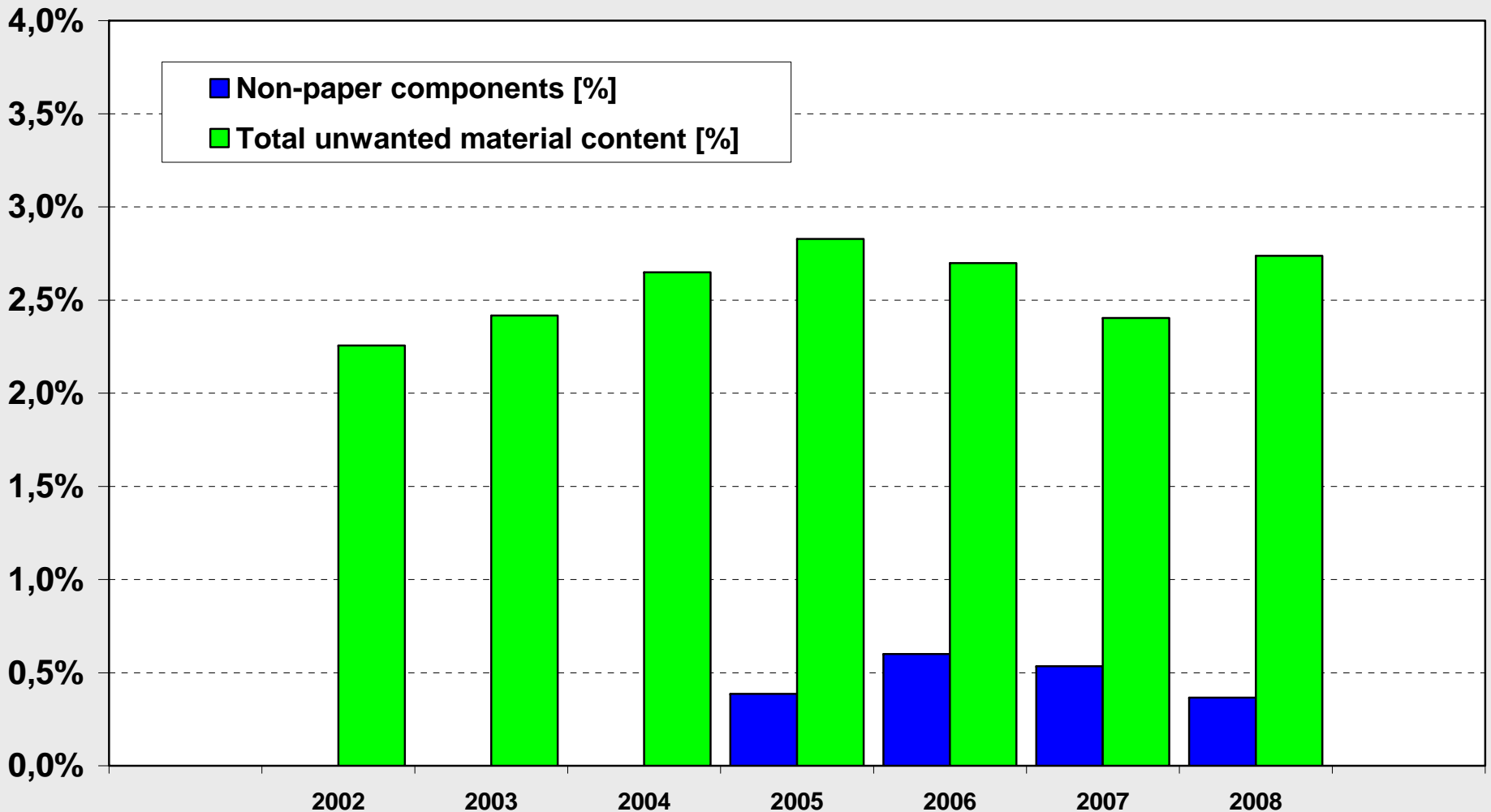
Entry inspection of recovered paper



- **Parameters**
 - **Contamination – non-paper components, unwanted papers**
 - **Composition**
 - **Moisture**
 - **Age**
- **Entry inspection methods**
 - **Visual, e. g. by INGEDE Method 7 (revision released in April 2009)**
 - **Gravimetric, e. g. by INGEDE Method 14 (newly released in April 2009)**
 - **Sensor systems**



Contaminants in recovered paper for deinking in INGEDE member mills



Paper collection systems



Picture: dpa / Spiegel



Concepts for paper collection



- **Graphic papers separate from any other material**
=> preferred by the deinking industry
- **Paper & board together but separate from other material**
=> generally accepted by the paper industry
- **Mixed dry recyclables (paper, board, plastic, cans & glass commingled)**
=> undesired
- **Mixed waste**
=> unacceptable

Unwanted material in recovered paper



- **Related to recovered paper collection, handling and storage**
 - **Cardboard**
 - **Glass**
 - **Plastics**
 - **Sand, Stones, Metals, ...**
- **Related to paper products**
 - **Inks**
 - **Adhesive applications**
 - **Lamination, coating, varnish**
 - **Clips, staples**
 - **Product samples, CDs, ...**




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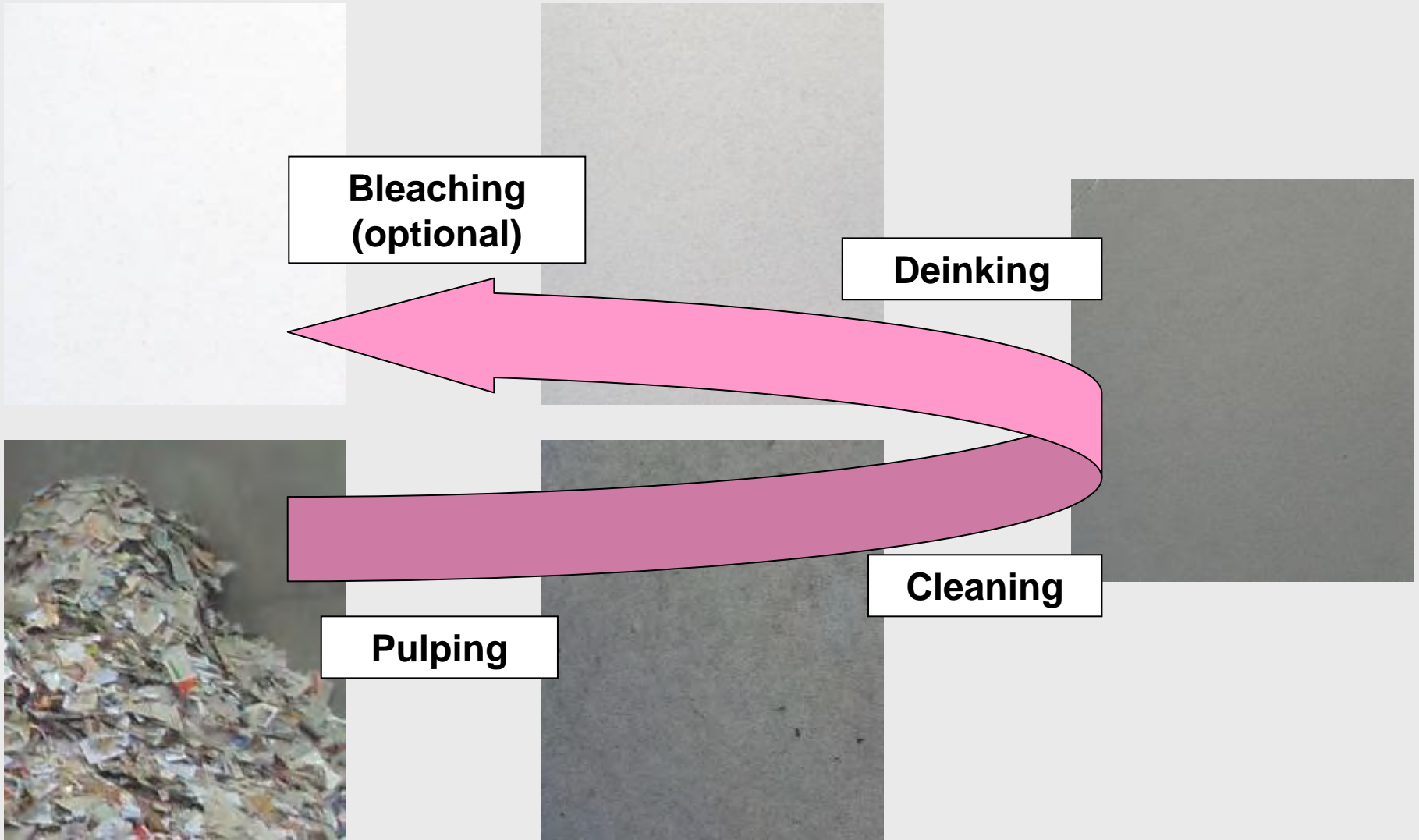


(Source: KBA)

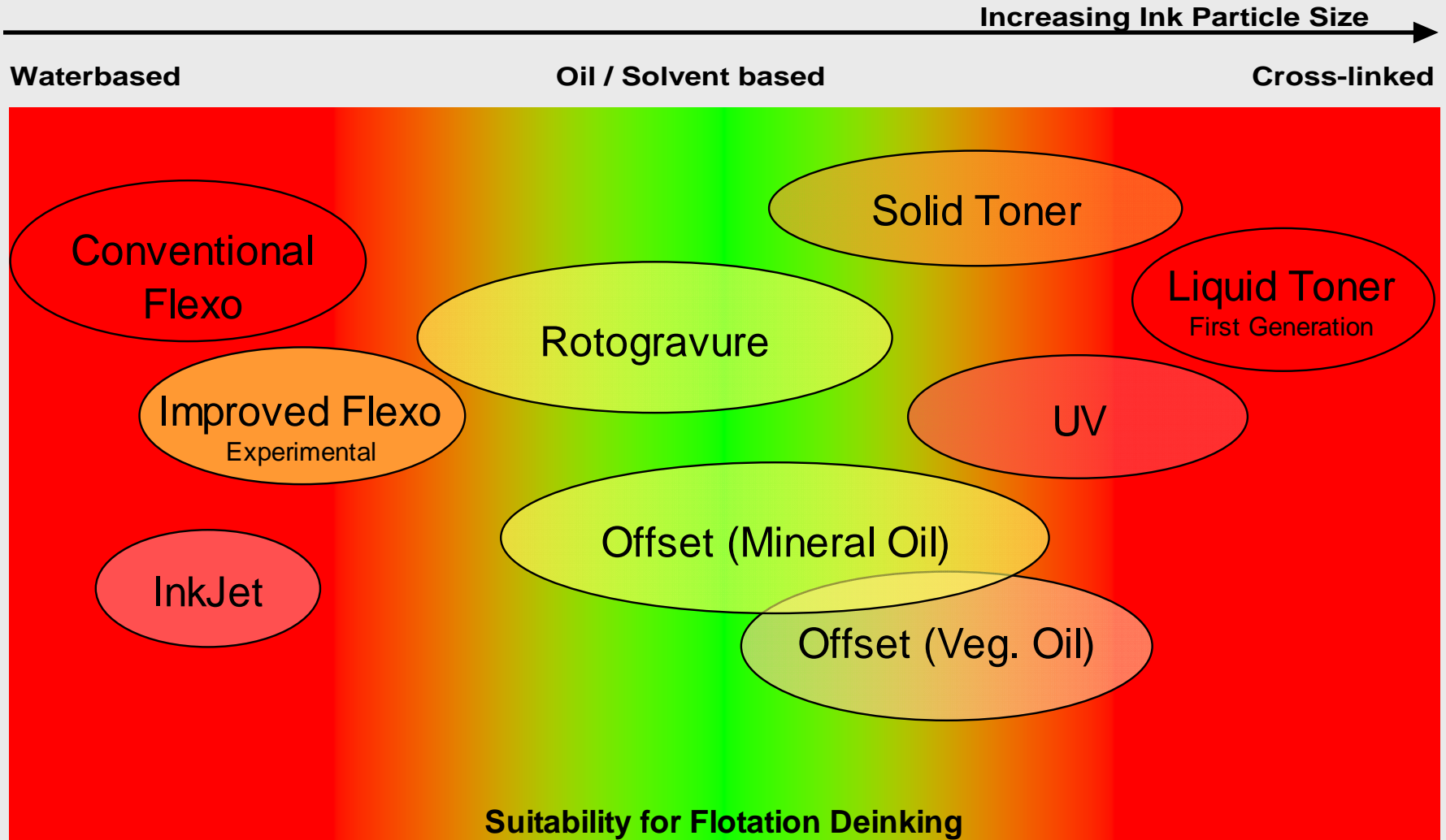
The task: removal of ink



Principal process steps in a deinking plant



Printing – Deinking



Laboratory hand sheets from deinked pulp



Waterbased
Flexographic
Newspaper

Good Deinkable
Offset Newspaper

Offset Newspaper with
too many dirt specks

Digital News on
UV Offset Preprint

Deinkability Scorecard



<p>European Recovered Paper Council</p> <p>Adopted in 4/3/08 ERPC meeting</p>	<p>Assessment of Print Product Recyclability – Deinkability Score –</p>	 The logo of the European Recovered Paper Council, featuring a circular emblem with the text "European Recovered Paper Council" and "European Recycled Paper Association" around it.
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1 Purpose and scope of application

This ERPC document provides an assessment of the deinkability of a printed product by evaluating results of a laboratory deinking test procedure. It is applicable to all kinds of printed products on white paper.

The deinkability of a print product as a whole can be assessed by only looking at its Deinkability Score, which can range from -100 to +100. For individual products this is done by using the rating of the results given in this specification or by comparing the Deinkability Scores of several print products.

If a more thorough technical / scientific evaluation has to be made, the individual scores or the measured values of the deinkability parameters can be used.

2 Principle

Results of deinkability tests achieved by means of INGEDE Method 11 are converted into deinkability scores. For each of the five parameters – luminosity, colour, cleanliness, ink elimination and filtrate darkening – threshold and target values are defined. The target values are depending on the category of the print product; thresholds are the same for all categories. If the result meets the target value or is better, it scores the maximum points allocated to this parameter. The maximum points achievable for each parameter are different thus indicating the importance of each individual parameter. A score below 0 in one or more parameters leads to the overall assessment "not suitable for deinking".

3 Determination of the Deinkability Score

In this chapter, particularly in the tables, abbreviations for the assessment parameters are used:

- Y: Luminosity
- a*: Colour a* (green – red) of the CIELAB system
- A: Dirt particle area

First version adopted in March 2008

Updated version adopted on 17 March 2009

papers. For the determination of IE the parameter R_{700} has to be used with the term

$$\left(\frac{(1 - R_{\infty, \text{unpr}})^2}{R_{\infty, \text{unpr}}} \right) \text{ set to 0. For the image analysis, DOMAS or Simpatric are allowed.}$$

Deinkability Scores

Threshold values



Parameter	Y [Points]	a* [-]	A ₅₀ [mm ² /m ²]	A ₂₅₀ [mm ² /m ²]	IE [%]	ΔY [Points]
Lower Threshold	47	-3,0			40	
Upper Threshold		2,0	2.000	600		18

Y: Luminosity of deinked pulp

a*: Colour of deinked pulp in green / red axis

A₅₀: Dirt particle area of all particles larger than 50 μm

A₂₅₀: Dirt particle area of all particles larger than 250 μm

IE: Ink elimination

ΔY: Filtrate darkening

Deinkability Scores

Target Values



Category of printed product	Y [Points]	a* [-]	A ₅₀ [mm ² /m ²]	A ₂₅₀ [mm ² /m ²]	IE [%]	ΔY [Points]
Newspapers	≥ 60	≥ -2,0 to ≤ +1,0	≤ 600	≤ 180	≥ 70	≤ 6
Magazines, uncoated	≥ 65				≥ 70	
Magazines, coated	≥ 75				≥ 75	
Stationery (Y of base paper ≤ 75)	≥ 70				≥ 70	
Stationery (Y of base paper > 75)	≥ 90				≥ 80	



Categories are now more clearly structured to print products, with subcategories for the base paper where needed

Allocation of other printed products to the categories



- Telephone directories belong to “newspapers”
- Flyers belong to “newspapers” if a maximum ash content of 22% suggests that they are printed on (improved) newsprint, otherwise to “magazines”
- The two categories “stationery” comprise all products which usually contain less ink than magazines, typically business and transactional prints

Deinkability Scores

Maximum Score per Parameter



Parameter	Y	a*	A ₅₀	A ₂₅₀	IE	ΔY	Total
Maximum Score	35	20	15	10	10	10	100



Deinkability Score

Assessment of test results

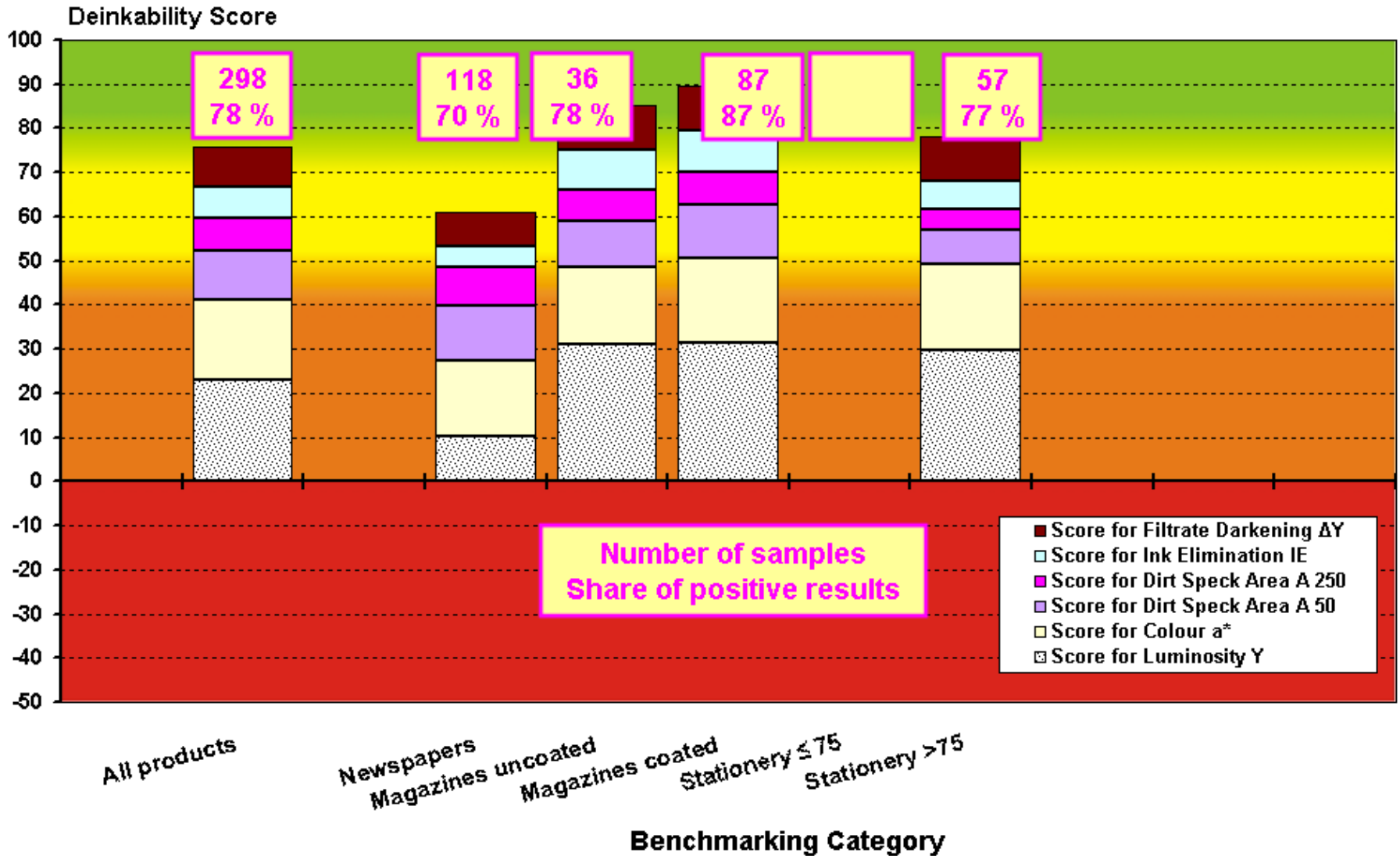


Score	Assessment of deinkability
71 to 100 Points	Good deinkability
51 to 70 Points	Fair deinkability
0 to 50 Points	Poor deinkability
negative (failed to meet at least one threshold)	Not suitable for deinking*

*The product may be well recyclable without deinking

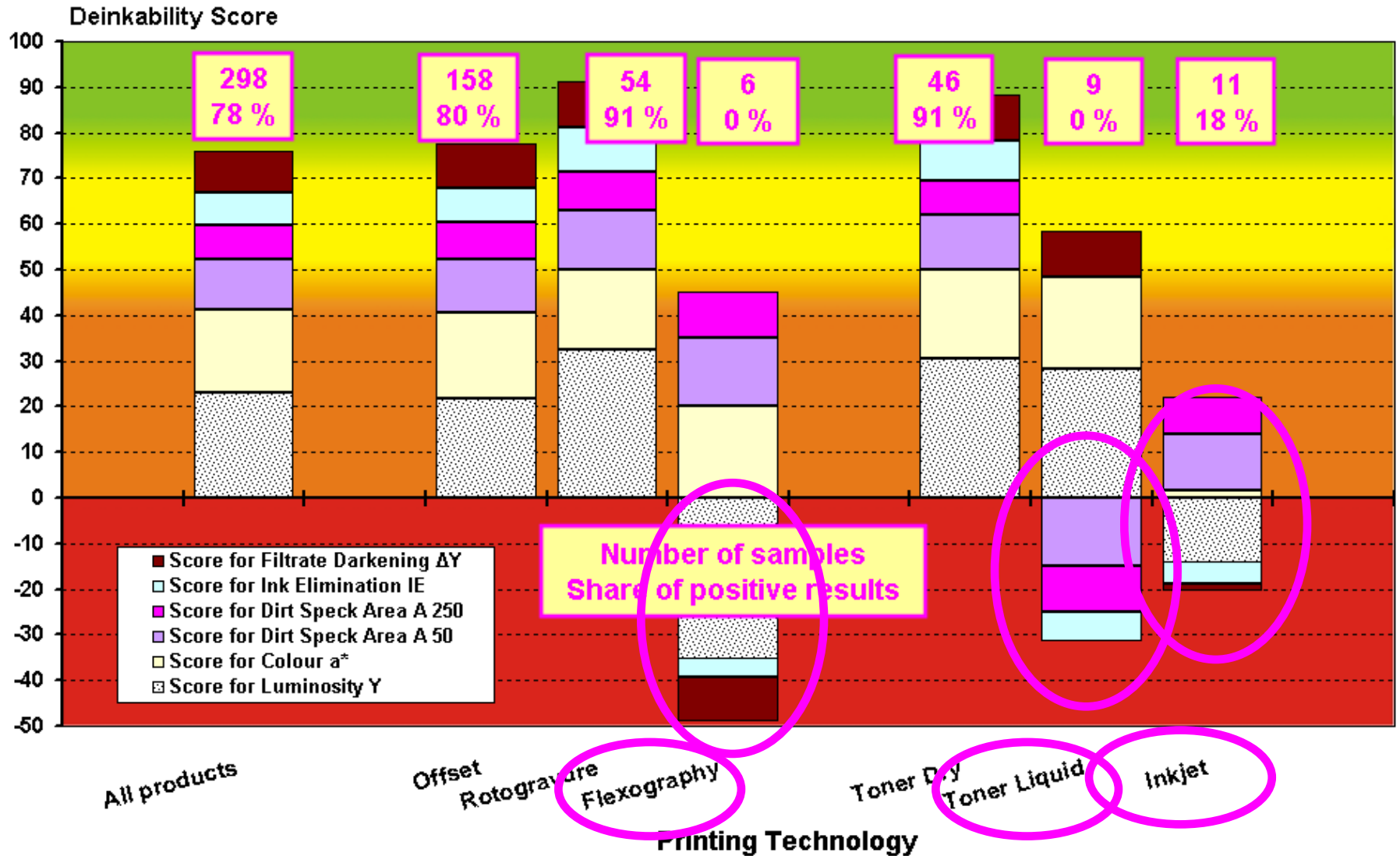
Deinkability Scores

Results by benchmarking category



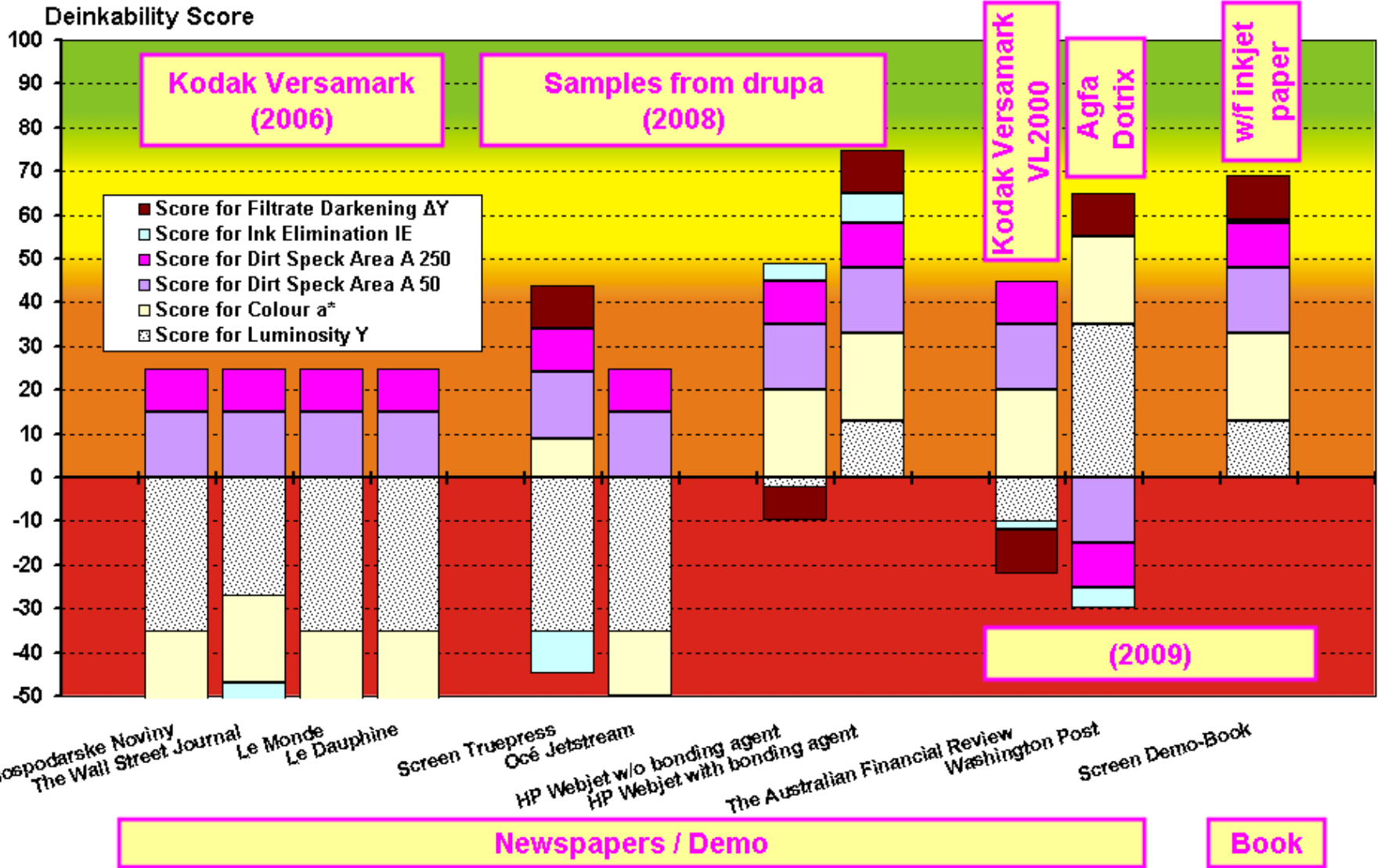
Deinkability Scores

Results by printing technology



Deinkability Scores

Results of inkjet prints



Summary on deinkability (1)



- **Deinkability of conventional offset, rotogravure and dry toner prints is generally acceptable to good**
 - **If there are deficits in offset, they can be allocated to high ink content, UV curing or the use of vegetable oil based inks**
 - **Red discolouration of rotogravure prints is still an issue but to a lesser extent than in the past**

Summary on deinkability (2)



- **Flexographic newspapers, inkjet and liquid toner prints are a threat for deinking mills**
 - **Hydrophilic flexographic and inkjet inks are not compatible with the process required to remove hydrophobic inks**
 - **Cohesive toners of liquid toner prints cause a high number of large dirt particles**

Adhesive applications on graphic paper products



Decorative or promotional stickers

Glued spines

Labels

Glued inserts

should not end like these



Requirements for adhesive applications in view of a good recyclability



Adhesives should be engineered and applied on paper so they will:

- **Disintegrate** during pulping in fractions large enough which can be removed by standard screening procedures to a maximum degree.
- **Not lead to** the forming of **secondary stickies** during the deinking and papermaking processes.

Removal of adhesive applications in a paper recycling process

The most efficient process step is mechanical separation by slotted screens.

Screen baskets have usually a slot width of 150 μm .

Pulp passes through the slots by pump pressure, a rotor inside the baskets prevents plugging of the screen.



Development of an assessment system for adhesive applications

Disintegrated Adhesive Application



Reject

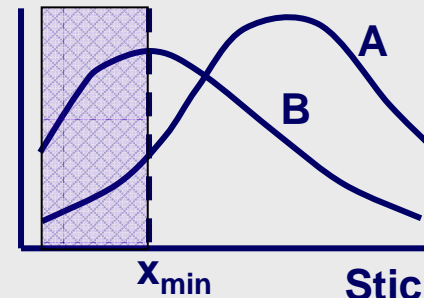


Accept

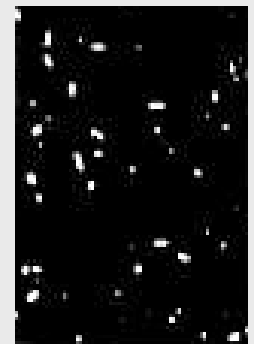
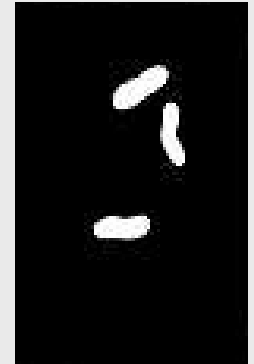
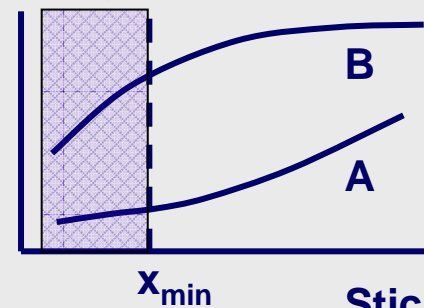
A better than B

Sticky Size $> x_{\min}$ (\varnothing 2,000 μm)
→ high efficiency of industrial screening

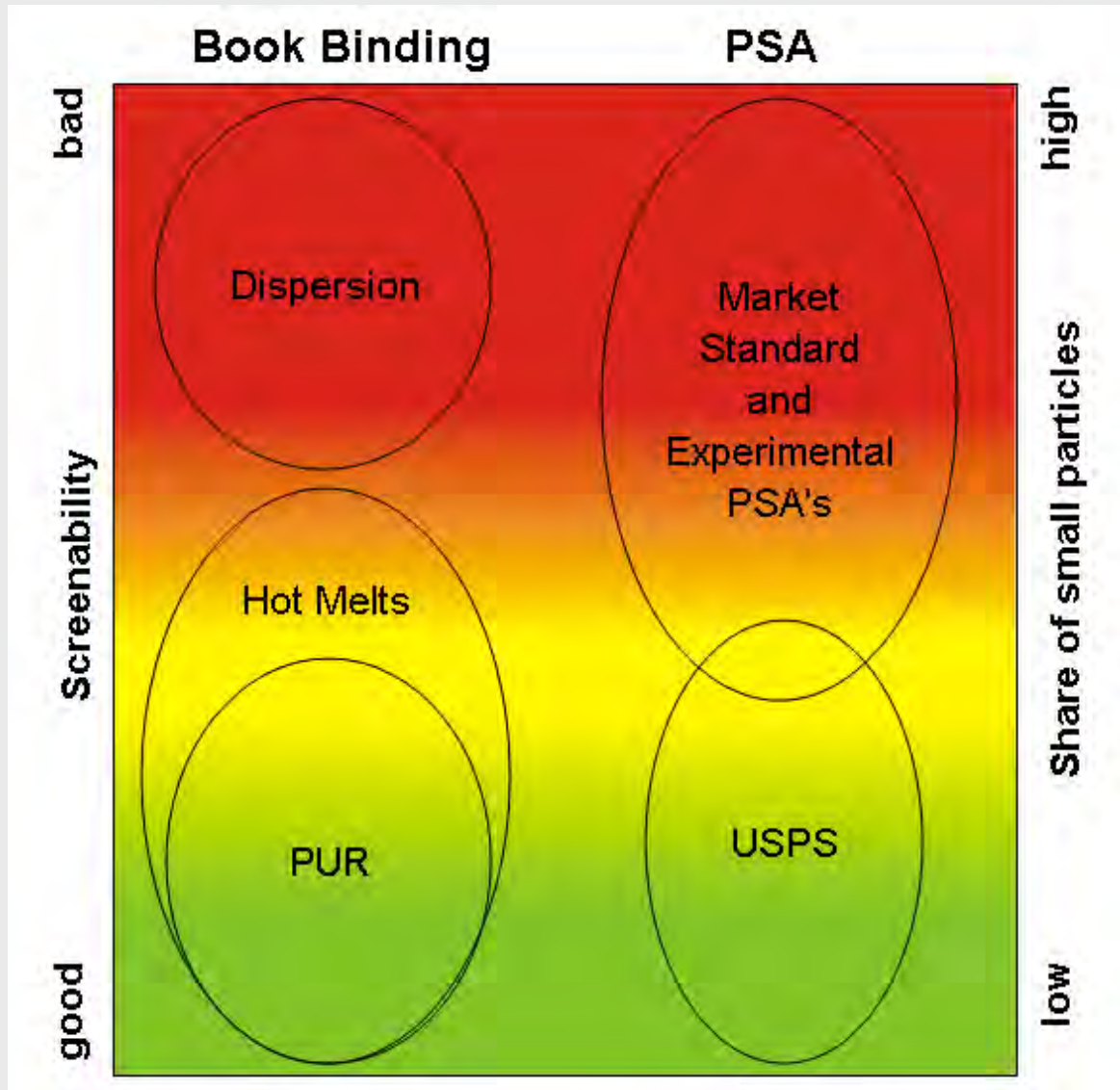
Relative Frequency, %



Area, mm²



Recyclability results of adhesive applications



PSA:
Pressure sensitive adhesive (for labels and envelopes)

PUR:
Polyurethane

USPS: United States Postal Service

Ongoing work on adhesive applications



- **INGEDE started the discussion of an assessment system similar to the Deinkability Scores in ERPC**
- **PMV will perform a survey with about 200 printed products with adhesive applications**
 - **Magazines**
 - **Catalogues and paperbacks**
 - **Mailings**
 - **Envelopes**
- **Survey will start in July 2009**
- **Co-funding of 20 000 € is still needed; INGEDE will fund 40 000 €**

INGEDE

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