



## Recyclability Evaluation

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Ljubljana / 22. January 2014

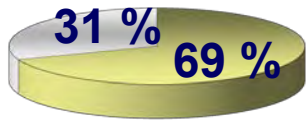
- **Fibre Demand for Paper Production**
- **General Recyclability Criteria**
- **Requirements of Graphic Paper Products**
- **Requirements of Packaging Paper Products**
- **Conclusions**

# Fibre Raw Material Demand 2010

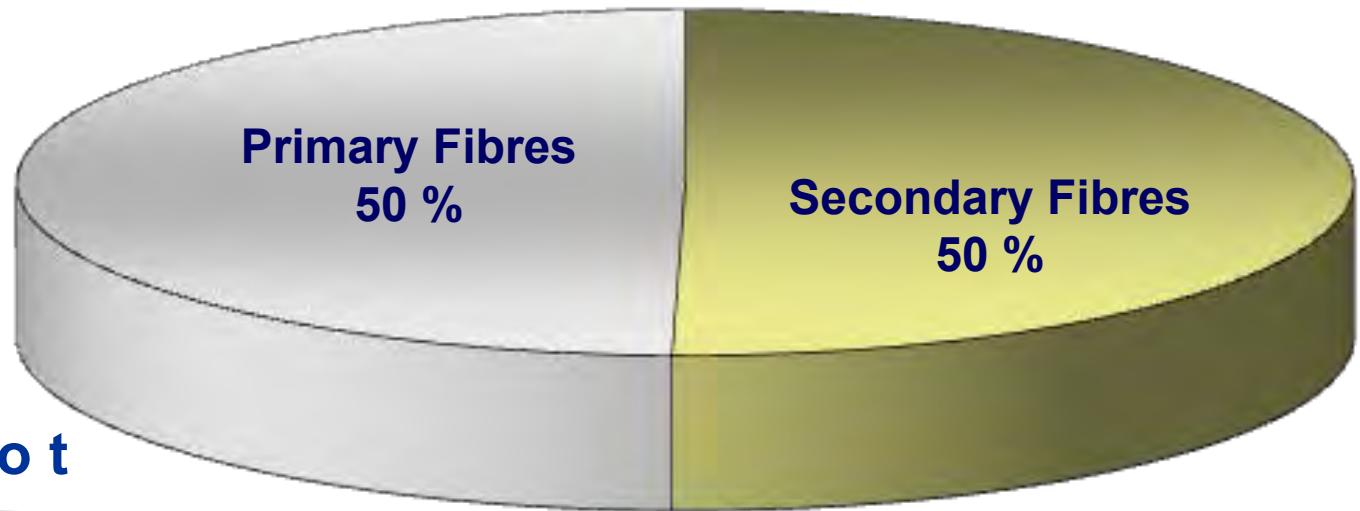
(calculated with 15 % losses in RP processing)



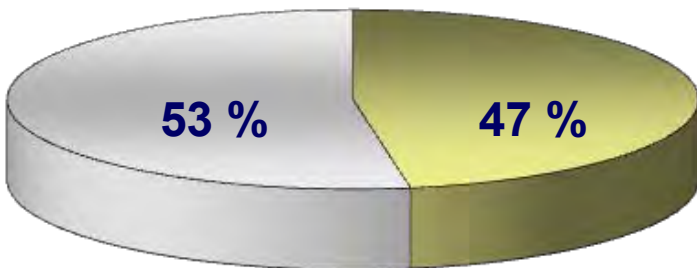
Germany: 19.9 Mio t



World: 373.5 Mio t



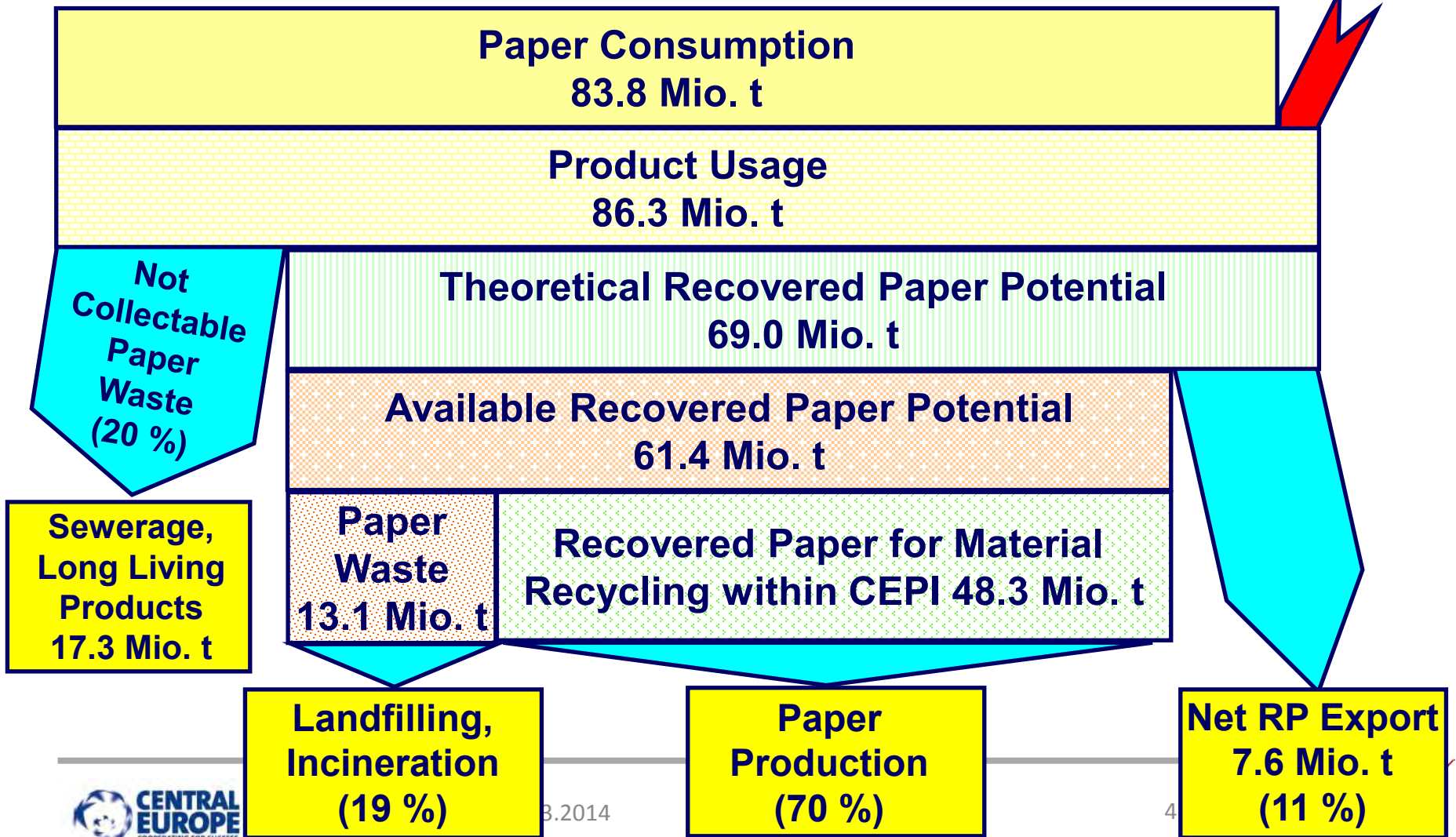
EU: 99.5 Mio t



# Paper – Recovered Paper – Balance 2010 (EU 27)



Additives 2.5 Mio. t



# Challenges of Paper Recycling



- **For good recyclability, paper 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**



# Aboriginal Test Method



## PTS-METHODE PTS-RH 021/97

Oktober 2012, ersetzt die Fassung vom September 1997

Prüfung von Roh-, Halb- und  
Hilfsstoffen der Papiererzeugung

Kennzeichnung der Rezyklierbarkeit von  
Packmitteln aus Papier, Karton und Pappe sowie  
von grafischen Druckerzeugnissen

### 1 Zweck und Anwendungsbereich

*Diese vom Unterausschuss „Recyclingkriterien der Altpapierverwertung“ des ZELLCHEMING-Fachausschusses RECO in enger Abstimmung mit der deutschen altpapierverarbeitenden Papierindustrie erarbeitete PTS-Methode soll zur Charakterisierung der Rezyklierbarkeit von Packmitteln aus Papier, Karton und Pappe sowie von grafischen Druckerzeugnissen dienen. Sie soll ebenso zur Prüfung von Klebstoffanwendungen oder Ausrüstungsmaterialien herangezogen werden, die zur Transportsicherung, Verstärkung oder zur Handhabung von recyclinggerecht gestalteten Verpackungen dienen und aus zum Teil papierfremden Materialien bestehen.*

Mit dieser Methode kann somit im Labor die Re-

### 2 Begriffe

#### Altpapier

Altpapier ist der Oberbegriff für Papier, Karton und Pappe, die außerhalb ihres Fabrikationsprozesses nach Verarbeitung oder Gebrauch anfallen. Die nach den hier definierten Kriterien zu bewertenden Produkte sind daher immer nur Einzelkomponenten im Altpapier.

#### Altpapierrecycling

Unter Altpapierrecycling ist die Rückgewinnung und Wiederverwertung derjenigen Komponenten des Altpapiers zu verstehen, die für die Herstellung altpapierhaltiger Neupapiere geeignet sind. Rezykliert werden sollen also in erster Linie die Faserstoffe - soweit noch papiermacherisch ge-

A first method on recyclability was developed by PTS in 1995 as internal standard, published as PTS-RH 021/97 method in 1997 and adopted to INGEDE standards in 2012

# Responsibility of Material Recycling



The first voluntary agreement on graphic paper products was made by the graphic paper chain in 1994 by AGRAPA.

In 2000 a voluntary agreement followed on the European level for all paper grades by CEPI und ERPA which was approved in 2006 und 2011 by ERPC with 7 signing and 5 supporting associations of the paper chain.

ARBEITSGEMEINSCHAFT GRAPHISCHE PAPIERE  
AGRAPA

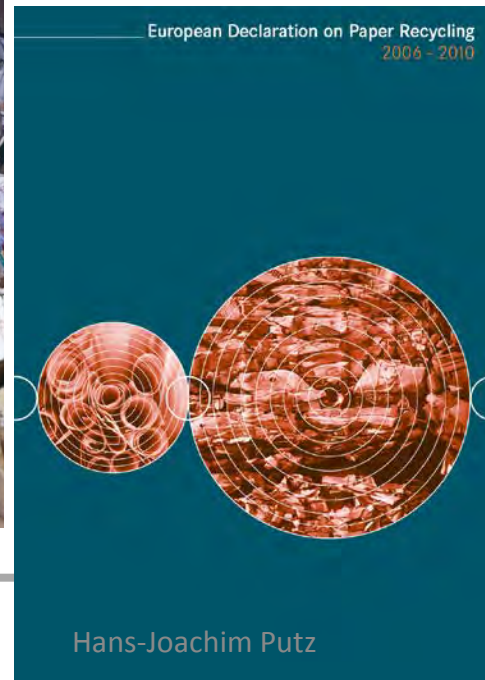
VOLUNTARY AGREEMENT ON  
THE RECYCLING OF  
USED GRAPHIC PAPER

26 September 1994

(Approved by the Federal Minister for the Environment on 14 October 1994)

p. A. Gesellschaft für Papier-Recycling (GePaRec) mbH  
53113 Bonn • Schaumburg-Lippe-Str. 3 • ☎ 02 28 - 9 15 27 - 0 • Fax: 02 28 - 9 15 27 99

CONFEDERATION OF EUROPEAN PAPER INDUSTRIES  
European Declaration  
on Paper Recovery



# Responsibility for Recycling Friendly Print Products



|  |   |  |
|--|---|--|
| ERPC/005/09  |   |  |
| <b>European Recovered Paper Council</b><br><small>Adopted in 17/03/09 ERPC meeting</small>   | <b>Assessment of Printed Product Recyclability – Deinkability Score –</b> |  |
| <p><b>1 Purpose and scope of application</b></p> <p>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 graphic products on white paper.</p> <p>The deinkability of a printed 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 printed products.</p> <p>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.</p>  |   |  |
| <p><b>2 Principle</b></p> <p>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. Cleanliness is measured as dirt speck area in two particle size classes. The target values are depending on the category of the printed 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".</p> |   |  |
| <p><b>3 Determination of the Deinkability Score</b></p> <p>In this chapter, particularly in the tables, abbreviations for the assessment parameters are used:</p> <p>Y: Luminosity<br/> a*: Colour a* (green – red) of the CIELAB system<br/> A: Dirt particle area<br/> A<sub>50</sub>: Dirt particle area for particles larger than 50 µm (circle equivalent diameter)<br/> A<sub>250</sub>: Dirt particle area for particles larger than 250 µm (circle equivalent diameter)<br/> IE: Ink elimination<br/> ΔY: Filtrate darkening</p> <p>Rounding of the parameters: Y, IE and ΔY to whole numbers, a* to one decimal and A to one decade. The individual scores of each parameter are rounded to whole numbers as well. Method: financial rounding.</p>  |   |  |

For graphic paper products a procedure exists since 2008 (adopted in 2009) to evaluate the deinkability. Product specific requirements are fixed in the “Deinkability Scorecard”.

Since 2011 a comparable evaluation exists on the removability of adhesive applications on graphic paper products.

## Assessment of Printed Product Recyclability

### Scorecard for the Removability of Adhesive Applications

No general agreement exists for an assessment on packaging paper products until now.

Assessment of Packaging Material Recyclability

Scorecard for the ...

Not available



EUROPEAN UNION  
EUROPEAN REGIONAL  
DEVELOPMENT FUND



Put





# Abstract from the “Guide to an Optimum Recyclability of Printed Graphic Paper”



## ➤ Introduction

... to maintain the achieved standard, it is also necessary that everyone involved in the paper chain – including parties placing the order and designers of print products – give due consideration to the requirements of recycling.

## ➤ Soluble and Redispersible Components

... The requirement therefore is that recovered paper should contain as few components as possible, which dissolve or disperse in weakly alkaline medium and form sticky residues or cause discolorations.

## ➤ Recyclability Assessment

... Therefore it is necessary that all parties involved evaluate their products as to good recyclability if major changes are made at materials and processes.

# Guide to an Optimum Recyclability of Printed Graphic Paper



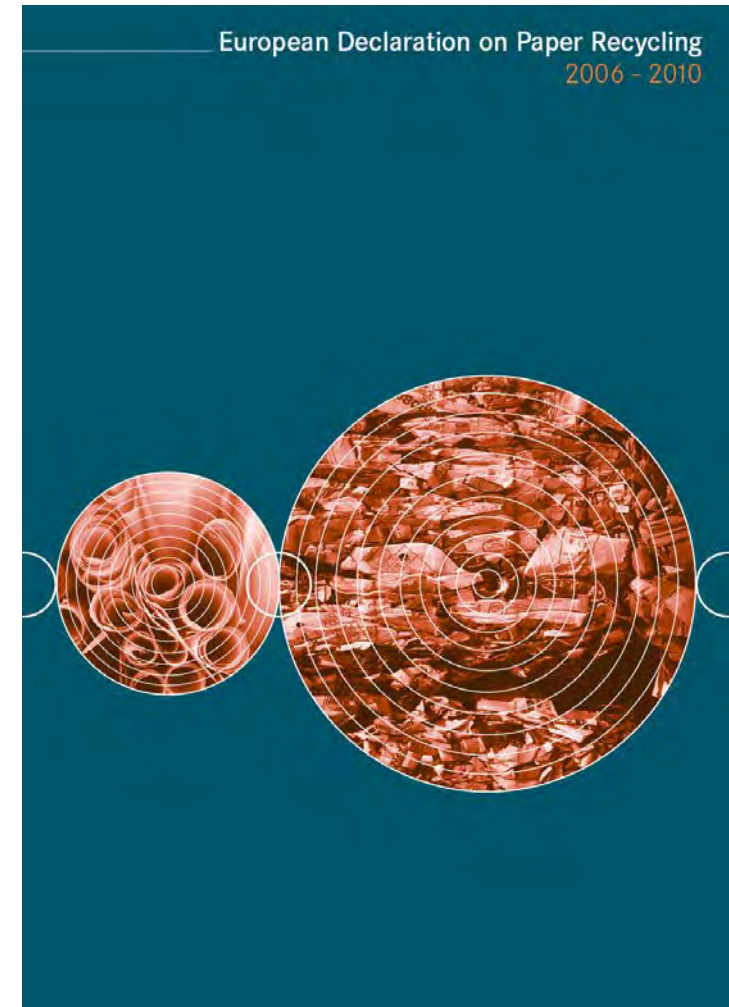
# European Declaration on Paper Recycling



## - Definition of Recyclability -

“Design, manufacturing and converting of paper based products in such a way as to enable a **high quality recycling** of fibres and other materials in a manufacturing process in compliance – where appropriate – with current standards in the Community.”

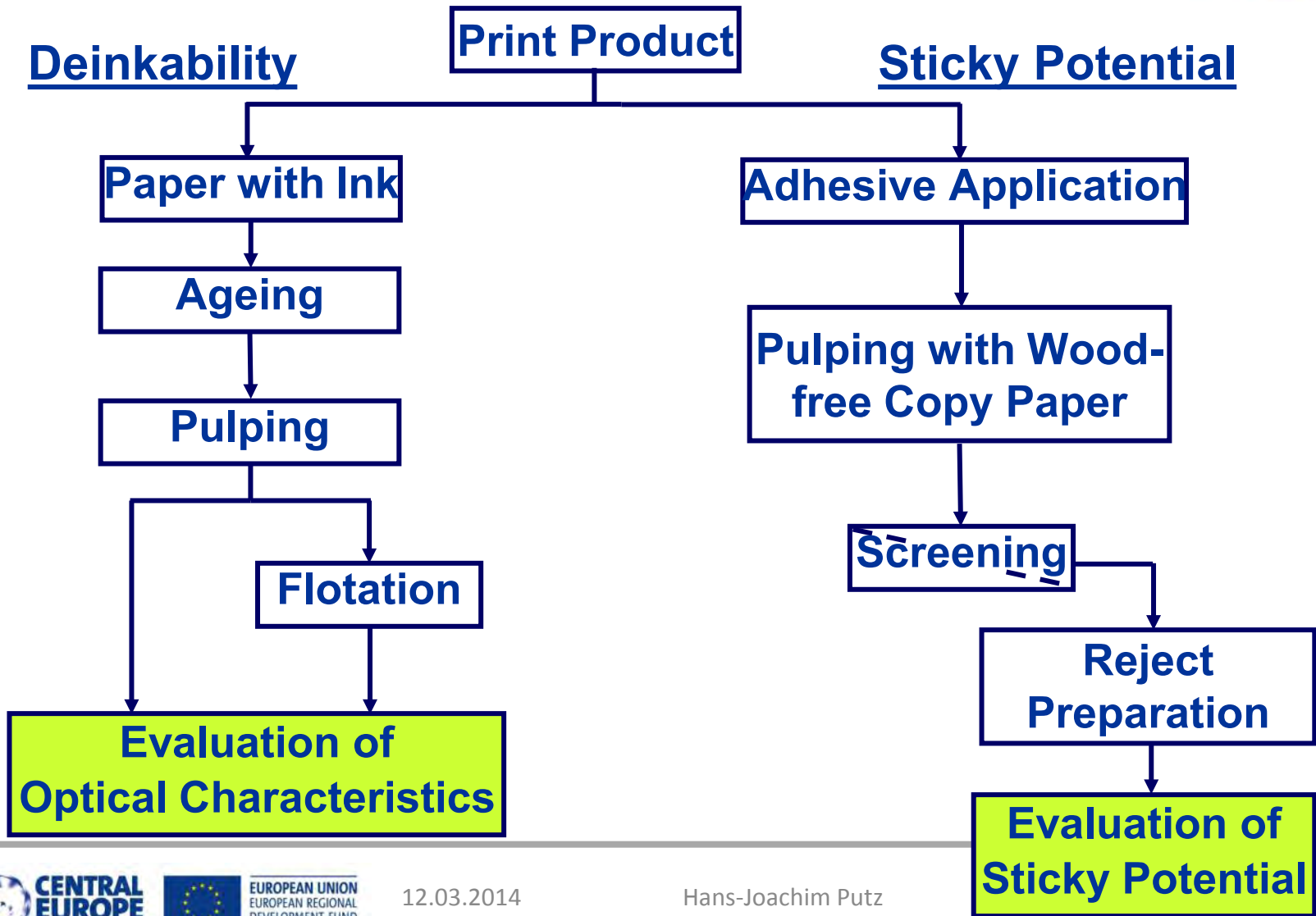
A recycling target of 66 % ( $\pm 1,5$  %) is promised by the Signatories in 2010.



# Recyclability Evaluation for Print Products



ERPC “Deinkability Score”



ERPC “Removability Score”

# Recyclability Evaluation for Print Products – Deinkability



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

Quality Parameters

Process Parameters

→ Results transferred into ERPC “Deinkability Score”

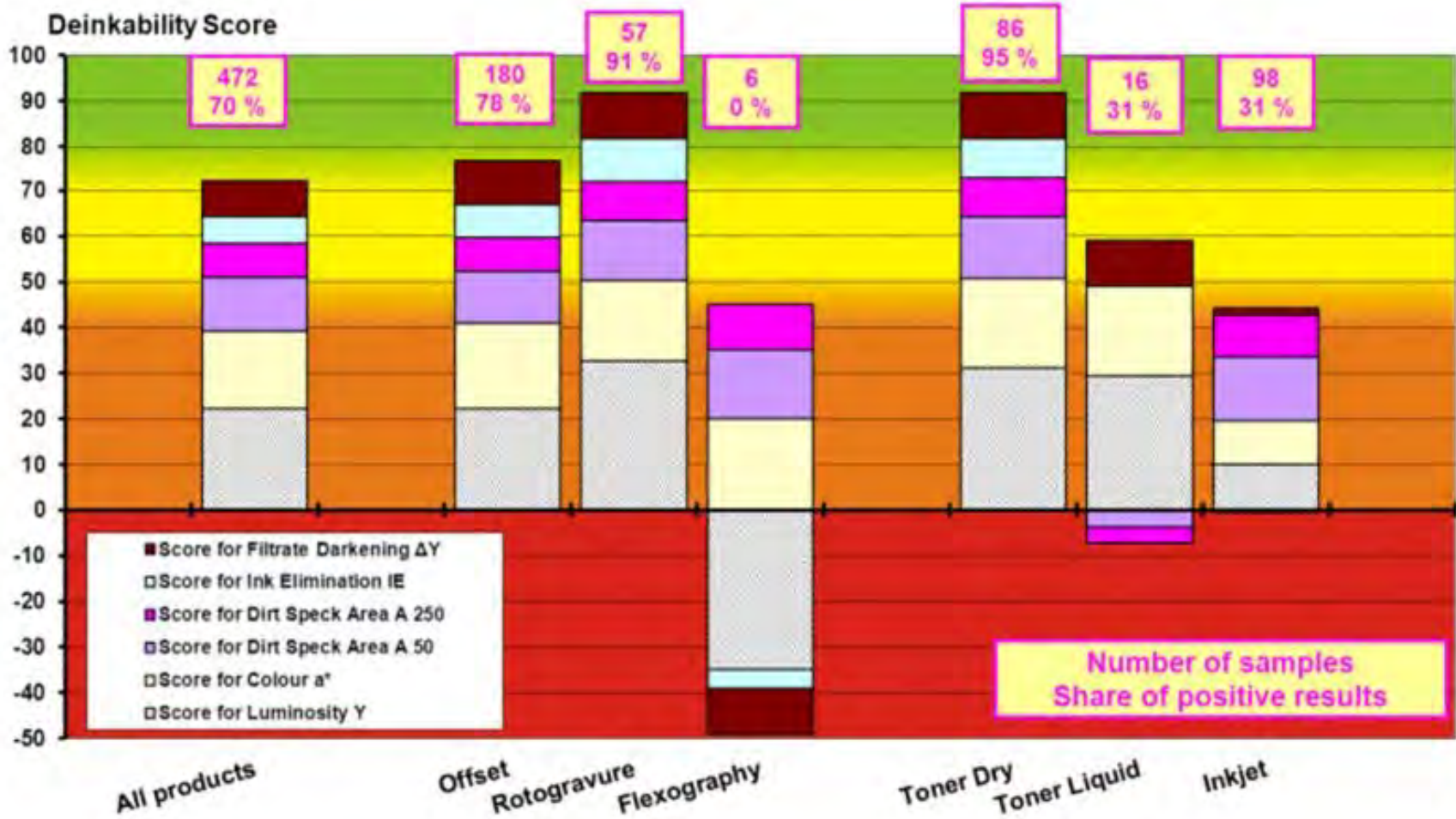


# Deinkability Score



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

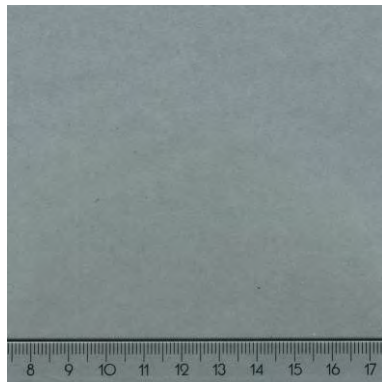
# Example for Deinkability Score



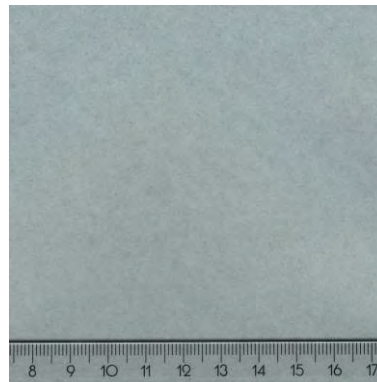
# Most Important Challenges – I



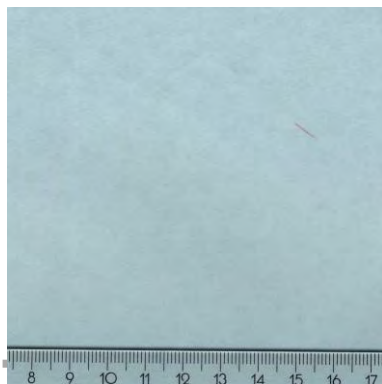
Improvement of the deinkability of inkjet and flexo prints. This is related to the luminosity of deinked pulp and filtrate quality.



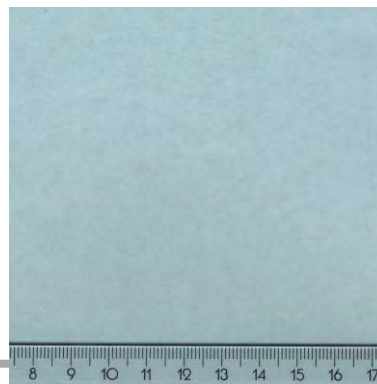
Flexo



DP



Inkjet



UP

## Filtrate Quality



Flexo

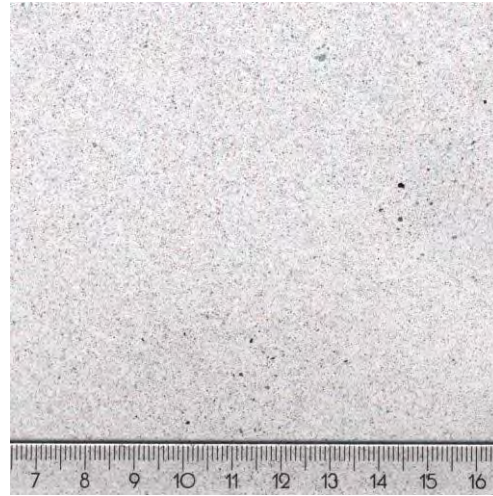
Offset



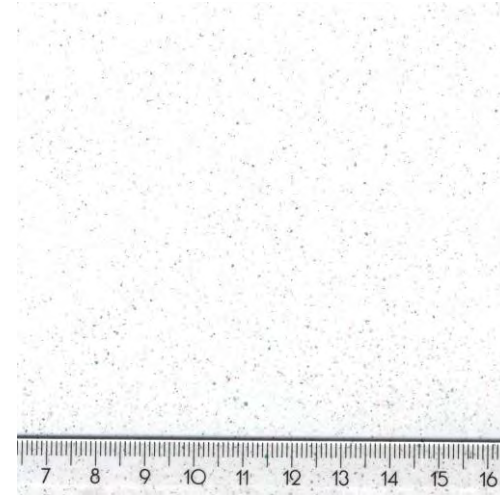
# Most Important Challenges – II



Improvement of the deinkability of liquid toner ink and some types of UV ink. This is related to ink specks in the deinked pulp.

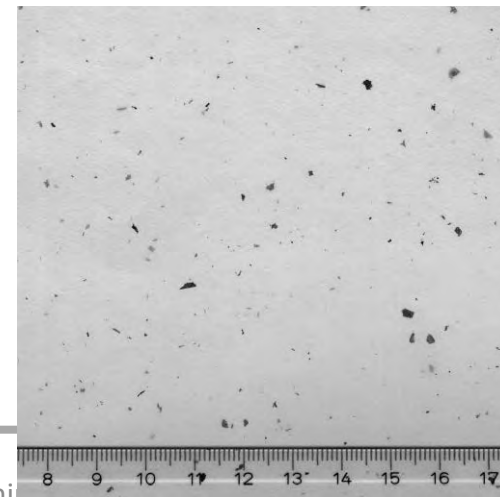
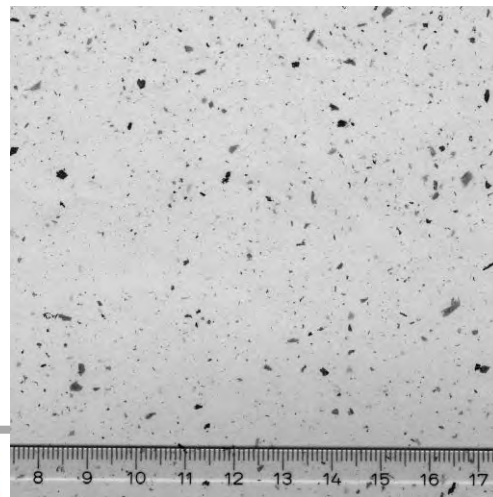


UP



DP

UV Print



Liquid Toner



# Handsheets of DIP



Offset newspaper with much ink specks

Waterborne flexo newspaper

Good deinkable offset newspaper

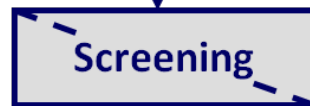
Digital newspaper with UV preprint



# Assessment of Sticky Removal Potential acc. to INGEDE Method 12



Disintegrated Adhesive Application

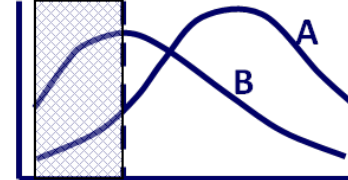


Reject



Accept

Relative Frequency, %

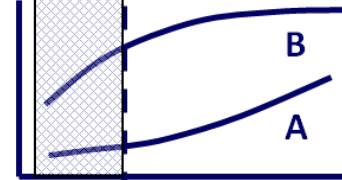


A better than B

$x_{min}$

Sticky Size

Area, mm<sup>2</sup>



A better than B

$x_{min}$

Sticky Size

➔ Sticky Size >  $x_{min}$  (Ø 2 000 µm)

high removal efficiency in industrial screening

# Filter Samples (according to INGEDE Method 12)



**Side and Spine Glue Application**  
– Hotmelt –



**PSA**  
– UV Cured Acrylic –

# Recyclability Evaluation for Print Products – Removability



| Objective               | Evaluated Parameter   |
|-------------------------|---|
| Sticky Potential        | Total Macrosticky area < 2 000 $\mu\text{m}$<br>(after theoretical screening) |
| Fragmentation Behaviour | Share of Macrostickies < 2 000 $\mu\text{m}$                                  |

**Benchmark**

**Cut-off Criteria**

→ Results transferred into ERPC “Removability Score”

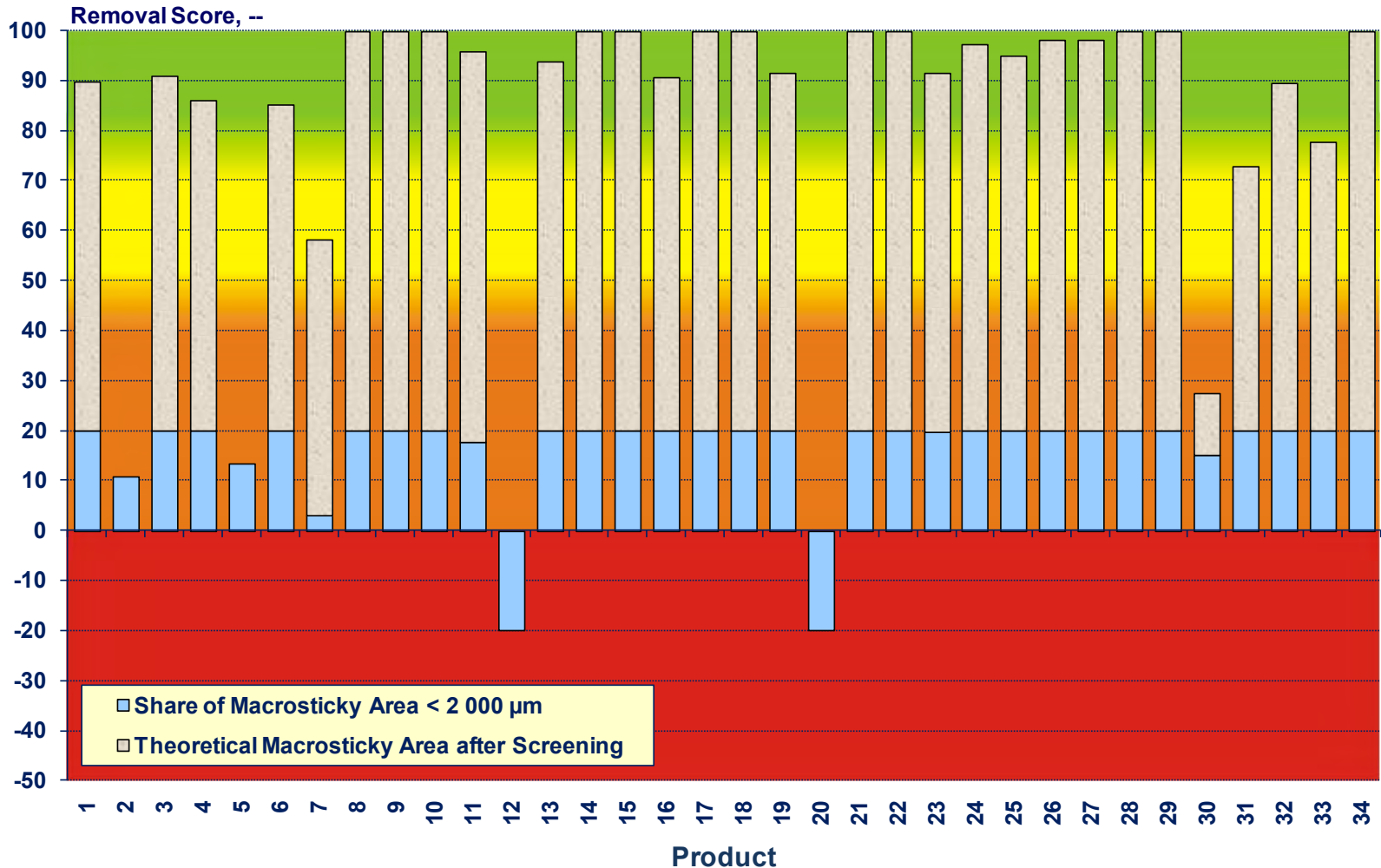


# Removability Score Rating of the Results



| Score                                   | Evaluation of removability |
|---|----------------------------|
| 71 to 100 Points                        | Good                       |
| 51 to 70 Points                         | Fair                       |
| 0 to 50 Points                          | Poor                       |
| Negative (failed to meet the threshold) | Insufficiently removable   |

# Scoring for Books and Magazines

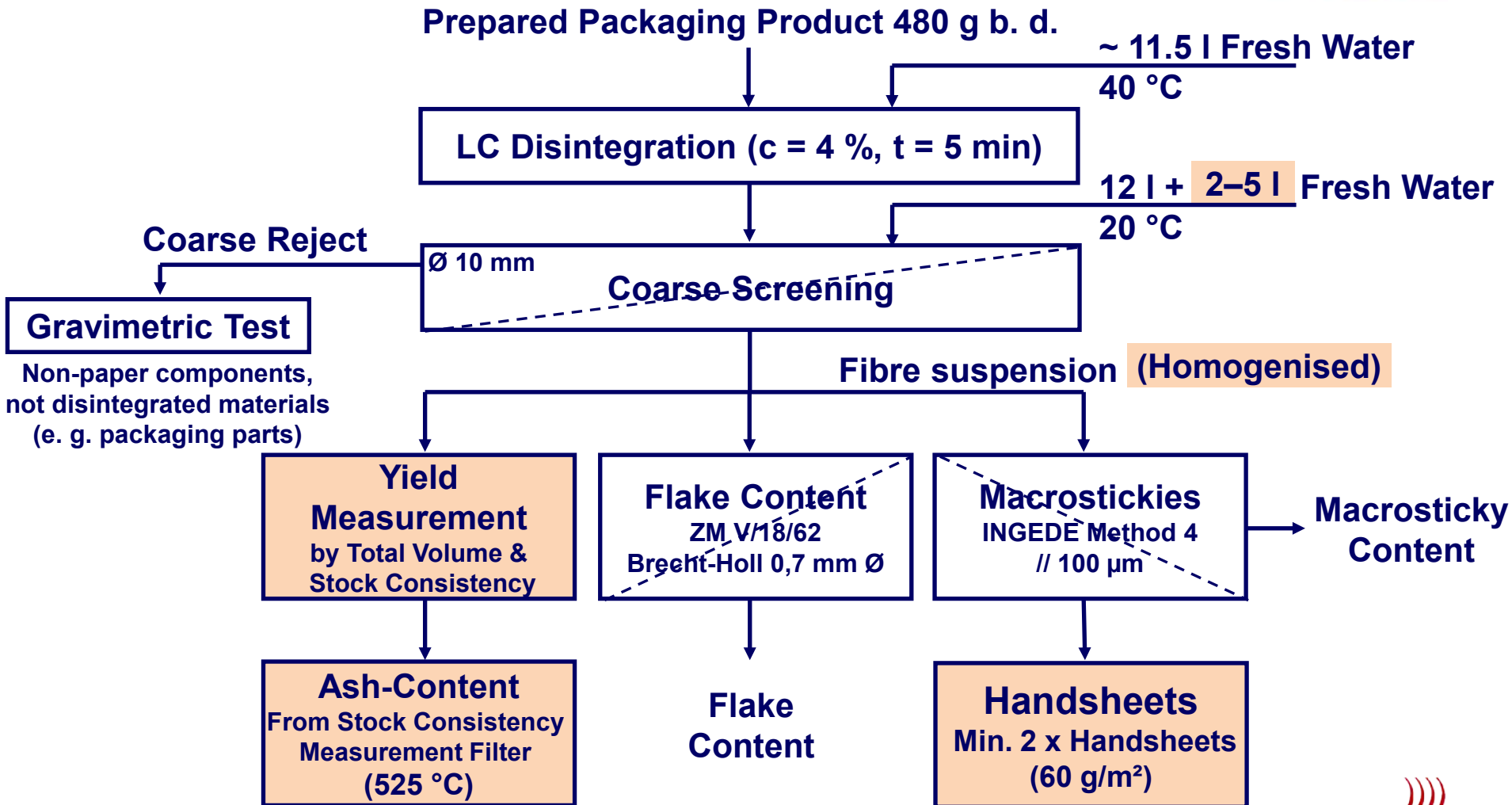


# Tasks in ECOPAPERLOOP



- **Development of a recyclability test method for packaging products**
- **Development of a scoring system for the assessment of packaging paper products**
- **Performing lab tests to expand the database on recyclability of print products**
- **Performing lab tests to establish a database on the recyclability of packaging products**
- **Transfer of knowledge on recyclability aspects of paper products**

# Recyclability Test for Packaging Products (4<sup>th</sup> Draft)





# Major Equipment



**LC-Disintegration**



**Coarse Screening**



**Flake Content &  
Sticky Evaluation**

# Possible Assessment

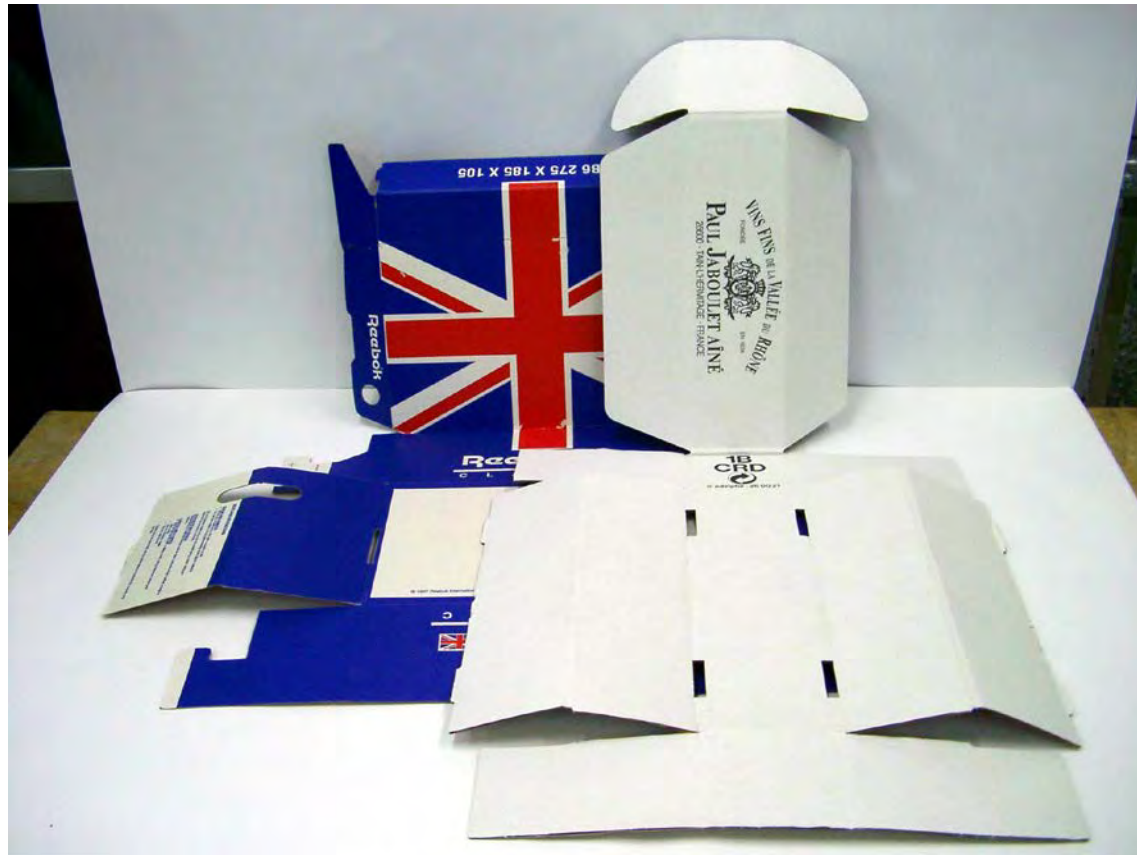


- **Non-fiber components**
- **Flake content (for disintegration behaviour)**
- **Sticky content**
  - **Share of stickys e. g.  $< 3.000 \mu\text{m}$**
  - **Theoretical total sticky area after screening**



**Scoring system analogue to deinkability or removability score**

# Example of a Recycling Friendly Packaging Material





# Conclusion



- **Main production in Europe: graphic and packaging paper products**
- **Recycling friendly products are necessary to support the EcoPaper Recycling loops**
- **Packaging products must fulfil recyclability standards as well as graphic paper products**
- **EU and Austrian Ecolabels for graphic paper products already require a positive deinkability (the German Blue Angel will follow soon)**
- **Recyclability evaluations for packaging products are necessary**



# Thank You!



For further Information contact

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