Packaging Paper and Board: Raw Materials, Production, Converting and Recyclability

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- **Quality Properties of Packaging Products**
- **EPL Recyclability Test for Packaging Products**
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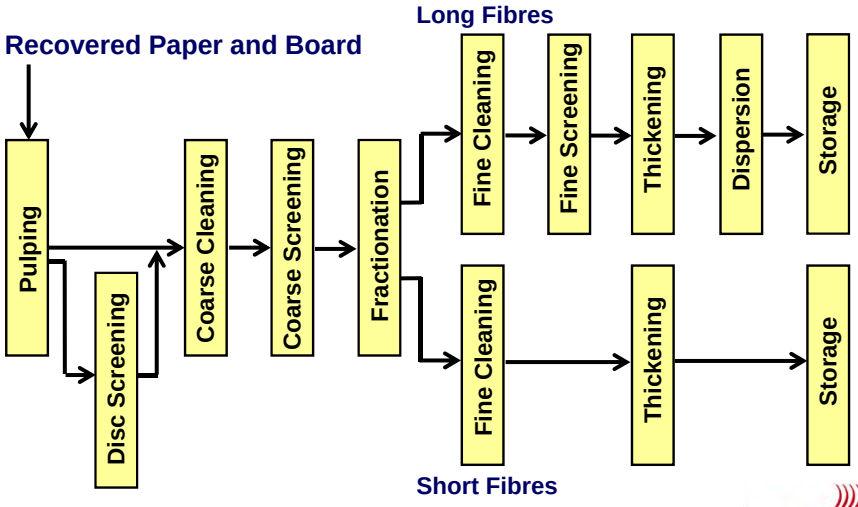
Recovered Paper Stock Preparation for Packaging Products

Stock Preparation for Packaging Products

Process Step	Objective Target
Pulping	Generation of a pumpable suspension
Cleaning	Removing lower and higher specific weight particles (e.g. metal, glass, stone, polystyrene)
Sorting	Removing particles which are larger than the screen perforation (e.g. films, plastics, bits)
Dispersion	Homogenisation of the visual appearance of the recovered pulp
Refining	Improving the strength potential of the recovered pulp

Recovered Paper Stock Preparation for Packaging Products with Fractionation



Storage and Pulping of Recovered Paper and Board


Hall storage of bales and loose recovered paper


Outside storage of bales


LC pulper
(Low consistency)
Source: www.voith.com

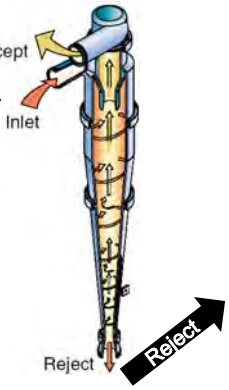
Cleaning of Recovered Pulp

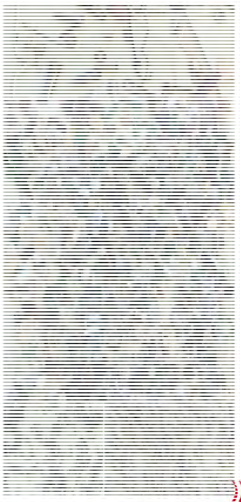
Source: www.voith.com

Accept of the pulper

Reject of the pulper

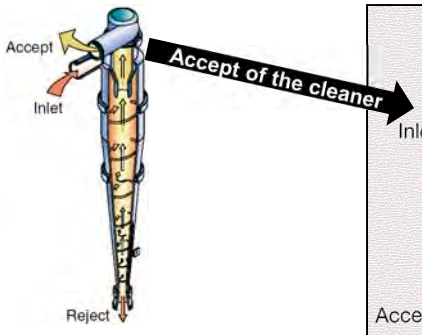
HC cleaning with hydrocyclones

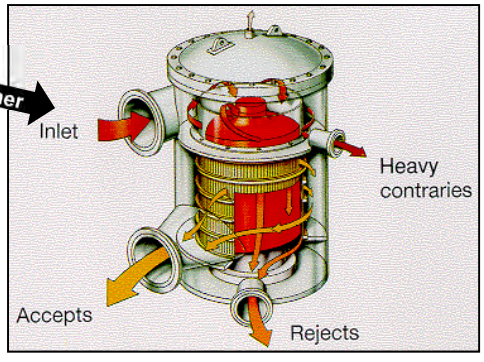




Sorting of Recovered Pulp

Sorting with pressure screen

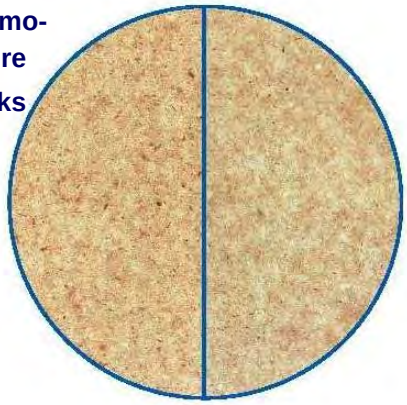




Dispersion of Recovered Pulp

Before and after dispersion with 50 kWh/t

- Rough and inhomo-geneous structure
- Larger dirt specks are visible



- Finer and homo-geneous structure
- Larger dirt specks are reduced to small pieces and not visible as specks any more
- Grey

Quality Properties of Packaging Products

Overview of the Most Important Recovered Paper and Board Grades

Group 1 – Ordinary grades

- **1.11 Sorted graphic paper for deinking**

  Sorted graphic paper from households (newspapers and magazines) each at a minimum of 40 %. The percentage of non-deinkable paper and board should be reduced over time to a maximum level of 1.5 %. The actual percentage is to be negotiated between buyer and seller.

- **1.02 Mixed papers and boards (sorted)**

  A mixture of various qualities of paper and board, containing a maximum of 40 % of newspapers and magazines.

- **1.04 Supermarket corrugated paper and board**

  Used paper and board packaging, containing a minimum of 70% of corrugated board, the rest forms solid board and wrapping papers.

(Source: European List of Standard Grades of Recovered Paper and Board, June 2002)

Overview of the Most Important Recovered Paper and Board Grades

Composition of the most important Recovered Paper and Board Grades for Packaging Products

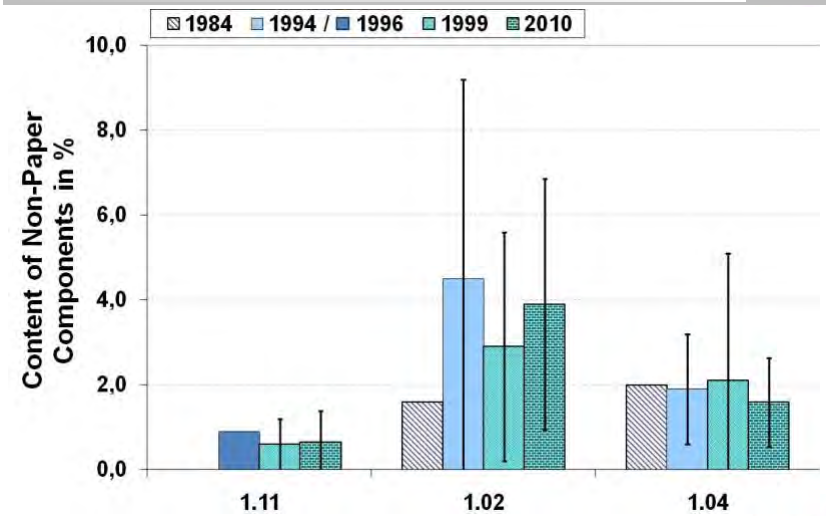
Grade	Graphic Papers	Packaging Papers and Cardboard	Unsuitable Papers	Non-Paper Components
1.11	93 %	5 %	1 %	1 %
1.02	55 %	39 %	2 %	4 %
1.04	18 %	79 %	1 %	2 %

Source: Weinert, S.; Putz, H.-J.; Qualitätseigenschaften der wichtigsten Altpapiersorten in Abhängigkeit von den Sortierbedingungen; AiF-Project: 15408 N

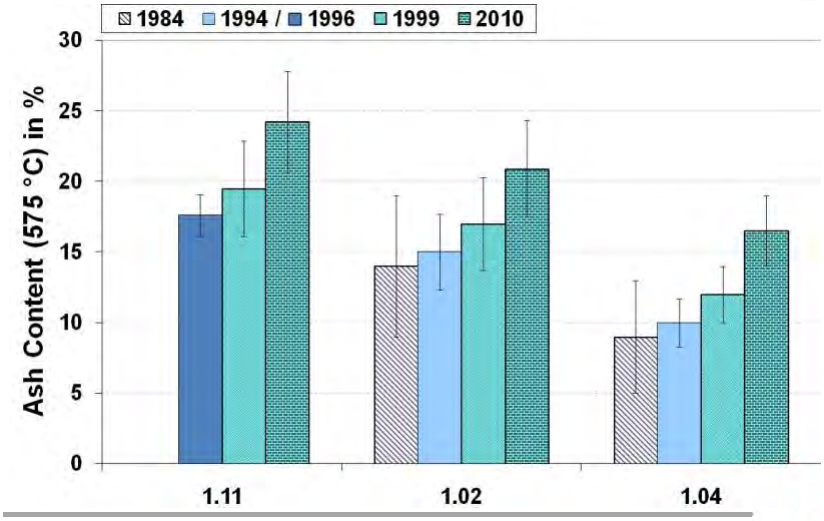
Quality Properties to be Tested

- Non-paper components
- Ash content
- Strengh properties
- Sticky content

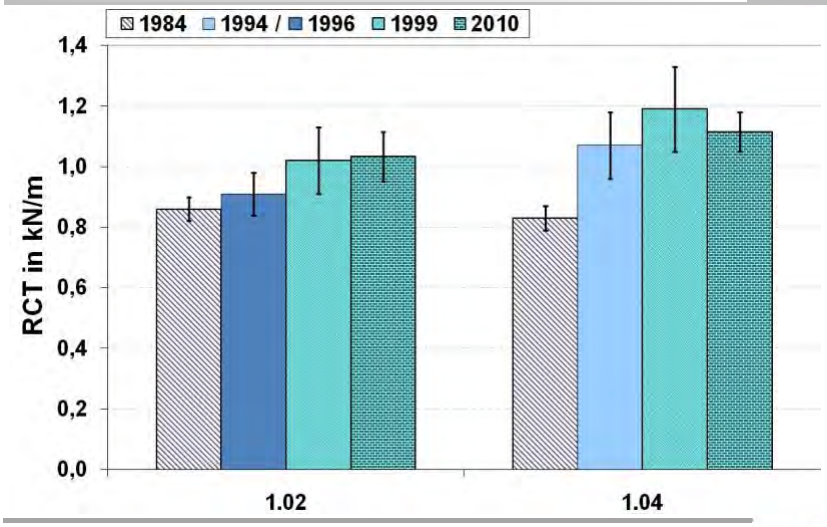
Non-Paper Components



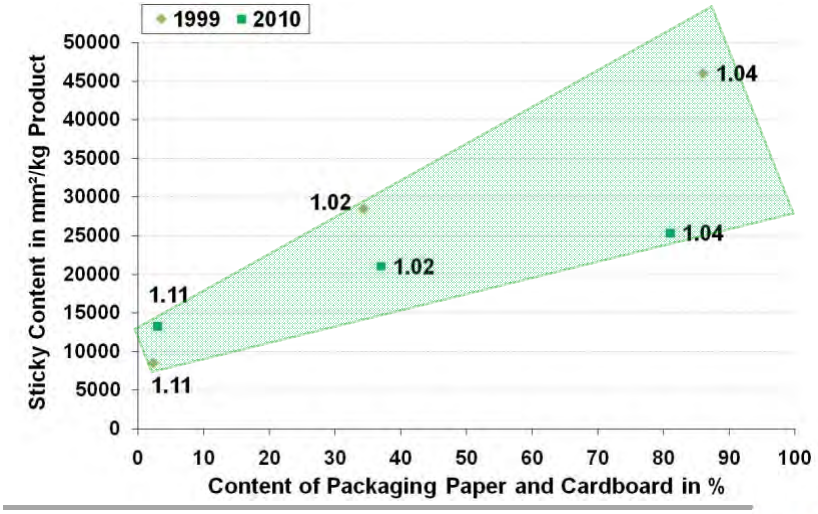
Ash Content (575 °C)

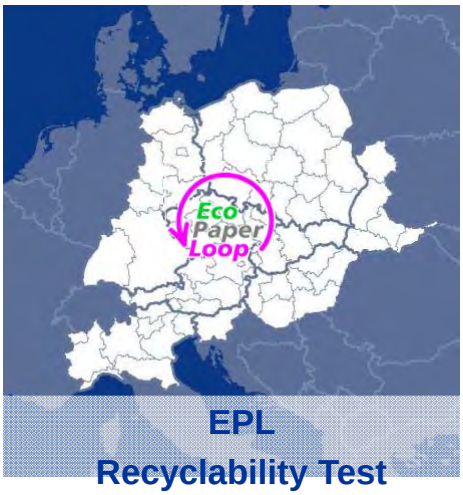


Ring Crush Test (RCT)



Sticky Content Relating to Packaging Product and Cardboard Ratio





EPL
Recyclability Test for Packaging Products

Typical Packaging Products

Non-paper components
e.g. "window foils"
e.g. composite materials

Glued Parts
e.g. Hotmelts or adhesive stripes

→ A Problem for Recovered Paper Processing?

Objectives for the Recyclability Evaluation of Packaging Products

- **High amount of sample material**
- **Sample preparation before pulping to evaluate the adherend mass**
- **Disintegration step with practical relevance**
- **Objective evaluation of non-paper components**
- **Objective evaluation of ash content**
- **Objective evaluation of sticky potential**
- **Objective evaluation of flake content**

Sample Preparation

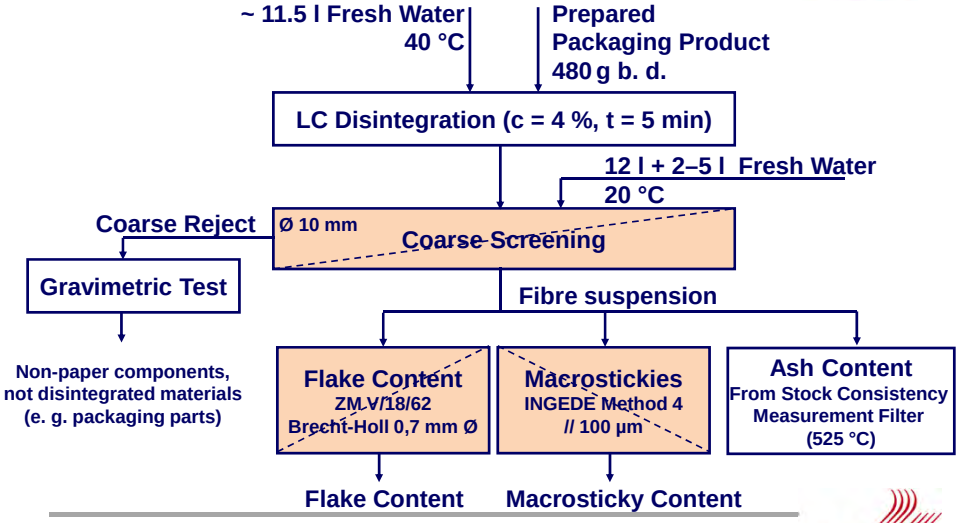
Adherend Ratio

- **Weigh the complete product sample**
- **Cut the glued parts tight with all adhesive material**
- **Weigh the glued parts with adhesive material**
- **Calculate the Adherend Ratio:**

$$X_{\text{Adherend}} \text{ in } \% = \frac{m_{\text{Adherend}}}{m_{\text{Packaging\_Sample}}} \times 100$$

→ Necessary to maintain same amounts of glued/non-glued parts of a product, if shares are used for the test

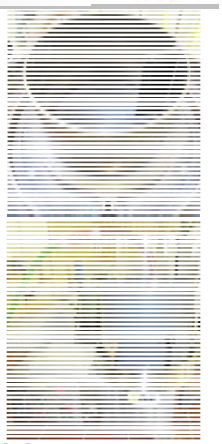
Recyclability Test for Packaging Products (4th Draft)



Major Equipment

LC Disintegration

Coarse Screening

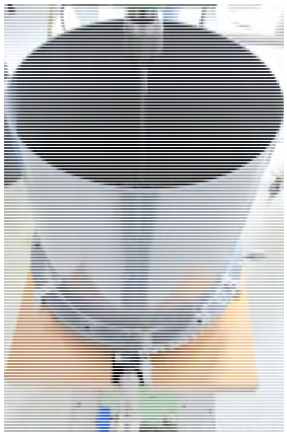


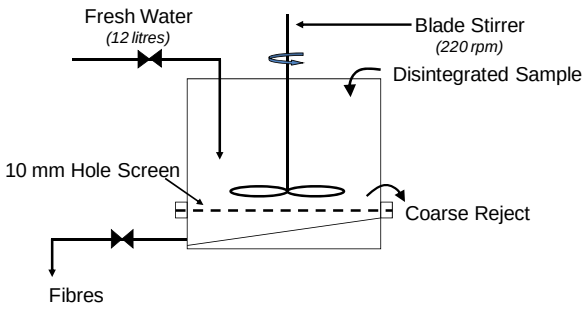
Flake Content &
Sticky Evaluation

Pulping

- 480 g oven-dry sample material
- 4 % stock consistency
  → water amount has to be calculated regarding dry content
- 40 °C water temperature
- 5 min disintegration time

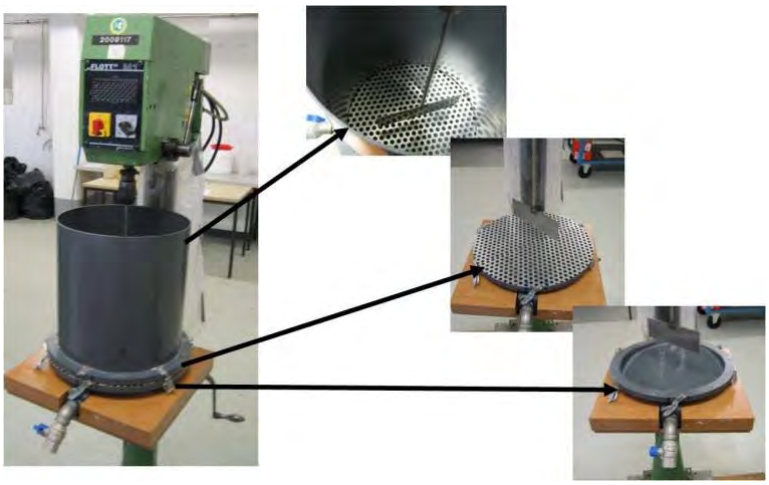
Coarse Screening



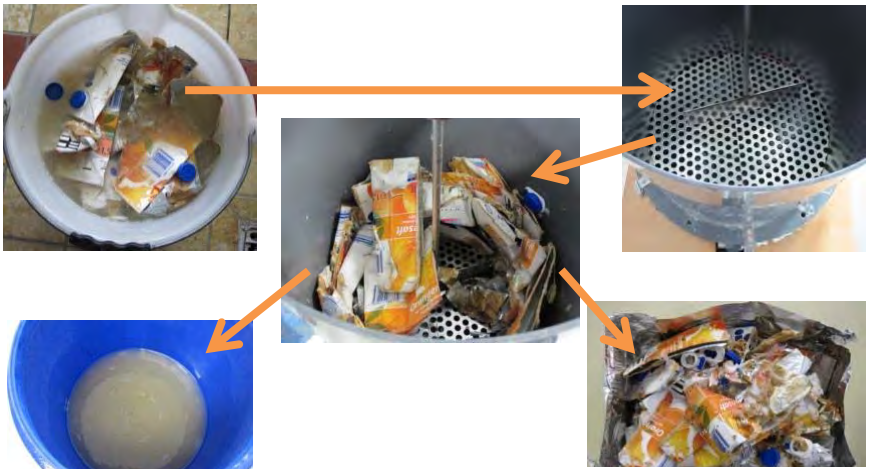


Reject could be removed easily and objectively, near to industrial standard

Coarse Screening



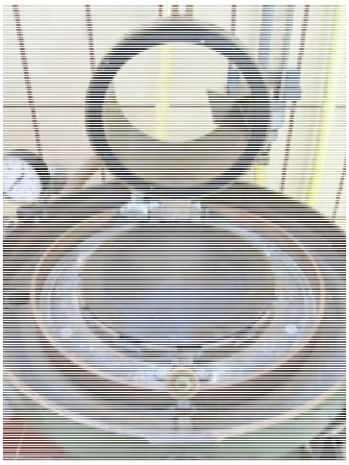
Coarse Screening

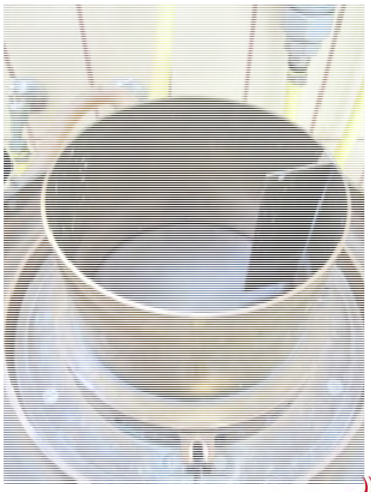


Accept Coarse Screening

Reject Coarse Screening

Determination of Flake Content





Macrosticky Test

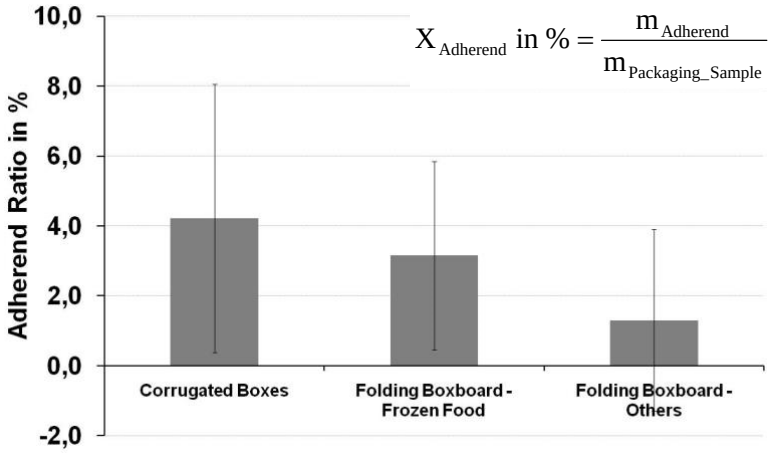
Investigation of Packaging Products from Poland with EPL Recyclability Test

EPL Recyclability Test for Packaging Products

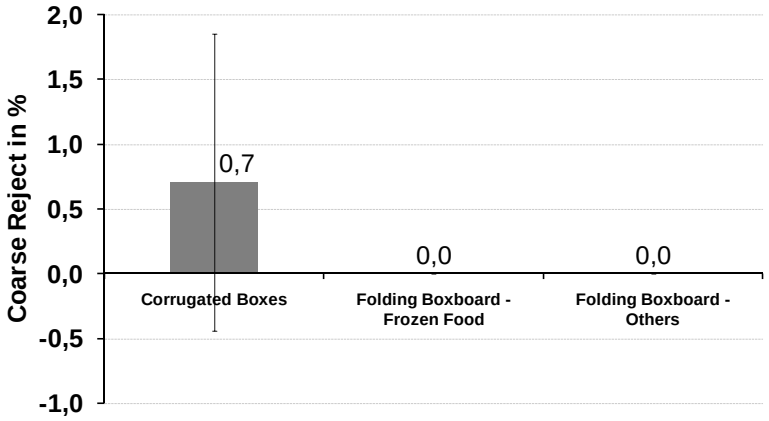
- Tested product categories from Poland
  - Corrugated Boxes (5 samples)
  - Folding Boxboard for frozen food (4 samples)
  - Folding Boxboard for other fields (4 samples)

Evaluation of Adherend Ratio

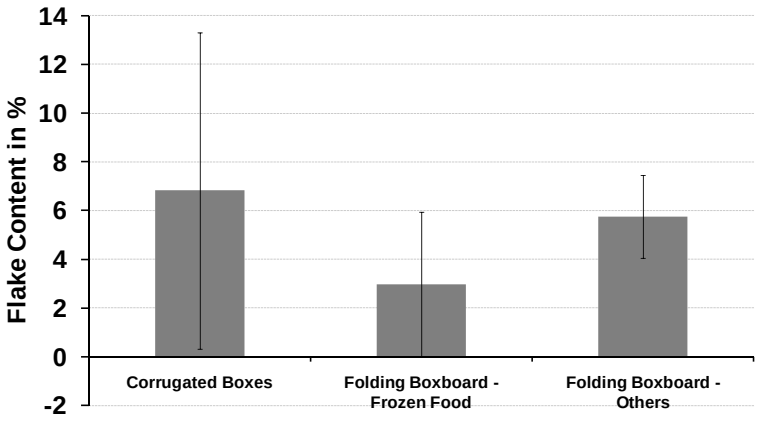
$$X_{Adherend}\ \text{in}\ \% = \frac{m_{Adherend}}{m_{Packaging\_Sample}} \times 100$$



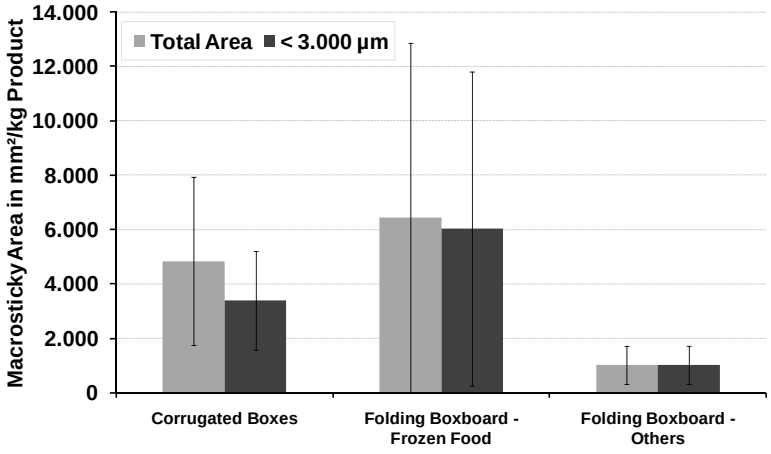
Evaluation of Coarse Reject



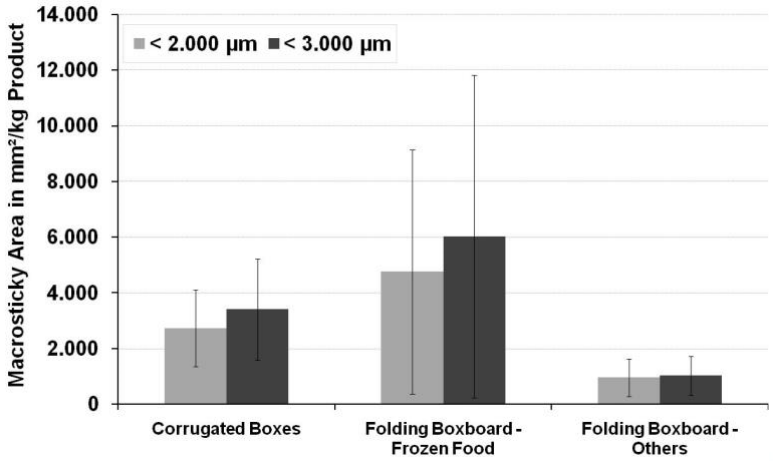
Evaluation of Flake Content



Evaluation of Sticky Measurement



Evaluation of Sticky Measurement



Outlook

- **Up to 160 samples of the following categories will be tested:**
  - **Corrugated Boxes (all sizes)**
  - **Folding Boxboard (incl. solid board) – frozen food**
  - **Folding Boxboard (incl. solid board) – others**
  - **Bags (open bags with handles)**
  - **Sacks (all sizes) – pure paper**
  - **Sacks (all sizes) – with composite material**
  - **Liquid Packaging**
  - **Moulded products**
- **The samples will be collected in 5 countries (PL, SI, HU, IT, GER) → 4 samples per category/partner**
- **Results will be analysed to develop a database for thresholds and target values leading to a scoring system**

Thank You!

For further Information contact

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