

Training School

Recyclability of Packaging Products

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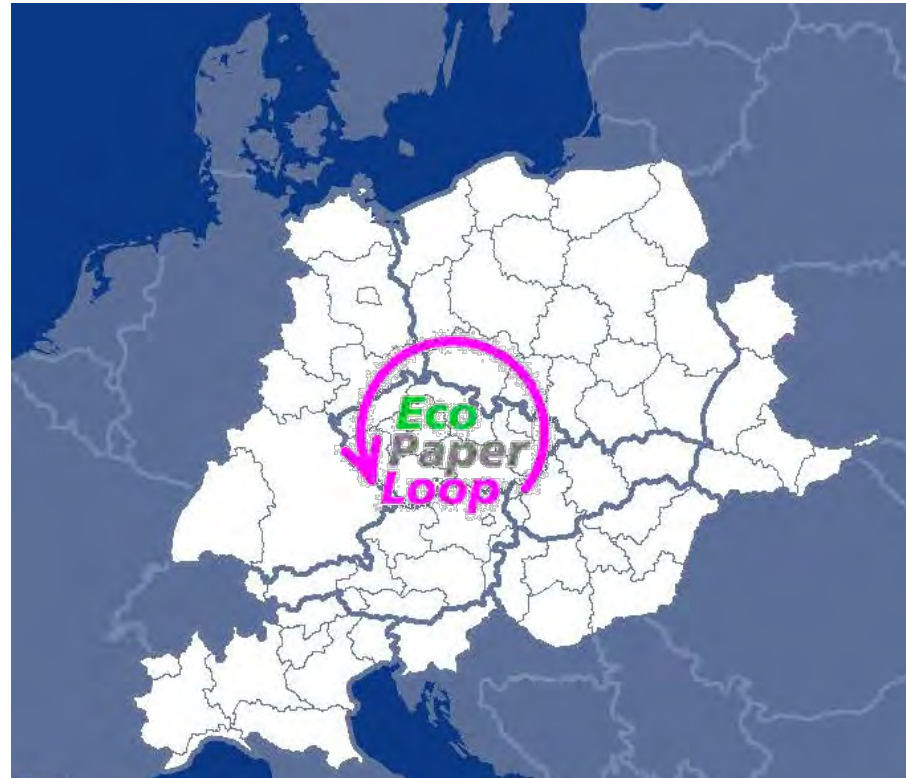
Ecopaperloop

Ljubljana, January 23rd, 2014

Content



- Packaging Recyclability Method
- Typical Results



EcoPaperLoop
PACKAGING Recyclability Method

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?

Challenges of Recycling



- **For good recyclability, 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**

Packaging Recyclability Method

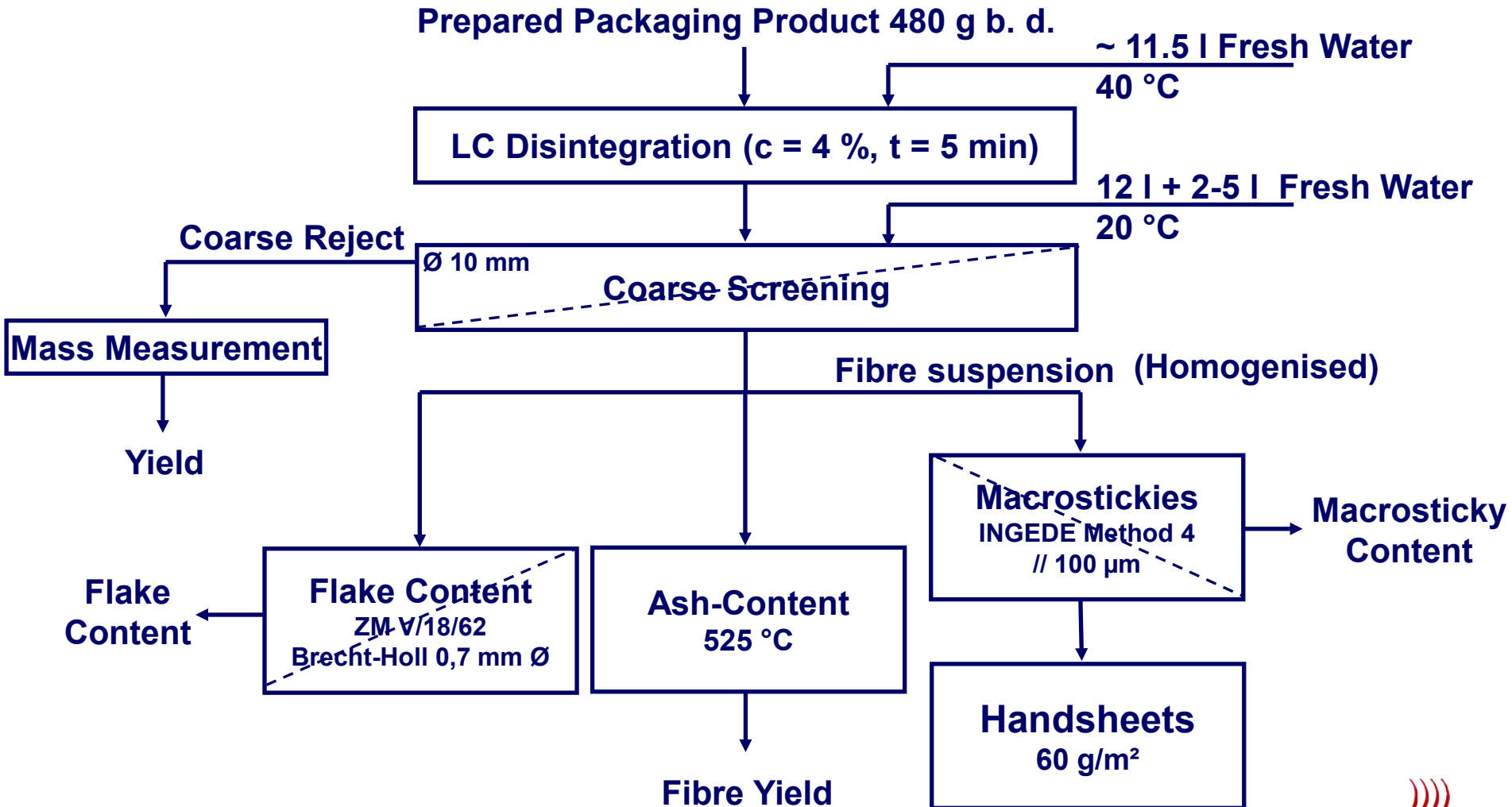
AIM



Method for the Recyclability Evaluation of Packaging Products

- High amount of sample material
- Disintegration step with practical relevance
- Objective evaluation of non-paper components
- Objective evaluation of flake content, sticky potential and sticky size distribution
- Evaluation of fibre yield

Recyclability Test for Packaging Products (5th Draft)



Major Equipment



LC Disintegration



Coarse Screening



Flake Content & Sticky Evaluation

Sample Preparation



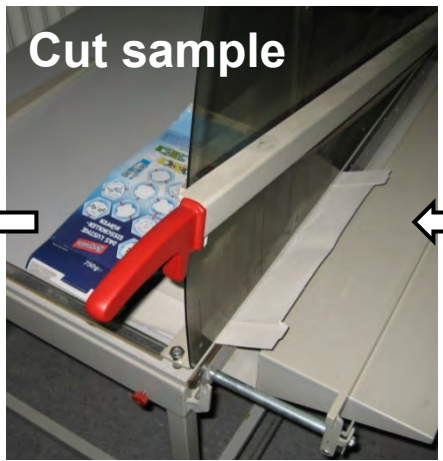
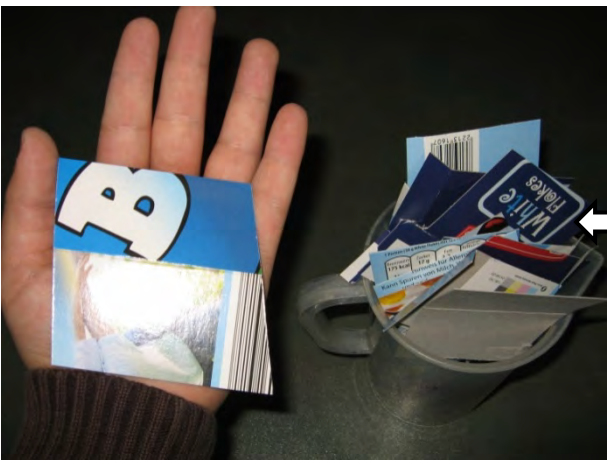
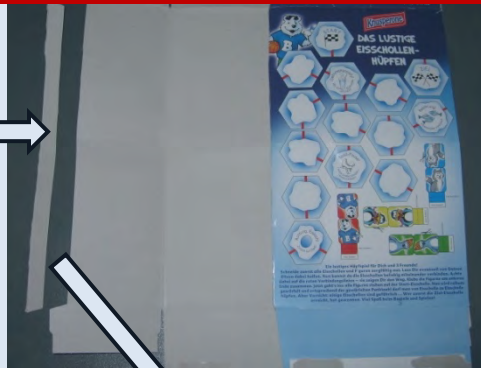
NEEDED TO CALCULATE ADHEREND RATIO



Weigh the sample



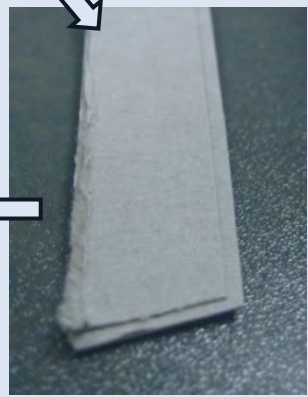
Cut glued parts



Cut sample



Weigh glued parts



Adherend Ratio



- If a packaging product has to be divided, use the adherend ratio to maintain the correct ratio between adherend and non adherend material
- Calculation of the Adherend Ratio:

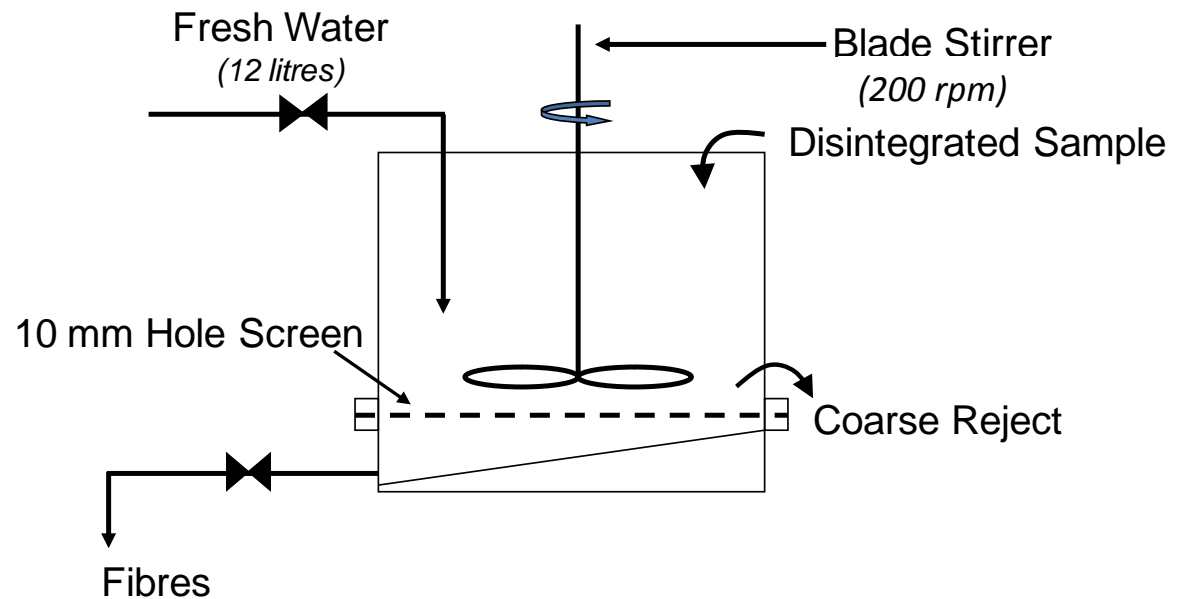
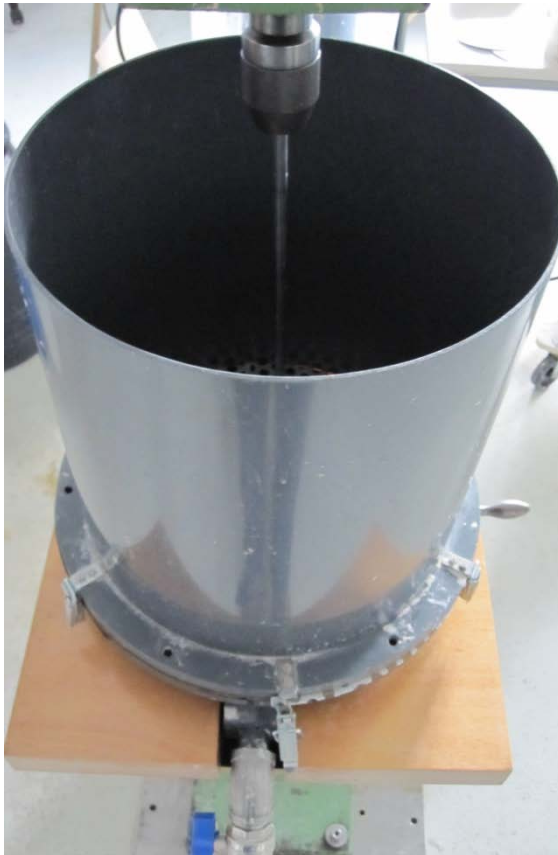
$$X_{\text{Adherend}} = \frac{m_{\text{Adherend}}}{m_{\text{PackagingSample}}} * 100 [\%]$$

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



1. Outlet-valve is closed
 2. Start the stirrer with 200 rpm
 3. Fill in the disintegrated material (for 1st screening)
 4. Smooth rotating for 3 s
 5. Open the outlet valve and drain the device completely
- free fibres are removed without high shear forces

Coarse Screening



5. Close the outlet valve again
6. Fill in 12 l tap water (for 2nd screening)
7. Smooth rotating for 3 s
8. Open the outlet valve and drain the device completely



Coarse Screening



9. Free fibres attached to the screening plate or surface of device are sprayed out using approx. 2 l tap water
10. Transfer the reject on the screening plate to a weighted box

Accept Coarse Screening:
Suspension for further evaluation (~ 24 l)



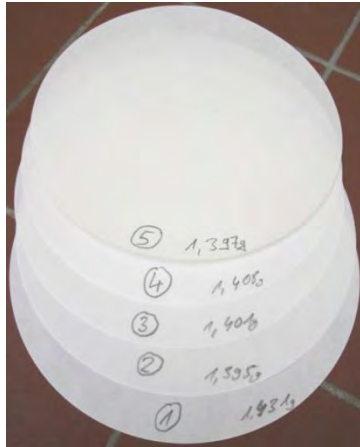
Reject Coarse Screening:
Gravimetric Analysis



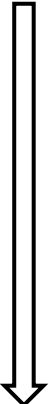
Determination of Flake Content



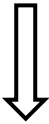
Determination of Flake Content (I)



Prepare 5 filters



5 x 2 g oven-dry sample material

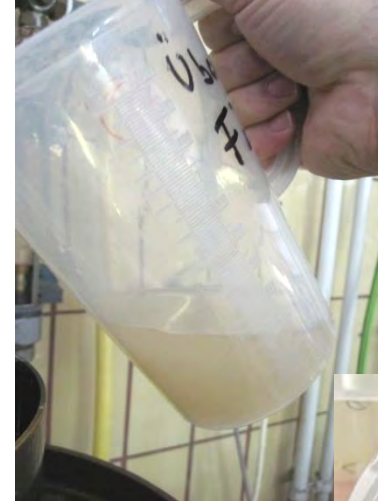


Dilute to 800 ml

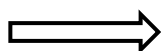


Screening plate:
0,7 mm hole diameter

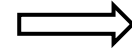
Determination of Flake Content (II)



Start the device with 0.1 bar water pressure at a water flow of 3.33 l/min



Fill in the sample gently within 25 s

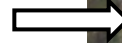


Fill in the leftover within the next 5 s

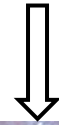
Determination of Flake Content (III)



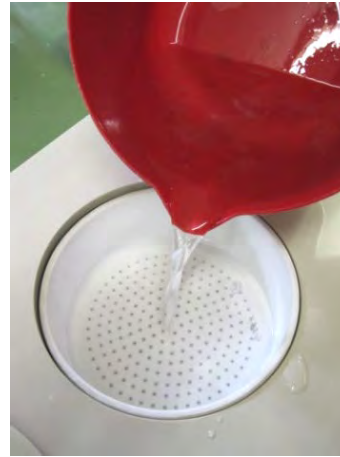
Stop the water flow and screening process after 5 min



Remove screening plate and wash the flakes into beaker



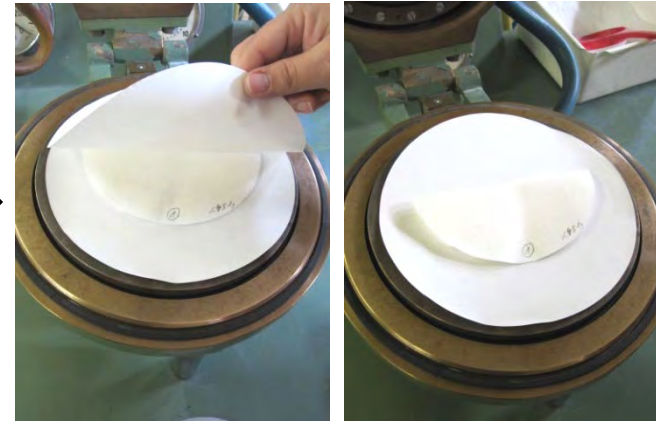
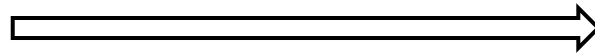
Drain the flakes over a filter



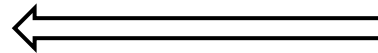
Determination of Flake Content (IV)



Dry the filter for 10 min (92 °C),
e.g. between two papers in a RK-Dryer



Weigh the filters



Drying oven
for 24 h
(105 °C)



Macrosticky Test



Macrosticky Test (I)



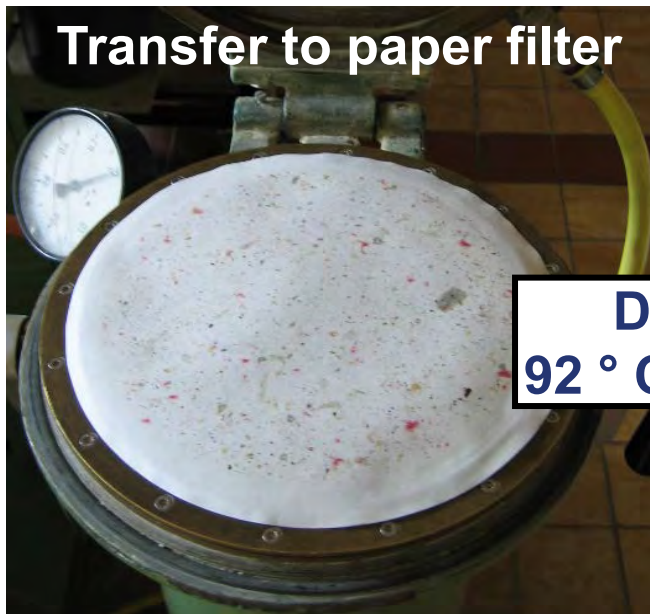
4 x 10 g oven dry sample material are screened over a 100 μm slotted plate (10 l/min, 5 min, 480 double-pass)
Fill in the sample directly



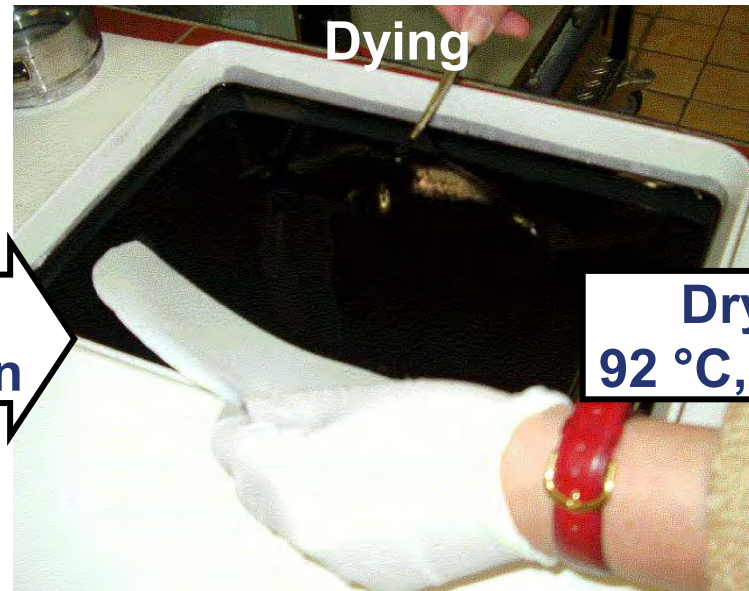
Macrosticky Test (II)



- The reject is washed into a beaker and transferred to a paper filter
- The filter is dried, the sticky material is attached (Silicone paper as cover)
- The filter is dyed (Silicone paper as cover)



Drying
92 ° C, 10 min



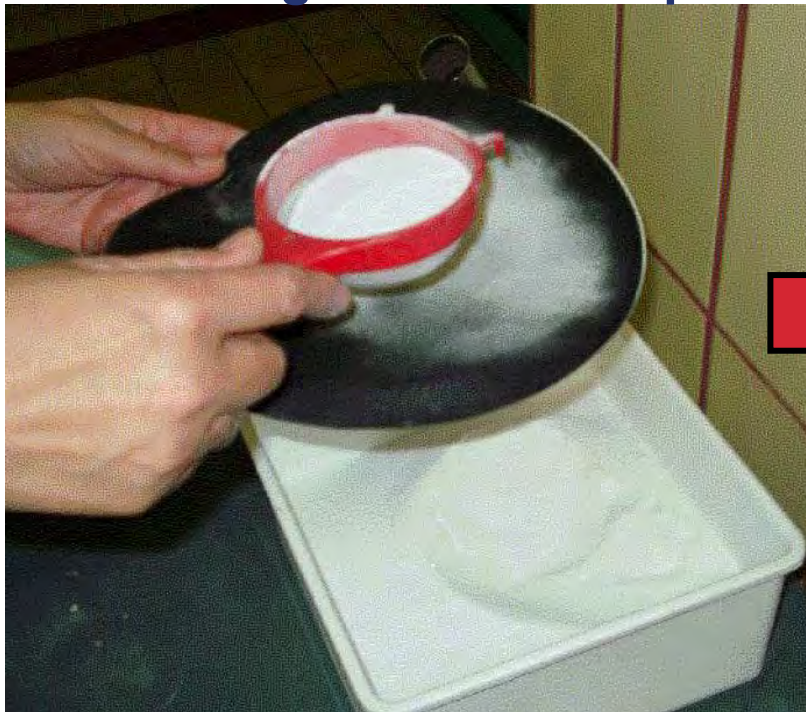
Drying
92 ° C, 10 min

Macrosticky Test (III)



Sticky particles are contrasted by using alumina powder

Contrasting with alumina powder



Drying, 92 °C, 10 min



Macrosticky Test (IV)



Visual inspection to remove/mark other white material (e.g. plastics)
Image analysis with DOMAS system to get macrosticky area



Further steps



Yield

- The yield describes the usable solid stock material which passes the coarse screening step

$$\text{Yield [\%]} = \frac{\text{Packaging Product used [g b.d.] - Coarse Reject [g b.d.]}}{\text{Packaging Product used [g b.d.]}} * 100 \%$$

Ash Content

- The ash content describes the inorganic content after incineration (525 °C) of the solid stock material which passes the coarse screening step. By using the ash content a fibre yield could be calculated

$$\text{Fibre Yield [\%]} = \frac{(\text{100 \%} - \text{Ash Content [\%]}) * \text{Yield [\%]}}{100 \%$$

Handsheets

- Handsheets of the accept from sticky evaluation are prepared for a visual inspection of the optical properties of the stock



Typical Results

Samples



Corrugated Board

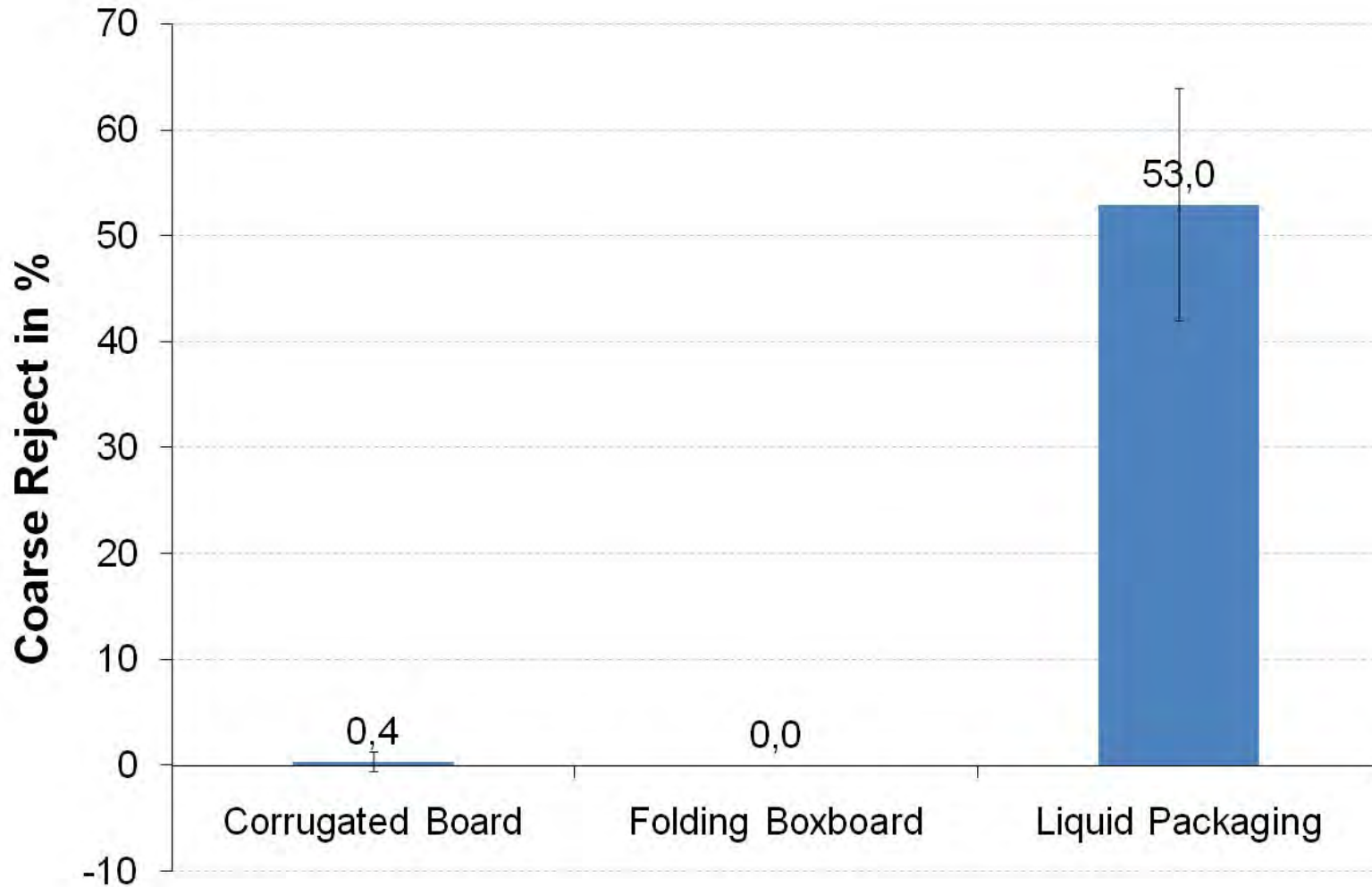
Folding Boxboard



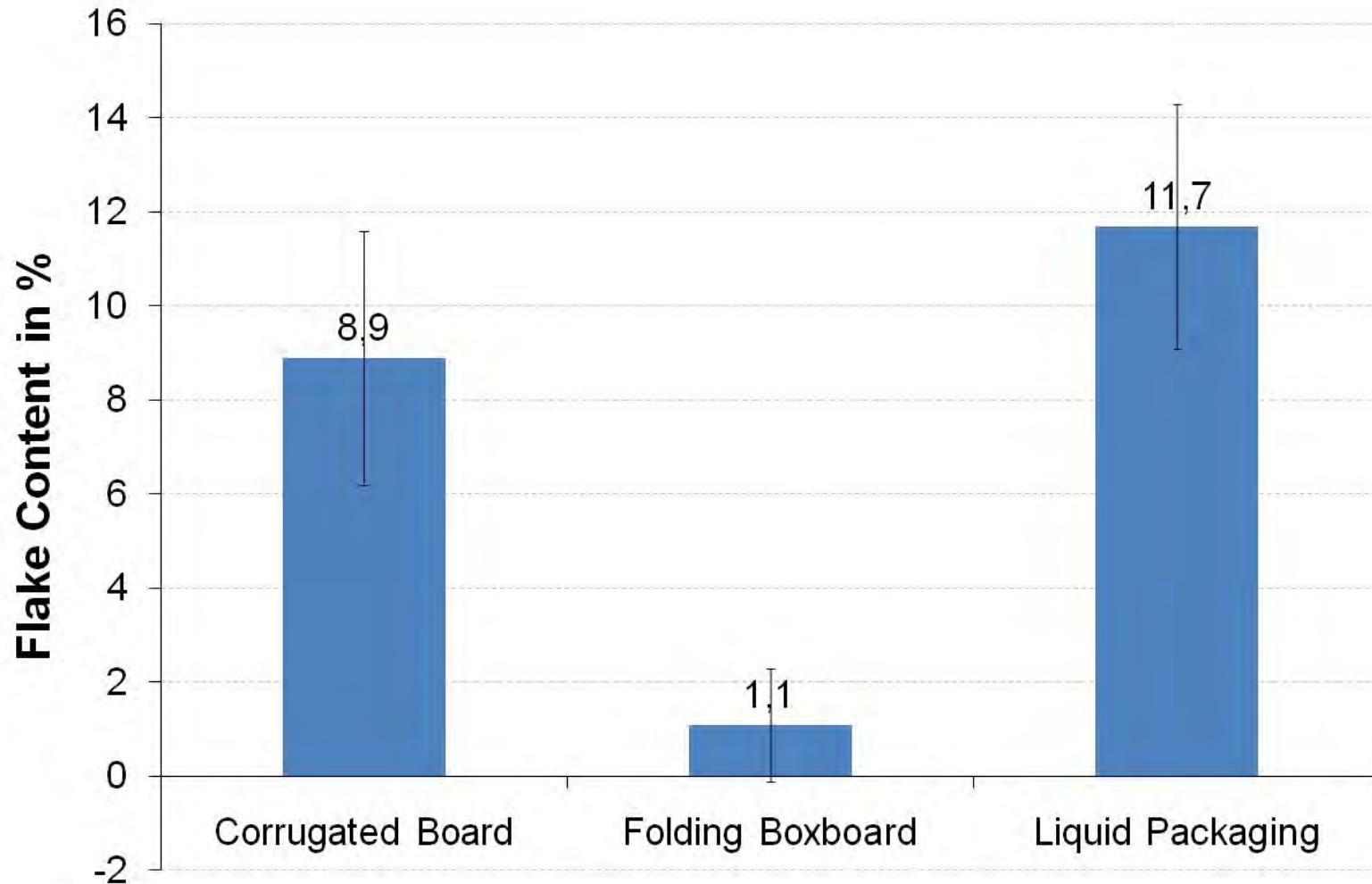
Liquid Packaging



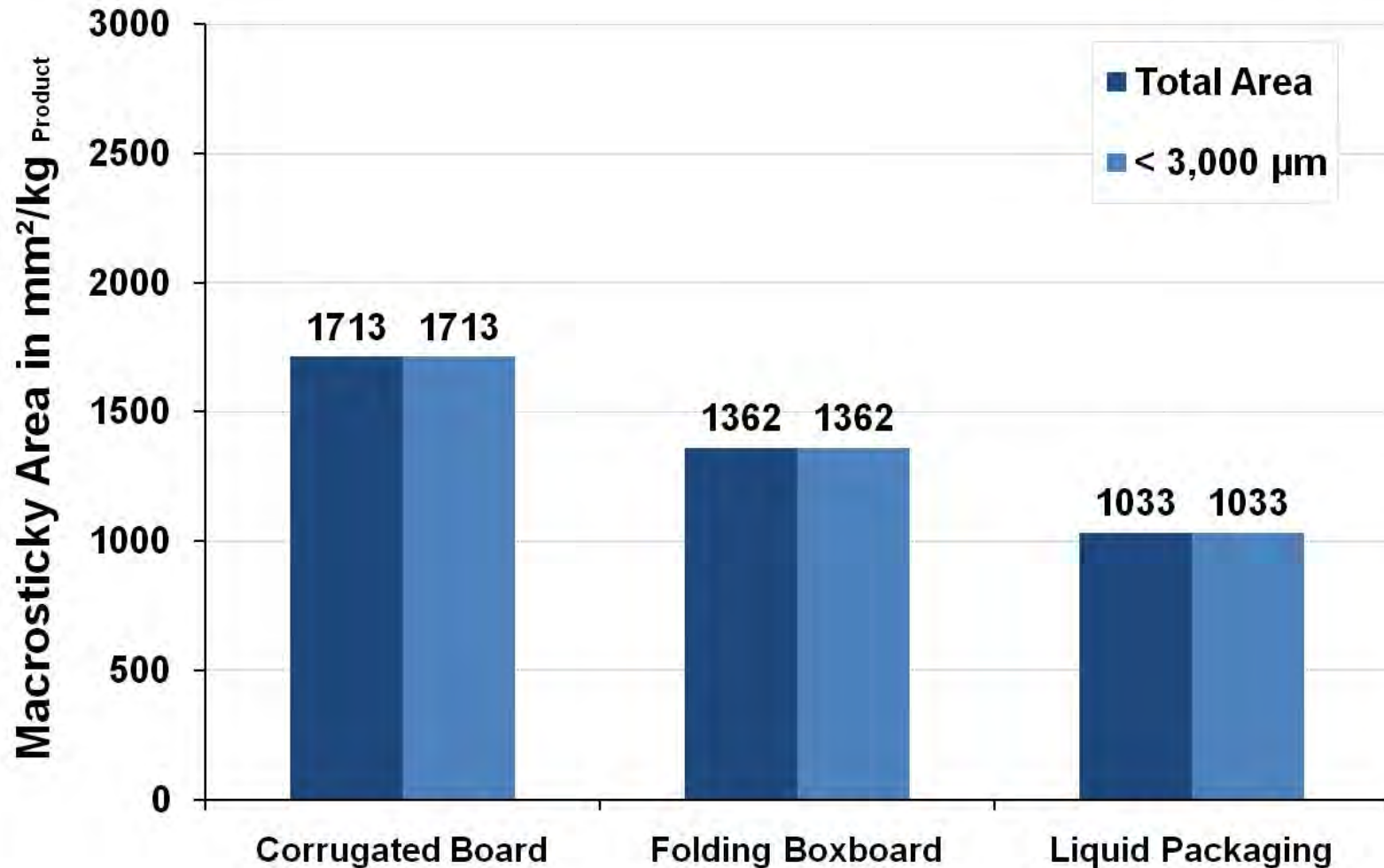
Comparison of different products



Comparison of different products

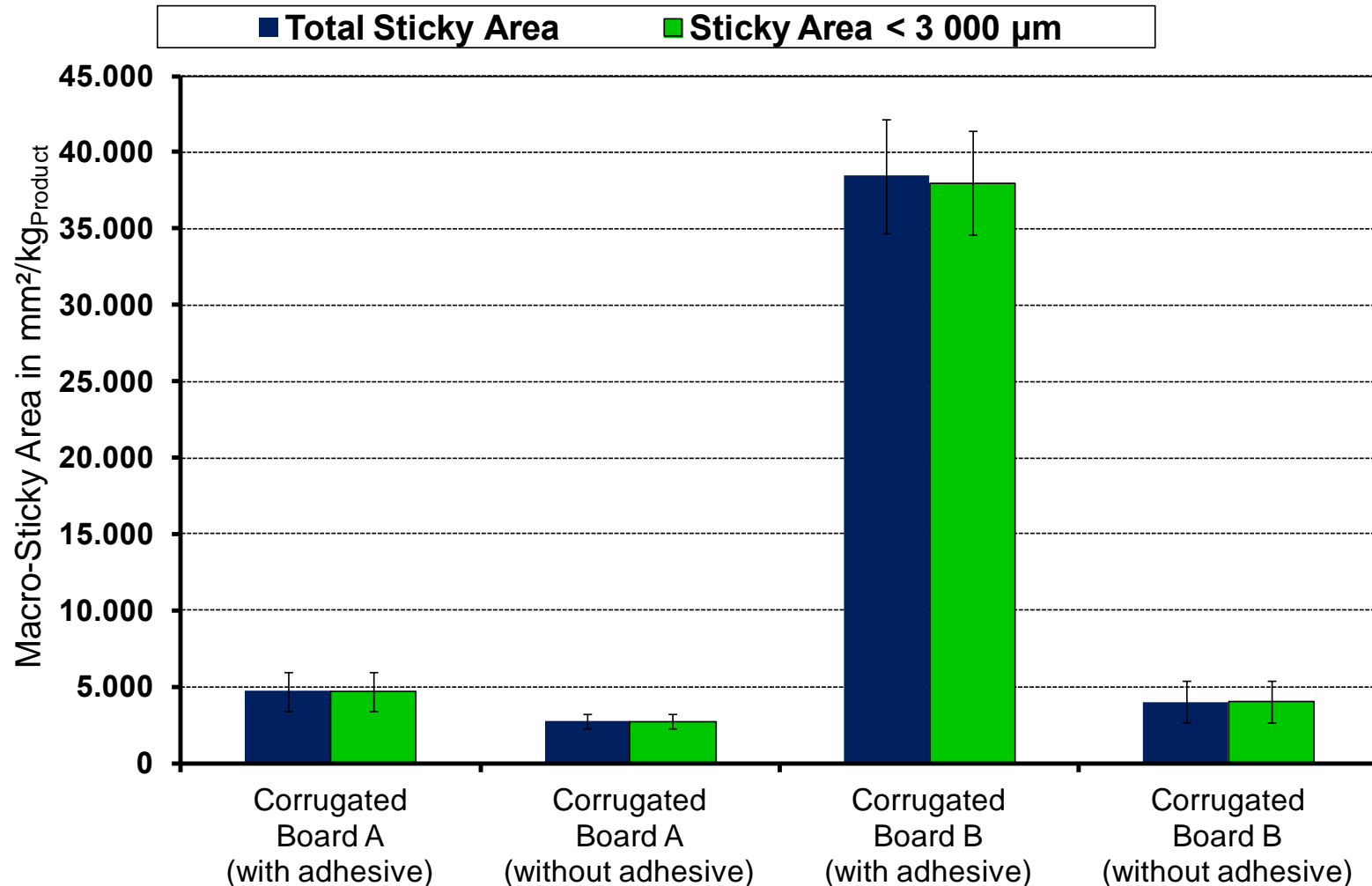


Comparison of different products

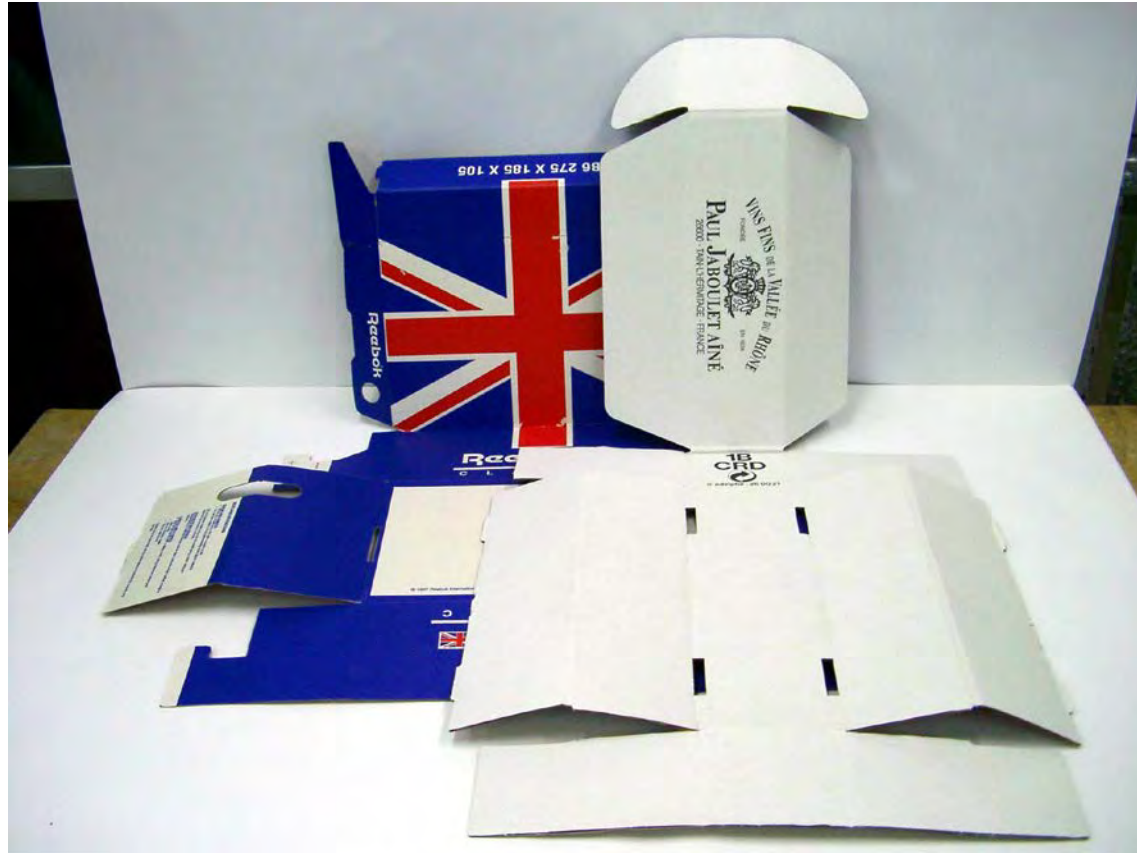


Typical Packaging Products

Possible Results for Sticky Area



Example of a Recycling Friendly Packaging Material



Thank You!



For further information contact

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