

# TKPV-Briefing Note 8

Version: September 2020



Industrieverband  
Klebstoffe e.V.

## Behaviour of Hotmelt Applications in the Paper Recycling Process

Prepared by TKPV – Technische Kommission Papier-/Verpackungs-  
klebstoffe (Technical Working Group on Paper & Packaging  
Adhesives) of Industrieverband Klebstoffe e.V., Düsseldorf

Adhesives are used to manufacture most products made from paper and cardboard. At the end of the life cycle of these paper & board products, the adhesive applications (as an integral part of the product design) enter the paper recycling process.

In the paper recycling process, the used paper products are mechanically treated in water to segregate the cellulose fibres for recycling. Paper recyclers demand the removal of all "non-paper" components from the process at an early stage and as completely as possible.

Since paper recycling is a purely mechanical process, the answer to the question to what extent "non-paper" components can be removed in the recycling process can also be deduced from their physical properties - irrespective of their chemical composition.

Regarding the behaviour of adhesive applications in the paper recycling process, it is necessary to identify those physical parameters that determine the fragmentation behaviour of the adhesive applications as a parameter for segregation (removability of adhesive applications).

Numerous scientific studies have shown that the mechanical strength of adhesive applications during the paper recycling process depends on three factors:

- the "sensitivity" to aqueous media,
- the "sensitivity" to higher temperatures,
- the layer thickness and the geometrical dimensions.

Furthermore, the test results have shown that hotmelt applications that are neither water-soluble nor water-re-dispersible - tested according to INGEDE Methods 12 and 4 respectively - can always be removed very well and they reliably achieve a 100-point rating according to the ERPC scorecard, provided that following physical properties are met:

- **Softening point**  
of the adhesive application (acc. to "Ring & Ball"):
  - for non-reactive hotmelt adhesives: > 68 C°
  - for reactive hotmelt adhesives: not applicable
- **Layer thickness**  
of the adhesive application
  - for non-reactive hotmelt adhesives (thermoplastic application) 120 µm
  - for reactive hotmelt adhesives (fully cured, non-thermoplastic application): ≥ 60 µm
- **Horizontal dimension**  
of the adhesive application  
(in any direction): ≥ 1,6 mm

Once again, this was confirmed by tests commissioned by the German Federal Environment Agency (UBA) for the recently published study "Suitability of Adhesives for Printed Products with the Blue Angel Eco-Label (DE-UZ 195)".

The conclusion of this study is that "hotmelt adhesives based on polyurethanes (PUR) can be generally recommended for use because they are easy to remove. Hot-melt adhesives based on ethyl vinyl acetate (EVA) or polyolefins (PO) can also be generally recommended if the above conditions are met".

However, it should be emphasised in this context that only the physical properties influence the fragmentation and sorting behaviour while the chemical composition of the hot melt has no influence at all!

Any hotmelt adhesive application which is neither water-soluble nor re-dispersible reliably meets the requirements of the ERPC scorecard with 100 points, provided that the three physical parameters mentioned above - softening point, layer thickness and geometry of the adhesive application – are fulfilled, irrespective of the chemical composition!

**References:**

- INGEDE 12 „Assessing the Recyclability of Printed Products — Testing of Fragmentation Behaviour of Adhesive Applications“  
<https://www.ingede.com/ingindx/methods/inged-e-method-12-2013.pdf>, as of January 2013  
INGEDE e. V., Munich
- INGEDE 4 „Analysis of macrostickies in pulps“  
<https://www.ingede.com/ingindx/methods/inged-e-method-04-2013.pdf>, as of April 2013  
INGEDE e. V., Munich
- RAL UZ 195 “Printed Matter”  
<https://produktinfo.blauer-engel.de/uploads/criteriafile/en/DE-UZ%20195-201501-en%20Criteria.pdf>, as of January 2015, currently under revision  
RAL gGmbH, Bonn
- RAL UZ 14B „Finished products made from recycled paper“  
<https://produktinfo.blauer-engel.de/uploads/criteriafile/en/DE-UZ%20014b-202001-en%20criteria.pdf>, as of January 2020, currently under revision  
RAL gGmbH, Bonn
- „Ring & Ball“ – „DIN EN 1238:2011-07 „Adhesives - Determination of the softening point of thermoplastic adhesives (ring and ball)“  
Beuth Verlag GmbH, Berlin
- UBA-Study „Suitability of Adhesives for Printed Products with the Blue Angel Eco-Label (DE-UZ 195)“  
<https://www.umweltbundesamt.de/publikationen/eignung-von-klebstoffen-fuer-druckerzeugnisse-dem>, as of June 2020  
text only available in German  
Umweltbundesamt, Dessau-Roßlau
- ERPC-Scorecard „Assessment of Printed Product Recyclability: Scorecard for the Removability of Adhesive Applications“  
[https://www.paperforrecycling.eu/?page\\_id=11&sf\\_s=scorecard](https://www.paperforrecycling.eu/?page_id=11&sf_s=scorecard), as of March 2018  
European Paper Recycling Council (EPRC), Brussels

All available leaflets of the  
Technical Committee Paper and Packaging Adhesives (TKPV)  
of the Industrieverband Klebstoffe e.V.  
can be found in the currently valid version at

**www.  
klebstoffe  
.com**

The information platform on the internet.