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**Research area: Product aims**

End products made of paper, paperboard and board // Print products

**Key words:**

Offset, printing, cardboard, folding, creasing, adhesion, cracking, dynamic-mechanical performance, varnish, lacquer

**TITLE:**

**Adhesive and cohesive behavior of the ink and varnish layers during folding of UV-varnished cardboards**

**Background/Problem area**

Due to high demands on printing quality, appearance and haptics folding box carton is mainly printed by offset printing using high amounts of printing inks and at least one lacquer coating. In such way printed folding boxes show significant processing failures at creasing and folding after printing, in particular if UV curing varnishes have been used. This leads to cracking and white areas in the folding groove. The reason for this kind of defects has not yet been sufficiently clarified.

**Objectives/Research results**

In addition to non-optimized folding and creasing parameters the following causes for spalling of ink, lacquer or coating could be stated:

- Poor adhesion of lacquer on ink or ink on substrate
- Inappropriate curing parameters or dependence on degree of crosslinking
- Different expansion behavior of coating, ink and lacquer during further processing
- Different hardness and viscoelasticity of the layers

For the theses listed above no adequate and systematic research has been carried out so far, so this project addressed the specified context. Regarding their ability to describe the forces (cohesion and adhesion) in printing inks and coatings resulting in failures when creased and folded various methods were investigated: the dynamic mechanical performance of the printed cardboard was determined using DSC, DMA, and Nano indentation; IR spectroscopy was used to determine crosslinking of the printing inks and varnishes. The aim of the project was to predict the suitability of folding box cartons for a certain print job and reveal possible limitations for these predictions.

**Application/Economic benefits**

The project identified several reasons for poor adhesion of UV printed and lacquered prints when being creased. Limited recommendations could be given on which parameters the printers and converters should pay attention when choosing folding box carton, printing inks and UV varnishes in order to avoid adhesion problems in the folding zone. The quality of the printed and converted folding boxes will increase significantly, delivery times can be guaranteed and customer needs will be met.

The project results will benefit mainly small and medium sized enterprises in the packaging industry, particularly print shops and converters, but will also help board suppliers to develop folding box carton with good ink and varnish adhesion properties.

**Period of time: 01.01.2014 – 30.06.2016**

**Remarks**

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