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**Research area: Product aims**

Paper, paperboard and board // Graphic papers

**Key words:**

Folding, coating cracking, multiple coated offset papers, paper stress strain behaviour, intermediate polymer layer

**TITLE:****Simulation-based optimization of coating cracking behaviour during the folding of multiple coated offset papers containing pre and top coatings by including an additional intermediate polymer layer****Background/Problem area**

Besides printability characteristics, the folding performance of printed papers is an essential quality feature that imparts high practical value to products. Many coated graphic paper grades are subjected to an intensive folding process after printing exerting a high mechanical load on the base paper and coating layers. If the breaking stresses are exceeded during folding, cracking and damage at or close to the folding line will occur. Cracked coating pieces split off from the paper surface may be pressed into printed areas causing visible imperfections after cutting and binding leading to customer complaints and expensive losses.

Conventional measures to avoid coating cracking include, for instance, a creasing process to achieve a well-directed delamination of the paper structure or a remoistening unit leading to a softening of the fold region. Other possibilities are associated with changes in base paper and coating formulation to adjust the corresponding properties of the mechanical layer. However, these methods involve either additional cost-intensive process steps or influence the properties of the base paper and coating layer, and may therefore interfere with printability requirements.

A new concept is to apply an additional intermediate, thin polymer layer to improve the coating cracking behaviour while maintaining high printability performance. Such polymer materials are commercially available in a large variety. It can reasonably be assumed that the polymer layer properties can be adapted quite well to the needs of multiple coated printing papers.

**Objectives/Research results**

The project aim is to reduce the tendency of coating cracking during the folding of multiple coated offset papers containing pre and top coating layers. This aim is achieved by modifying an existing multiple coating system including an additional intermediate polymer layer. Based on simulation results and experimental data, suitable polymer materials have been selected, adapted and tested in pilot trials. Simulation models using FEA (finite element analysis) have been developed and are improved iteratively, dependent on current results, to derive the requirements regarding thickness and mechanical properties of the layer composition. The modelling results are continuously validated by experiments. Furthermore, the manufacturing of the new multiple coatings will be performed with the multi-layer curtain coating equipment.

**Application/Economic benefits**

Weaker and uniform cracking at the fold of the coating layer with a more uniform surface will benefit the whole value chain from papermakers and their suppliers to printers and converters.

Printers and converters will gain an economic advantage by avoiding misprints due to cracking at the fold. This will be followed by fewer complaints and waste reduction during production and in the end to an overall increase in customer satisfaction.

Chemical suppliers will also benefit from the project results by allowing them to develop special additives for paper coating to help reduce cracking at the fold of the coating layer.

**Period of time:** 01.01.2012 – 31.12.2013

**Remarks**

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