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**Research area: Product aims**

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

**Key words:**

Creasing, creasing parameter, creasing tools, folding box board, cardboard, water-based coatings, numerical simulation model

**Title:****Development of a comprehensive concept for optimal creasing of cardboards with water-based coatings****Background/Problem area**

Accurate creasability is an important property that coated cartons must meet during processing. Creases are used for the preparation of bending positions and are performed simultaneously with the blanking. During creasing, the cardboard and the coating are deformed strongly. There is a risk that the barrier layer may be damaged. While the creasing process is currently predominantly mastered for extrusion-coated and foil-laminated cartons, problems are frequently encountered with water-applied coatings. It is unclear, in particular, under which conditions an exact creasing can be achieved.

Compared to extrusion coatings, water-based coatings have different structures and thus other deformation properties of the polymer film. This is due to the different processes involved in film formation. Unlike film forming in plastic melts, converge and entanglement of the polymer chains in water-based systems occur only in the final phase of drying. Moreover, depending on the residual water content, aqueous polymer solutions result in soft to brittle films (polyvinyl alcohols, starch), that can also be problematic during creasing.

**Objectives/Research results**

The aim of the project is to create a comprehensive concept for the creasing of cardboards equipped with water-based barrier coatings, so that they are free of defects. The concept takes into account the involved materials (cardboard and coating) and the process conditions (creasing parameters and creasing tools). Suitable creasing parameters and new geometries for creasing tools are to be determined and investigated based on finite elements models. The results should be summarized for practice in the form of creasing recommendations. This leads to the following sub-objectives:

- With regard to the coatings, the minimum properties are to be determined which lead to sufficient faultless creases. This includes the application weight and the ductility of the coating.
- For the raw carton, the required mechanical properties should be defined and the feasible creasing parameters should be determined.
- The influence of the creasing tools and creasing parameters is to be examined intensively and varied with the aim of achieving the best possible creasing result. It is proposed to use creasing knives, creasing geometries and creasing grooves which are not part of the current standard. In order to be able to carry out an optimization, numerical simulation models need to be developed and applied.

**Application/Economic benefits**

For the first time, the main influencing factors on the creasability of cardboards with water-based barrier coatings are systematically recorded and the results will be implemented into recommendations for precise creases. The recommendations contain detailed instructions which can be applied directly in practice. In addition, a simulation model for the creasing process is provided, which allows identifying the optimal creasing geometries faster and better than the empirically determined equations which often provide only a rough orientation and hardly reduce the extent of necessary preliminary tests. The industries that benefit from this include the manufacturers of paper, cardboard and articles thereof, the chemical supplier industry, the production of packaging and their supplier industry.

Currently only the visual appearance of the creasing lines and the reduction of the folding moment are tested. The results of the project may be the basis for further evaluation procedures (e.g. permeabilities of fluids and gases at the creasing lines).

**Period of time: 01.02.2017 – 31.01.2019**

**Remarks**

The research project IGF 19313 BG is being funded by the Federal Ministry of Economic Affairs and Energy (BMWi) and is being conducted by PTS-PTI, Munich, and PTS-IZP, Heidenau.