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**Research area: Product aims**

Paper and paperboard production // Papermaking

**Key words:**

Highly filled paper, filler, ceramic, metal, silicagel, mechanism

**TITLE:****Title: Specific control of the morphology of highly filled special papers by investigation of active mechanisms dependent on materials and processes****Background/Problem area**

On the basis of IGF project work it was proved successfully that interesting product ideas can be generated by strong enrichment of the papers with fillers. Finally the present projects show that the laboratory results (in particular the recipes) can be transferred practically on the trial paper machine at PTS-Heidenau. On the basis of the long-standing experience at PTS Heidenau the influencing control about process and material parameters of the continuous paper web production of highly filled specialty papers should be examined and optimised systematically.

A new process approach to the production of specialty papers consists in fixing functional fillers in the paper extremely. With filler contents up to 90 weight-% the quality profile of the paper is not only complemented or modified with the filler any more, but stamped by it. The filler with its specific qualities (e.g., sinterability, adsorption capacity, heat accumulator capacity or electric conductivity) is given in "paper-like" consistency. The highly filled papers can be supplied typically for paper processes (coated, formed) and accordingly variably to the corresponding application systems. The paper-technical realisation of such highly filled papers shows a special challenge and assumes an adaptation of the paper production process as well as the specific fixation of the raw materials (like filler, binding agent, fibrous material) in z direction. Universally valid knowledge to the specific setting of the paper morphology (in particular of the raw material distribution and porosity) has not been published up to now for such highly filled papers. Therefore, it is necessary to expand the knowledge on the basis of the available knowledge about filler-containing papers (e.g.: To extend Sc papers with filler salary between 34 and 36 % by weight).

**Objectives/Research results**

By specific adaptation of the process parameters, fillers and raw materials were arranged straight in the paper. Concerning this the measuring-technical know-how of the department of metrology flew in into the result evaluation, while the raw material distribution was assessed in the cross section (z direction) of the paper (in particular the filler distribution). Also the impact of densifying the papers by calendering was focus of the examinations in one of the 7 work packages. Several trials were run at PTS trial paper machine in Heidenau with different kind of fillers like ceramic, silica, calcium carbonate and copper. Especially wet end process parameters like de-watering, wet pressure and online drying conditions were tested. The produced sample material was used for detailed densifying tests to investigate the influence of pressure, temperature and time to control density and paper strength of highly filled papers. Filler distribution was analyzed by computer tomography and preceramic paper was sintered and characterized.

**Application/Economic benefits**

Target markets are all those markets which are financially active currently with the application of fillers. Fillers used to the production of highly filled specialty papers can be organic or inorganic powders by particle dimensions smaller 50 µm. For example, ceramic manufacturers use ceramic powders, which were formed by conventional styling procedures (extrusion, pressing) into the desired prefabricated part shape. Activated carbon filters for the car industry are filled or coated with activated carbon powders or fibres.

Finally the development of highly filled special papers offers a new procedure to organise fillers in flat form to transfer this afterwards in complicated structures (e.g., corrugated cardboard structures). This filler-dominant semi-finished product is made available to the respective user for the subsequent treatment. Some possible target markets are accordingly industries to the areas of paper, ceramic, metal, filter, fire prevention, climate, Electric, automotive engineering.

The research results will be used by German paper manufacturer and converting plants. Secondly, they will have an impact on the future trend of German SMEs (small and medium-sized enterprises) in the filler industry. Low cost applications realized by highly filled paper solutions could evolve into a totally new market for German enterprises once the current technical problems such as raw material distribution and paper strength have been solved.

**Project period:** 01.06.2009 – 31.05.2011

**Remarks**

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