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Research area: Process-aims

Paper and paperboard production // Surface treatment

Key words:

Coating colour, NIR drying

Title:**Simulating the behaviour of high-viscous coating colours during textile and paper coating****Background/Problem**

Coating of textiles and paper is a challenging upgrading process aiming at an improved and adapted surface. Coating colours based poly vinyl chloride (PVC), poly urethane (PU), silica, acrylic acids, and water based mixtures of pigments and latex are applied to the substrate on one or on both sides. Substrates may be woven or knitted fabrics, fibrous mats, paper or board. Systematic investigations for textiles as well as for paper are still lacking, where rheological behaviour of high-viscous coating colours and rheological conditions at the coating machine in the laboratory or in industrial scale are related to the resulting properties of the final products. A software based simulation technique, fluent/polyflow, offers new opportunities in this direction, because the local flow behaviour of the coating can be calculated using appropriate rheological models.

For the first time, the coating of moving surfaces can be simulated locally within the layers in order to optimize process and quality of the application in the textile and paper industry.

Research objective/Research results

The objective of this project is to use CFD-simulation software and appropriate measurements to elaborate dependencies between the rheological behaviour of a coating colour and conditions on a industrial coater (geometry, speed, etc).

Blade metering under different conditions has been simulated using models for the rheological behaviour of real coating colours. Shear rate dependent viscosities have been measured and implemented in the models, where the geometry under the blade and in the vicinity of the blade are simulated.

Local velocities in the coating layer during application and pressure distributions have been calculated and have to be interpreted now. Due to the high shear rates under the blade, it seems to be most important to know the viscosity under these conditions for an appropriate simulation. Additional parameter studies (coating speed etc) will be evaluated in order to estimate where runability problems can be expected when industrial coaters with ever higher speeds are sent into operation.

Application/Economic benefits

Manufacturers of coated papers and textiles will be offered the opportunity to evaluate simulation results for cost reduction and quality improvement. Optimizations of coating colour, application systems and parameter settings can be derived to obtain an even and uniform coating layer at the desired application speed.

Changes in coater design and in coating colour components are possible for manufacturers of coating colour equipments and for those who produce coated papers and textiles.

Limitations can be shown, where irregularities may give rise to severe runability problems.

Project period: 01.03.2005 – 28.02.2007

Remarks

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