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**Research area: Process aims**

Paper and paperboard production // Papermaking

**Key words:**

Wet end, optimisation, simulation, process control, retention, formation

**Title:****Model-assisted optimisation of retention and formation in the paper machine wet end****Background/Problem area**

Retention and formation have not yet been looked at from the angle of a combined and simultaneous model-assisted optimisation of both parameters. Existing retention control solutions fail to consider any boundary conditions or constraints for adequate formation. Data-based retention and formation models are seen as a prerequisite for plant-specific optimisation methods to derive optimum values for all relevant dosing variables.

The main shortcoming of previous studies is their failure to include all relevant influences on retention and formation as input channels into the models. In particular the wet end parameters (pH, zeta potential, cationic demand, conductivity etc.) indicating the state of the wet end ("indicators") haven't been integrated as dependent variables into the models so far. The project aims at developing multi-variable models which are suitable for model-based optimisation methods.

**Objectives/Research results**

The research project is intended to enhance the productivity of paper machines whilst ensuring the product quality through simultaneous model-based optimisations of retention and formation. The objective is an optimum balance of the two processes taking into account all relevant influences.

Data-based mathematical models are used to describe both retention and formation as functions of additive dosing and major material- and process-specific influences.

The second modelling stage is dedicated to the data-based modelling of dependent wet end parameters as functions of the primary parameters and by means of online data and separate sub-models. This is expected to help interpreting the performance mechanisms of the additives used.

The resulting models are to be applied in optimisation methods to derive set points and targets for the optimum dosing of wet end additives, and to obtain information on optimum boundary conditions for the wet end.

**Application/Economic benefits**

The stable and optimum retention of fibres, fillers and fines in the wet end is a key prerequisite for improved paper machine productivity and paper quality. Improving and stabilising the formation – one of the main quality parameters of the papers produced – simultaneously with retention will create further synergetic effects on productivity and quality. These synergetic effects will manifest themselves in fewer raw material losses, the more efficient use of expensive wet end additives, increased machine speeds, faster grade changes and more consistent paper quality. Considerable cost savings are possible as well if the dosing quantities of retention aids can be lowered by just a few percentage points through suitable control and optimisation measures.

Systematic and transferable methods for the optimisation of process and quality parameters as well as simulation-based tools are particularly important to SME having little research funding and facilities of their own. The methods and tools developed in this project will help to enhance their competitiveness, plant productivity and product quality.

**Project period:** 01.02.2006 – 31.01.2008

**Remarks**

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