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Research area: Process aims
Paper and paperboard production // Papermaking

Key words:
Wet end, optimization, simulation, retention, formation, scale-up

Title:
Optimization of retention and formation in the paper machine wet end through model-based scale-up of lab and pilot plant results

Background/Problem area

Chemical additives are used in modern paper production to achieve the desired product quality, elevate process performance and plant profitability, and fix disturbing substances. As machine trials are costly and bear the risk of production losses, lab scale trials are commonly used to optimize the additive usage. They facilitate the choice of suitable products, but the results do not lend themselves to a quantitative scale-up to the paper machine. At present no quantitative scale-up methods are available. The research project is intended to combine mathematical modelling based on mill data with quantitative results from lab and pilot scale trials in a basically new approach to retention and formation optimization in the paper machine wet end.

Objectives/Research results

The research project is intended to enhance the productivity of paper machines whilst ensuring the product quality through optimisation of retention and formation. For this purpose data-based retention and formation models will be used that are calibrated with lab and pilot scale results. This approach shall allow the calculation of optimally adjusted levels of numerically variable influence parameters in the wet end, in particular retention aid dosages.

Laboratory and pilot paper trials have been carried out with pulp and additives of the real paper machine. The input parameters (additive dosing, time, shear) have been varied using the same variations like in the paper mill. The trials settings have been planned using design of experiment. Some models have been made by using different software tools. The next step is scaling up the models to the real paper mill process and to find the right scaling functions.

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. The effects will manifest themselves in more consistent paper quality, fewer broke and the more efficient use of expensive wet end additives. A reliable scale-up of inexpensive lab and pilot scale results offers considerable additional benefits: Optimisation phases will be shortened, production losses due to machine trials can be avoided. An improved methodology to optimize the wet end is of high importance in particular to small and medium enterprises, as these often produce special niche products and are permanently under pressure to lower production costs.

Project period: 1.7.2006 – 30.6.2008

Remarks

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