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Research area: Process aims

Paper and paperboard production // Papermaking

Key words:

Wet end chemistry

Title:

Development of main tools for the "SystemCheck Wet End" to systematically optimise the wet end of paper production plants

Background/Problem area

The main problem of the wet end in paper production is the limited predictability of influencing factors. Both the empirical and functional interrelations are not yet fully understood. In the wet end a large number of factors interact in a non-linear way. Without well-founded knowledge and methodical design of the wet end processes, the productivity and product quality demanded by the market cannot be achieved.

Objectives/Research results

The objective of this research project is to develop an integrated approach for the systematic and effective optimisation of the wet end of paper machines. This approach consists of standardised procedures (tools) for analysis and optimisation. The benefit will be cost cutting and performance enhancement in the field of paper additives, the avoidance of deposits resulting from raw material and operational conditions, as well as better flexibility and stability of the processes. Based on acquired data from two paper mills, the following main tools were developed and tested:

- Correlation analysis: data visualisation and preprocessing, T2-charts, principal component analysis, correlation maps, auto-correlation and cross-correlation functions to identify influencing factors and their interactions
- Mathematical Modelling: predicting the effects of changes in additive dosage by means of data-driven modelling
- Additive dosage regime: evaluation of the additive performance by means of characteristic curves and diagrams; lab trials for efficiency comparison, optimum dosage and dosing sequence
- Run time analysis and additive kinetics: dynamic models adjustable to given plants to evaluate dosing strategies
- Deposit cause analysis: development of a systematic methodology and flexible decision structure
- Reference database: position-fixing and identification of optimisation potentials by plant comparison
- Validation of wet end optimisations.

A data acquisition and analysis were carried out with new tools developed in this project. Correlation analysis seems to be limited because of partially non-stationary process behaviour. Data-driven models are more powerful in this case. A run-time analysis of the additive dosage was developed and verified. A database layout for position-fixing and plant comparison was developed, tested and modified in the further work. A systematic methodology and flexible decision structure was developed to analyse deposit causes.

Application/Economic benefits

- Optimisation leads to significant saving potentials for the papermakers in different fields:
- Improved process supervision: more transparency and better process knowledge
- Reduced costs of additives: lower additive use or use of alternative products
- Better compatibility of the additive system: no detrimental interactions
- Improved process stability: fewer web breaks and deposits
- Avoidance of process-related product defects.

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Remarks

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