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Research area: Process aims

Paper and paperboard production // Papermaking

Key words:

Dewatering performance, dry content, productivity gains, retention, formation

Title: Developing a method to increase the production and save energy in papermaking plants through improved dewatering on the wire**Background/Problem area**

Most of the dilution water used for sheet forming is removed in the wire section of paper machines. Subsequent dewatering and drying processes in press and dryer sections require high amounts of energy. The demand for thermal and electric energy can be reduced by increasing the dry content after the wire. The dewatering performance is influenced by pulp characteristics, by the type, amount and dosing scheme of chemical additives, and by the technological concepts and parameter settings of headbox and wire sections.

All influences have an effect on other target parameters as well, which is why the latter cannot be influenced or controlled independently. Dewatering is linked with formation (uniformity of sheet forming) and retention via the flocculation of fibres. Strong flocculation tends to result in good dewatering and retention whilst deteriorating the formation.

The majority of paper mills are unable to simultaneously afford the personnel, measuring instruments and evaluation resources and lack the knowledge of relationships and scientific methods to perform such complex optimization tasks. Suppliers have suitable measuring methods for certain sections of the optimization field, but focus on certain aspects of the problem only - which means there is no comprehensive approach.

Objective/Research results

The R&D project is intended to develop a methodical analysis of potential for optimizing the dewatering on the wire in order to enhance the performance of existing paper machines and reduce their energy costs. A method is to be developed which links modern and innovative tools and evaluation methods to enable the standardized and efficient analysis and optimization of dewatering on the wire. The focus is on dewatering processes on paper machine wires, i.e. on the dry content after the forming wire as target parameter. The method to be developed by the project is a generally applicable and largely standardized tool for the efficient optimization of dewatering processes in the paper machine wet end.

Trials performed in a paper mill provided meaningful, reliable results, including a comprehensive process mapping and the measurement of dewatering profiles in machine direction (MD) under different process conditions as basis for the grade-dependent optimization of dewatering profiles in MD. To quantitatively describe the effects of manipulated variables on dewatering and other target parameters, the mill trials were evaluated by statistical methods, and mathematical models were developed for model-based optimization.

The influence of pulp parameters and additive dosing on the dewatering behaviour was investigated by laboratory tests. The results of these tests were implemented in the models as well.

Furthermore, oscillations in the dewatering profiles were measured by continuous measurement methods and analyzed by means of Fast Fourier Transformation (FFT) analysis.

Application/Economic benefits

Higher dry contents after the wire can be utilized to save energy and/or increase the production via speed increases. Both optimization targets can be proportionately combined.

A dry content increase ahead of the press can be assumed to result in comparable dry content gains after the press. An increase of 1 % after the press can lower the steam consumption of the drying section by around 4 %. The press section consumes around half of the overall electric energy demand of forming, press and drying sections. Modern newsprint machines have a specific consumption value of 170 kWh/t. When weighing up the costs, one should therefore also consider the option of relieving the press section by a higher dry content after the wire to save electric energy.

Project period: 01.01.2009 – 31.12.2010

Remarks

The research project IW 090062 is being performed funded by the German Federal Ministry of Economics and Technology BMWi and under the InnoWatt programme.