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Research area: Product aims

Pulps // recycled fibre pulp

Key words:

DIP, initial wet strength, CMC

Subject:

Improving the initial wet web strength (IWWS) of deinked recycled fibre pulps through fibre modification by means of strength-enhancing additives

Background/Problem area

Deinked pulp (DIP) is produced from sorted graphic papers for deinking. Back in 2001 the recovery and recycling rate of these papers had already been as high as 84 % in Germany. As a result, the quality of recovered papers has been deteriorating ever since, demanding growing expenses to ensure the desired quality of recycled-fibre based graphic papers. Moreover, paper machine speeds can decrease due to unfavourable stock properties.

Optimisations of existing or the design and dimensioning of new paper machines go hand in hand with increasing operating speeds. This tendency is often linked with simultaneous grammage reductions of the papers produced, leading to increased strength requirements. Without reservation, this applies also to initial web wet strength. Little has been known or published so far about the raw material or stock influences on IWWS. However, this information is necessary to be able to conduct studies into the quality improvement of DIP, and evaluate their results.

Research objective

Aims of the project are, on the one hand, the precise measurement and, on the other hand, the enhancement of initial wet web strength in paper formulations, especially DIP-based ones. Strength enhancement was to be achieved through strength-enhancing additives or fibre modification by means of these additives. As a result, the speed limit of older paper machines - which depends on initial wet web strength - was to be raised without structural or design alterations.

In the first project step, the methods currently employed for measuring the initial wet web strength were examined in detail concerning suitability. Focal points were the precise adjustment of dry contents and reproducible strength measurements. A consistent method was elaborated which enables reproducible, quantitative measurements of initial wet web strength.

To analyse the material influences on initial wet strength, several DIP samples from industrial practice were investigated. The results have shown that the initial wet web strength depends on pulp composition and ash content. To study the effects of additives for initial wet strength enhancement, DIP was modified by means of CMC, carboxymethylxylan and chitosan. The results achieved so far demonstrate that the effects of additives on initial wet web strength are strongly influenced by process conditions and the chemical modification of these additives.

Application/Economic benefits

Many of the German paper mills using DIP as a raw material are SME, for which low production costs and high product quality are of utmost importance. To increase the economic efficiency of their manufacturing processes, they must in particular raise the paper machine speed at low grammage levels, and reduce the number of web breaks. Many web breaks are due to an insufficient initial strength potential of the stock components or excessive filler contents in paper recycling mills. Knowledge of the relationships and interactions between the properties of stock components and the initial wet strength will enable papermakers to treat their raw materials more effectively and by means of properly selected additives, for better strength properties of the wet fibre mat and fewer web breaks and machine standstills.

Project period: 01.02.2005 – 31.12.2006

Remarks

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