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Research area: Product aims
Paper, paperboard and board // Graphic papers, Packaging papers and paperboard

Key words
Dry strength agent, starch, guar, polyacrylamide

Title: Strength increase in paper by the optimised use of dry strength agents

Background/Problem area

Paper strength is primarily the result of hydrogen bonds formed between fibres. In the case of recycled-fibre based papers, refining can only increase the bonding area between fibres to a very limited extent. In graphic paper production, fillers are added to the base paper to improve the printability characteristics whilst saving costs. These fillers usually act as spacers, reducing the number of hydrogen bonds.

Strength losses can be compensated for by means of natural and synthetic strength-enhancing additives. The additives are adsorbed on the surfaces of fibres, fillers and fines to thus increase the degree of bonding between these components. In this way, it will be possible to influence the breaking length, bursting strength, folding strength, internal bond (z strength), pick resistance, abrasion resistance, density and smoothness of paper.

However, other additives and white water constituents can impair or even prevent the performance of strength-enhancing additives. Pilot paper machine trials using white water will therefore be performed to study how base paper strength can be favourably influenced by selected additives.

Objectives/Research results

The project aims to investigate how strength losses can be compensated by

- the type of dry strength agent (e.g. cationic starch, guar, polyacrylamide, polyvinyl amine, carboxymethyl cellulose),
- its dosage,
- the dosage sequence of DSA and other additives,
- its molecular weight and
- its degree of substitution (DS) / charge.

Initial results regarding the dosage levels of a cationic starch, a guar and a cationic polyacrylamide already exist. The papermaking trials were performed on a laboratory-scale paper machine with a width of 0.40 m running at a speed of approx. 2 m/min using bleached eucalyptus kraft pulp, 25% GCC or PCC as the filler and with two types of water (tap water, white water from a paper mill).

The next step will involve the systematic variation of cationic starch and CMC of different molecular weights and DS in laboratory-scale papermaking (pilot plant PTS Heidenau). Two different kinds of white water will be used: one from paperboard production with very high conductivity and one from a graphic paper mill with somewhat lower conductivity.

Furthermore the spraying of appropriate DSA between the layers of multiply paper/board will be examined.

Application/Economic benefits

The project results will be used by manufacturers of both recycled-fibre based and wood-free graphic papers based on virgin fibres. Packaging paper producers can benefit from the results as well.

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Remarks

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