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Research area: Product aims

End products made of paper, paperboard and board // Corrugated products

Key words:

Wet end starches, hydrogel character, polysaccharide, starch retention, drainage

TITLE:**New hydrogel structures for wet end starches****Background/Problem area**

Wet end starches are used in the paper industry to compensate for the loss of paper strength caused by the use of recycled fibres with permanently decreasing quality parameters. Furthermore, they act as a retention aid for fines and fillers and they guarantee stable paper machine runnability at high speeds by interacting with other additives. Cationic starch derivatives belong to the most important wet end additives. Due to closure of white water circulation, especially in corrugated board producing mills, large amounts of dissolved salts and anionic trash accumulate in the system. For this reason, the cationic starch derivatives may become ineffective in the pulp suspension. The increase in a charge bound to starch does not further increase its efficiency in highly contaminated systems. It is therefore necessary to develop a new generation of wet end starches.

Objectives/Research results

The aim of this project is to combine the advantages of the effect of the solution structure including charges with the advantages of the particulate structure for the development of new wet end additives on the basis of biopolymers. During the interaction with the fibre fleece, the products will link the effect of surface charge with the effect of anchorage by the filtration of partially swollen structures. The target-oriented modification of polysaccharides is aimed at products with high active component effectiveness which guarantees both high retention in the fibre fleece and a positive quality of drainage on the paper machine. Furthermore, the focus of this project is directed to the technological implementation of the results in industrial practice. The technology for treating the new wet end starches has to be involved as well, since the paper industry has to be provided with a technological solution for the incorporation of the newly developed wet end starch in the thin stock without destroying the hydrogel character.

Previous investigations have shown that the particle size distribution of hydrogels of starch derivatives has a significant impact on the starch retention and strength properties of paper. Therefore the systematic adjustment of the average particle size by varying the modification and shear energy to achieve high retention and high strength properties is the current objective. The newly developed starch derivatives were cool treated with ultra-turrax or rotor/stator machine and were characterized and tested in the lab. Handsheets prepared with salt water (conductivity: 6000 $\mu\text{S}/\text{cm}$) were carried out. The changed structure and the derivatisation of the starch are directly related to the drainage behaviour of the pulp, starch retention and strength properties of the formed handsheets. These results provide the basis for the next target oriented structure change of the starch derivatives. The lab treatment of starch derivatives were scale up in the pilot treatment.

Application/Economic benefits

Starch derivative structures should be produced by a suitable combination of physical and chemical derivatisation of starch polysaccharides in combination with other biopolymers. These derivatives should show restricted swelling even at high salt load of the circulating white water in the paper mill, they should interact with the pulp fibres via mechanical and electrostatic forces and they should enhance the fibre network of the paper sheet during drying by gelatinization of possibly available residual inner starch granular structures.

Period of time: 01.07.2013 – 30.06.2016

Remarks

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