Title:
Improved sizing agent efficiency through internal sizing in the HC range

Background/Problem area
Internal sizing agents are usually added to highly diluted stocks, i.e. at low concentration and in the presence of high contaminant loads. A new technological approach aimed at improving the sizing result in highly loaded systems is the dosing of sizing agents at higher concentration ratios (versus fibres) and at a point where the stock contains less contaminants and fillers. Initial laboratory tests showed an improved performance of sizing agents added to the HC stock by means of a kneader or disperger. The method is referred to as internal sizing in the high-consistency (HC) range.

Objectives/Research results
The research project aims at improving the new process concept of internal sizing in the HC range, to underpin the thesis of covalent bond formation in the HC range by the successful transfer of laboratory results into industrial practice. The innovative value of the envisaged results lies in the dosing of internal sizing agents in the HC range, an interesting option especially in view of the increasing use of disperger stages in papermaking.

Internal sizing tests will be conducted in the laboratory, using a lab kneader and three model stock systems (white recovered papers; grey recovered papers; sorted graphics for deinking. Parallel test series will be conducted using the conventional process and new HC method, and tap water or closely specified process water for dilution. The tests will be focused on the reactive sizing agents AKD and ASA, using AKD types of different starch and promoter contents and three stock samples per agent. All sizing agents will have exactly predefined characteristics and will be added at different dosing points to test their dosing point-specific performance. The sizing agents will be used in combination with tried and tested retention aids. The shear stability of absorbed sizing agents is considered an important factor in HC sizing, and will therefore be determined by separate tests. To be able to compare the various different processes, the residence times in the stock suspension will be closely monitored. Stock characteristics and dilution water loads will be established by common analytical methods. The sizing result (sizing effect) will be determined by PDA measurements. The retention of sizing agents will be measured by NIR spectroscopy. To study the forming of covalent bonds, the shares of chemically bonded and absorbed substances in the overall amount of sizing agent retained will be analysed by high-pressure liquid chromatography (HPLC). Tensile strength, strain to rupture and bending stiffness will be measured to establish the influence of sizing agents on strength properties. The results of the laboratory tests and corresponding process analyses will be used for large-scale HC sizing tests in paper mills representing one of the above stock systems. The results will be compared with those of the mills’ conventional sizing processes. Pilot tests using a laboratory kneader are under way to investigate technical problems related to the uniformity of dosing and the mixing of additives on fibres. Apart from the effects of shearing and hydrolytic stability, the mutual displacement of additives on fibre surfaces will be of crucial importance. Tests are intended to further clarify - by means of suitable measuring methods – how additives fixed on fibres and fines contribute to sizing, in order to establish whether their fixation is stable enough to withstand the interactions with other processing aids occurring in industrial practice.

Application/Economic benefits
About 24 % of all functional additives used are sizing agents, which makes them a major cost factor. The project aims at reducing the sizing agent consumption by up to 50 %, which will enable especially small and medium sized manufacturers of paperboard and packages to produce high-quality products at lower cost and without additional investment. Further cost benefits will be derived from increased plant availability due to the reduced deposition of sizing reaction products.

Project period: 01.02.2006 – 31.01.2008

Remarks
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