Research institute:
PTS Munich
Hess-Str. 134
80797 Munich

Internet: www.ptspaper.de

Head of the research institute:
Dr. F. Miletzky

Project leader:
Tiemo Arndt
Tel: +49(0)3529 / 551-643
Fax: +49(0)3529 / 551-899
E-mail: tiemo.arndt@ptspaper.de

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

Key words:
Coating, coated paper, binder, micro-fibrillated cellulose

Title: Reduction of cost and improvement of properties of coating colours by application of micro-fibrillated cellulose as coating colour co-binder

Background/Problem area

In comparison to uncoated paper the surface of coated paper is much smoother. This smoothness is achieved by coating the surface of a base paper with a dispersion based on pigments, binders and additives.

Special preparation methods make the micro-fibril structure of cellulosic pulp fibres accessible. Basic properties of these micro-fibrils like high surface area and bonding power lead to the assumption that micro-fibrils can be used as coating colour components. Micro-fibrillated cellulose has the potential to be used as binder in coating colours if the hydroxyl groups available on the surface give an improved bonding power between pigments and base paper without negative effects on viscosity. Depending on the preparation method used, different types of micro-fibrillated cellulose can be prepared. Before the final disintegration of pulp fibres down to the level of micro-fibrils, pre-treatment steps are responsible for the final properties.

Objectives/Research results

The aim of this research project is to prepare suitable products of micro-fibrillated cellulose (MFC) and apply them in coating colours to study their influence on the quality of final coating results. The objective is to replace synthetic binders in coating colours with specially prepared cellulosic structures. Besides starch a second natural alternative will be developed for the use as binder in coating colours to reduce the dependency of the paper industry on fossil raw materials and enable the use of more cost-effective cellulosic raw materials.

In addition to that the propensity for fold breaks is to be reduced by reinforcing the coated layer with micro-fibrils. This can help to reduce complaints from printing shops. The application of micro-fibrils influences the pore size distribution of the coating. A reduced pore size distribution leads to improved printability.

Initial results of the project indicated that there are some obstacles to applying micro-fibrils with high aspect ratio because of their negative influence on the viscosity properties of final coating colours and their high water content. To prepare micro-fibrils with low aspect ratio, hydrolytic pre-treatment steps helped to reduce the amorphous regions of the fibrils, thus influencing their shape.

Since the solid content of the MFC is still below 10%, the use of MFC in coating colours results in reduced coating colour solids, which is one of the most relevant quality parameters for paper coating.

The viscosity of coating colours is linked to their solids content and hence decreasing as well. As a result, the machine parameters and machine settings had to be changed in pilot coating trials, especially the machine speed and drying settings, to keep the coat weight constant. After the coating trials, the reels were printed on a heat set web-fed offset printing machine. A printing quality comparable to MFC free coating could be obtained only with the 10% MFC by reduced latex amount. Further developments in MFC processing are recommended to obtain high solids coatings with high solids MFC.

Application/Economic benefits

The preparation of high quality and reasonably priced coated paper improves the competitiveness of paper mills and the situation of small and medium sized enterprises in the whole value chain (machine builders, printing shops, additive suppliers).

The preparation processes for cellulosic micro-fibrils investigated in the project are connected to the preparation of starch. If this process is developed successfully, machine suppliers can market their products for this new application.

A reduced fold break propensity means reduced costs and less additional expenses combined with enhanced efficiency for printing shops.

Project period: 01.07.2008 – 30.06.2010

Remarks

The research project IGF 15705 was funded by the German Federal Ministry of Economics and Technology BMWi.