Towards an improved surface sizing – A study of the interaction between recycled linerboard base paper and surface sizing agent

Kai Dahlskog, Misla Lagus, Kimmo Huhtala, Sheryl Hildén and Jussi Salonen

Abstract

Growing internet business and sustainability are the main drivers for fiber-based packaging. As a result, the paper industry is transitioning towards production of packaging paper and board at the cost of graphic paper. This is especially true in recycled based corrugated board production.

This study concentrates on surface sizing of recycled linerboard, the flat facing of corrugated board. The linerboard needs to be hydrophobic to be able to protect the goods inside the final packaging product. Hydrophobicity has traditionally been achieved through internal sizing. However, due to economic factors and often occurring wet-end problems during internal sizing there is a clear trend towards increased surface sizing in production of recycled linerboard.

The objective of this study is to gain an improved understanding of factors governing the surface sizing and hydrophobization of linerboard.

The work was carried out on a laboratory size press. Liner base papers from different mills were surface sized with anionic and cationic surface sizing agents (SSA) with and without polyaluminium chloride (PAC). Starch was jet cooked and pH, viscosity as well as temperature were controlled throughout the work. SSA particle size, charge and film contact angle were measured.

Base paper was characterized with basic paper analyses, short span compression test (SCT), and also some unconventional analytical methods for the surface sizing application, namely mercury (Hg) porosimetry and dynamic water retention (DWR).

SCT values of lab surface sized papers were in line with commercial grades of same grammage. For the commercial surface sizing agents it was found, as expected, that a smaller particle size generally improves sizing efficiency at the same dosage (kg/t), but SSA film contact angle was also significant. PAC addition generally improved the sizing efficiency. Performance of commercial surface sizing agents, measured in hydrophobicity, varied between base papers that seemed similar in basic paper analyses. However, with unconventional analytical methods differences between the base papers could be detected and correlation to the surface sizing performance was obtained. Pick-up of surface size showed excellent correlation with Hg porosimetry and DWR and the impact of base paper structure on the efficiency of the SSA was significant. The fact that DWR is able to predict starch pick-up for different base papers will no doubt lead to further research on this subject to further obtain a deeper understanding of surface sizing of paper and board.