Application of Modified Fillers to Papermaking Wet End

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ABSTRACT

Fillers play important roles in the production of printing and writing papers. Adding fillers at papermaking wet end can enhance stock drainage, and improve opacity, smoothness, gloss, brightness, and printablity of the resulting paper. However, along with increasing filler loading, strengths of the paper decreased. As prices for fillers are cheaper than fibers, hence adequate use of fillers can effectively increase the paper quality and reduce production costs.

In this study, the common paper mill fillers such as wet ground calcium carbonate and precipitated calcium carbonate, or such fillers partially substituted with certain swelling and platy minerals such as micrometer grade bentonite, nano-grade montmorillonite, micrometer sercite and nano-sericite etc fillers, were first premixed with a retention aid, then gelatinize with a cationic starch. The starch gel adsorbed unto the filler particle surfaces causing them to alter the surface charge characteristics and became modified fillers. Upon adding to pulp, their chance of attaching to fiber should be enhanced and consequentially the paper physical properties and retention of fillers, fiber, and starch should be increased.

The results indicated that modified fillers added to pulp caused paper physical properties to increase, such as tensile index, tear index, bursting index etc. The ash content of the paper showed an increasing trend with increasing modified fillers. The more optimal modified filler formula suggested that a 30% cationic starch charge with 0.01~0.1% anionic polymer aid modified at 24,000 rpm mixing led to a handsheet having increases in tensile, tear and bursting indices of 19%, 9% and 20%, respectively as compared to handsheet with the cationic starch and filler added individually.

Adding modified fillers to pulp could effectively raise ash content in the handsheets, compared to handsheets with individual addition of fillers and cationic starch, the ash content increased from 15.6% to 23.2%. In the pulp retention experiments, all stocks added with modified fillers had more than 85% first-pass retention, as compared to an average first-pass retention of 82% for direction filler addition groups.

Observations using scanning electron microscopy (SEM) indicated that modified fillers often formed flocs which attached to the interstices among fiber surfaces.

Keywords : modified filler、wet end、calcium carbonate、sericite、bentonite、cationic starch

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