

Refining with Enzyme for BHKP in an Intergrated Pulp and Paper Mill - A Case Study in the VINAPACO, Vietnam

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ABSTRACT

An integrated paper mill in Vietnam applies BHKP, Bleach Hardwood Kraft Pulp, slurry for printing and writing paper production. These pulps are without pressing and drying, the fibers maintain their natural characteristics. Cellulose and hemi-cellulose are fibrillated after mechanical attrition in a refiner of pulp mill, we treat pulp fibers directly with a commercial enzyme, AZ-7567, which is compounded cellulase and hemi-cellulase could be expected more fibrillation on fiber surface. It is concerned to reduce refiner loading and present different paper physical and optical properties. There are many historic articles and references discussing enzyme applied in pulp and paper industries, we also learned more about refining with enzyme to BHKP from a laboratory test in VINAPACO, Vietnam. The BHKP samples for testing are taken from pulp chest which before feeding to paper lines. In this study, a 22 factorial experimental design was adopted to examine main effect X1 as pre-treatment time and main effect X2 of enzyme dosage, the interaction effects were also studied and analysis. Various pre-treatment times with different dosage levels are combined to conduct repeated tests at 0, 10, 20, 30 and 40 min refining times. The paper mill is using laboratory-type Holland Beater to simulate refiners of stock preparation, record OSR and make handsheet papers to find the effects between beating factors and response variables. By using 22 factorial analysis Schopper Riegler readings indicated inverse ratio to main effects X1 and X2; handsheet strength showed that bulks are increased while burst and tear strength all are reversed after 20 min refining. Effects from refiner and enzyme caused burst and tear strength loss as a result of inadequate refining with enzyme. Although many previous studies indicated fibers could be modified with enzyme, and suitable bio-catalyzed mechanism would enhance fibers bonding for more fibrillations, however, unsuitable refining and enzyme conditions could degrade BHKP strength in refining process. Theoretically brightness decrease of pulp sheets are due to more optical contact between fibers after refining. Enzyme treated fibers enhance fiber contacting but the brightness level did not maintain or dropped sharply after refining, so refining with enzyme does not improve the optical properties of fibers. BHKP from an intergrated pulp line are fresh form, so they are easier to be catalysed. Therefore, controls of enzyme dosage and refining degree must be optimized carefully when paper mills apply this technology. At present, the commercial enzymes are broadly applied to different fields in pulp and paper industries, but the optimum dosage should be examined further. However, this green products still interested papermakers to some extents.

Keywords : Refining with enzyme、intergrated mill、BHKP、pre-treated time、dosage、slowness、sheet properties

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