

Elemental chlorine free bleaching of wood: A case study of spruce kraft pulp

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Abstract: The bleaching of chemical pulps is necessary to remove residual lignin and improve pulp cleanliness to produce high grade paper products. With bleaching process, not only residual lignin, extractives and bark fragments removed but also fiber bundles and shives are also reduced to achieve high grade pulp. However, the removal of lignin from pulp have positive effects on fiber flexibility and strength that suitable for paper manufacturing. However, if multistage bleaching is not controlled well or too severe to fibers, this can be effects lowering paper strength. A typical bleaching of pulps consists of a number of stages, each of which has a specific function. However, unless large proportion of lignin removal, high level of pulp brightness can not be achieved. Hence, in broad sense, the bleaching can be aimed to two target; -Remove lignin as much as possible to brighten, - Remove chromophore to stabilize and improve brightness. In a typical bleaching of chemical grade pulps, the following sequences and chemical are utilized. However, the number of stages and used chemical determined by the mill that best results for them. The chlorine (Cl₂) is very effective chemical for lignin removal especially early stages of bleaching. But it has causes very toxic chemical formation (Dioxin; 2,3,7,8-tetrachlorodibenzo-p-dioxin) in bleaching effluents. For eliminating the use of chlorine (Cl₂) based chemicals and reducing toxicity to environment, the *Elemental Chlorine Free* (ECF) bleaching stages have been developed. In this approach, molecular chlorine (Cl₂) is replaced with chlorine dioxide (ClO₂). Hence, the term of ECF usually referring bleaching with chlorine dioxide as the only chlorine containing chemical in bleaching stages. So it has reported that the substitution of chlorine dioxide instead the chlorine in first stage, very effective reducing dioxin and AOX. Pulp bleaching have been changed since conventional chemicals have very toxic effluents to environment. After reviewing bleaching stages, extensive researchs have been done and new approaches applied on pulp bleaching sequences. In this study, the kraft method were used to produce pulp from spruce chips. The pulps were refined in PFI mill until the specified level of freeness (= 300 ml CSF) was reached according to Tappi standard No. 248. The bleaching of the kraft pulp produced from spruce wood was done by an ECF process which involves O-E-D-P (Oxygen-Alkali extraction-Chlorine dioxide-Hydrogen peroxide) sequences. The result found in this study promising and high brightness level of pulp (93%) with acceptable strength properties of pulps.

Keywords: Kraft pulp, Bleaching, Paper brightness, Elemental chlorine free bleaching