Optimization of Coagulation-Flocculation Process for the Treatment of Pulp and Paper Mill Effluent with an Approach towards Zero Discharge

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The ecological balance of Bangladesh has been threatened seriously with the open disposal of the wastewater and residual sludge of the pulp and paper industry which is one of the heaviest users of water. In order to treat the wastewater efficiently with a minimum cost through coagulation flocculation followed by sedimentation, optimization is required. The objective of the study is to investigate the optimization of coagulation-flocculation process for the treatment of effluent discharged from pulp and paper mill with an approach towards zero discharge. Here, the coagulant as well as flocculants dosages and pH were optimized to achieve the highest removal of pollutants from effluents during brown paper production. The high total suspended solids (TSS) removal, high turbidity reduction, low SVI (sludge volume index) and optimum pH were observed during the treatment process. The efficiency of alum and potash alum (coagulants) in combination with polymer (flocculant) at pH 6, 7 and 8 have been studied for the treatment of effluent generated during brown paper production. The effluents were collected from the Chittagong Asian Paper Mills Bangladesh Ltd where the mill is using wastepaper as raw material. The response surface methodology (RSM) was applied to optimize two most important operating variables: coagulant dosage and pH. Based on efficiency of TSS and turbidity removal with low SVI and high settling time this study suggests that Alum in coupled with polymer is the best combination for paper mill effluent treatment by coagulation-flocculation process. At the optimum, 1000mg/L Alum combined with 1mg/l polymer at pH 6 showed more than 90% removal of TSS and turbidity and at the same time, showed low SVI (88 ml/g), and settling time (2.3 min). The present study suggests that by adopting the appropriate dosages (Alum combined with 1mg/l polymer at pH 6), the treatment of effluent could be possible and finally, the treated water can also be recycled which will reduce the excessive consumption of fresh water extraction from natural source.