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**Title of Thesis :** Performance Evaluation of a Coagulant (Sludge Reagent  
Product) on Water Treatment

## ABSTRACT

In water treatment, the most challenging problem that environmental engineers encounter is the separation and settling of colloids from water. In general, inorganic coagulants of iron and aluminum compounds are used as most effective coagulants for colloidal suspensions removal. In fact, the coagulation with conventional coagulants results in the production of voluminous sludge that poses difficulty in handling and disposal. Therefore, the substitutes of conventional coagulants that produce lesser amount of sludge and treat the water more effectively has been the major area of research for environmental scientists and researchers in the recent past. In the present study, an attempt has been made to evaluate the performance of sludge reagent product (*SRP*) in the removal of colloidal suspensions under variable experimental conditions. The grab water samples have been collected from Wazirabad Barrage, river Yamuna in non-adsorbing PVC containers and preserved using suitable preservatives. Thereafter samples have been analyzed for various major water quality parameters as per standard water quality analysis procedure. Initially, the coagulation experiments have been performed using alum as a coagulant in Jar Test Apparatus. Then, the sludge is separated using

separatory funnels, acidified with sulphuric acid and the *SRP* has been prepared. The batch experiments for performance evaluation of *SRP* at neutral pH, low pH and higher pH conditions have been carried out. Furthermore, the experiments have been extended for 1% additional alum along with *SRP* at neutral, low and higher pH conditions and percentage removal of colloidal suspensions has been assessed.

The water quality of river Yamuna with respect to total dissolved solids, turbidity, pH, alkalinity, total hardness, and iron is observed to be within the permissible limits when compared with standards prescribed for drinking water except BOD<sub>5</sub>, COD and MPN. The experimental results of water treatment show that the percentage turbidity removal increases with coagulant dose increase up to some extent and then decreases in neutral pH conditions. Almost similar behavior has been observed at low and high pH conditions with lesser percentage removal of turbidity. As coagulant (*SRP*) along with 1% alum at neutral pH increases, the percentage turbidity removal also increases up to some extent and then decreases and again increases at almost all cycles of water treatment. Coagulant dose at low pH condition along with 1% alum also affects the percentage turbidity removal. Coagulant (*SRP*) along with 1% alum at higher pH conditions affects significantly the percentage turbidity removal and the maximum removal is observed at pH 11 to 13 for various cycles of treatment. Finally, the study concluded that the neutral pH is the best suited for coagulation with *SRP* and at very low pH of water sample the coagulation becomes less effective.