RESILIENT INFRASTRUCTURE
June 1–4, 2016

TREATMENT OF COMBINED SEWER OVERFLOW USING A NATURAL COAGULANT

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ABSTRACT

The hazards posed by combined sewer overflows (CSOs) to receiving water bodies cannot be overemphasised. CSOs can be a significant contributor of pollutants to receiving waterbodies. Ontario's F-5-5 procedure stipulates a treatment target of a minimum 50% reduction in suspended solids (SS) and 30% reduction in 5-day biochemical oxygen demand (BOD_5) for CSOs in the province. The physicochemical coagulation process is an effective and widely used treatment process to achieve these targets. The City of Windsor, Ontario currently uses a synthetic organic coagulant for coagulation at its retention treatment basin (RTB) for CSO treatment. However, environmental persistence and potential toxic effects on aquatic life are common concerns with synthetic coagulants. These concerns are not expected to be there when coagulants derived from natural (plant or animal) sources are used. In the current study, the effectiveness of a commercially available natural coagulant was evaluated for the treatment of Windsor CSOs. The results show that with natural coagulant dosages ranging between 5 and 30 mg/L, SS and BOD_5 removal efficiencies of 37 to 91% and 22 to 56%, respectively, were obtained. Over the duration of the study, natural coagulant dosage of 10 mg/L or higher were able to meet or exceed the treatment targets of Ontario's Procedure F-5-5 for both SS and BOD_5.

Keywords: Combined sewer overflows; Physicochemical treatment; Synthetic coagulant; Natural coagulant; Suspended solids; Biochemical oxygen demand

FINDINGS

The efficiencies of commercially available natural coagulants, Tanfloc SG (TANAC SA, Brazil), and the Dual Polymer System (HaloSource Inc., USA), were compared to the synthetic organic polymer, Zetag 7873, presently used at the RTB for the treatment of Windsor CSOs. The evaluation of the coagulants was done using raw wastewater from the City of Windsor's Lou Romano Water Reclamation Plant (LRWRP). The SS removal efficiency of the coagulants is presented in Figure 1. The adjusted SS removal efficiencies were calculated using the blank (no treatment) as the reference.

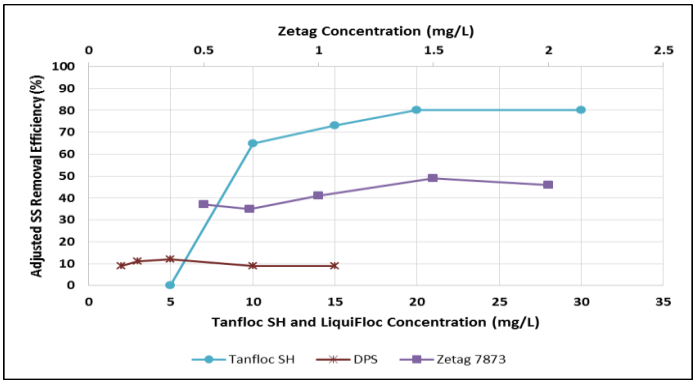


Figure 1: SS removal efficiencies of coagulant

For the range of concentration tested, the performance of Tanfloc SG was better than the dual polymer system (DPS) and it was selected for further evaluation. As shown in Figure 2, with a minimum dosage of 7.5 mg/L, the SS removal efficiency with Tanfloc SG was either similar or higher than the treatment efficiency of Zetag 7873 presently used for the treatment of Windsor CSOs.

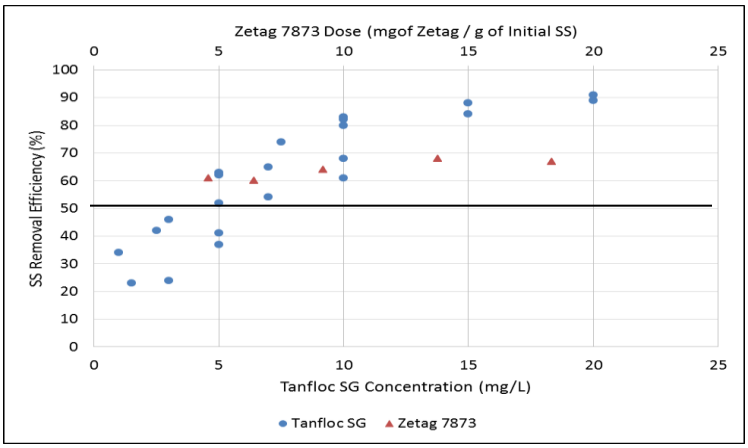
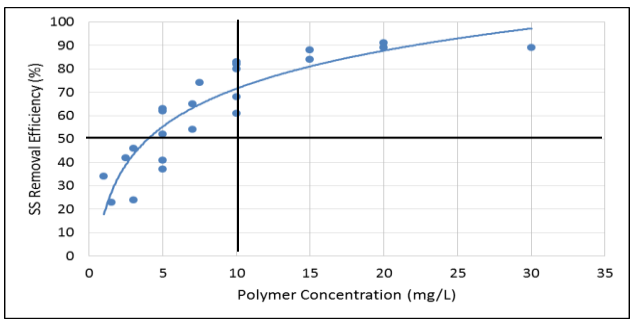
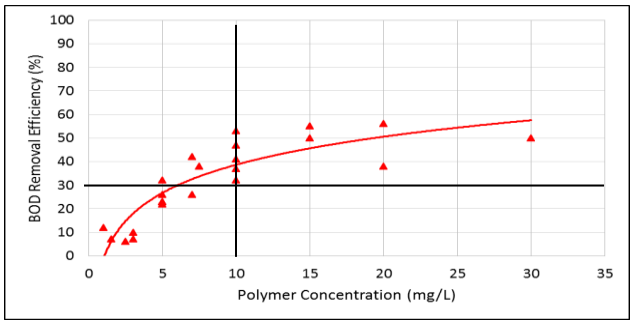


Figure 2: Comparison between the SS removal efficiencies of Tanfloc SG and Zetag 7873

Figures 3a and 3b shows SS and BOD removal efficiencies, respectively, of the selected natural coagulant Tanfloc SG. At dosages of equal to or higher than 10 mg/L, the selected natural coagulant was able to meet or surpass the requirements of Procedure F-5-5.



a)



b)

Figure 3: Effects of varying coagulant dose on a) SS removal b) BOD removal