

Abstract

A study was carried out to determine the physico-chemical treatment of the wastewater collected from a soap and detergent factory in Selangor, Malaysia. The study was initiated by determining the characteristics of the wastewater. Treatability studies involving coagulation and flocculation were determined by the jar test method. The parameters of interest were coagulant dosage, pH, mixing intensity, mixing time and settling time. The coagulants were restricted to alum and ferric sulfate and coagulant aids utilized were polyvinyl alcohol, sodium alginate and polyethylenimine. An extended evaluation to determine the effect of double chemical treatment was also carried out with the most effective coagulant and followed by the most effective coagulant aid. Adsorption studies using granulated activated carbon was carried out to evaluate the removal of color and surfactant.

The wastewater characteristics were as follows: pH range of 9 to 12.5, temperature range of 25 to 27°C, suspended solids range of 1500 to 1800 mg/l, zeta potential range of -38 to -25 mV, chemical oxygen demand range of 20 000 to 36 000 mg/l and surface tension range of 31 to 35 dynes/cm.

The optimum conditions for wastewater treatment with alum were as follows: dosage of 3.0 g/l, pH of 9, mixing time of 25 minutes, mixing intensity of 40 rpm and settling time of 30 minutes. Treated wastewater results were zeta potential of -1.7 mV, percentage turbidity removal of 90%, surface tension value of 67.3 dynes/cm, chemical oxygen demand of 5800 mg/l, sludge volume 190 mg/l and weight of solids in sludge 66.3 mg/l. The optimum condition for wastewater treatment with ferric sulfate was as

follows: dosage of 9.0 g/l, pH of 9, mixing time of 25 minutes, mixing intensity of 30 rpm and settling time of 30 minutes. The treatment yielded the following results: zeta potential of -4.8 mV, percentage turbidity removal of 80 %, surface tension value of 65.1 dynes/cm, chemical oxygen demand of 6700 mg/l, sludge volume of 50 mg/l and weight of solids in sludge 55.6 mg/l. The coagulant aids were found to be unsuitable for use in treatment.

Double chemical treatment was carried out with alum as the coagulant agent and polyethylenimine as the coagulant aid. The conditions applied were as obtained for treatment of wastewater with alum. The results obtained were better than single chemical treatment with alum. The results were as follows: zeta potential -0.9 mV, percentage turbidity removal of 94%, surface tension value of 68.2 dynes/cm, chemical oxygen demand of 3500 mg/l sludge volume of 94 mg/l, suspended solids of 200 mg/l and weight of solids in sludge of 75.2 mg/l.

The optimal dosage of granulated activated carbon required for removal of surfactant was 0.2 g/l. The removal of color by absorption was ineffective with the usage of granulated activated carbon as the removal was not complete even with a high dosage of 20 g/l.