

Reduction of COD from Secondary Effluent of CETP by Chlorination

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Abstract: Common Effluent Treatment Plant is established for treatment of wastewater generated by small and medium scale industries for abatement of pollution. In CETP, many industrial wastewater contains nonbiodegradable organics which cannot be treated by conventional biological treatment processes. This wastewater has low BOD/COD ratio (<0.2). Ultimately it contributes COD in effluent of secondary clarifier. Therefore, it requires further advanced oxidation process for removal of nonbiodegradable organics. Chlorination is one of advanced chemical process to oxidize nonbiodegradable organics. In this study, Secondary effluent of CETP is treated with chlorination using chemical calcium hypochlorite. Study is carried out at different contact time between 10-90 min and different concentration of chemicals. Removal efficiency increases as the contact time and concentration increases. Sludge generation increases as concentration increases. Optimum conditions are found for higher COD removal efficiency which is for 50 min contact time and 900 ppm concentration which gives 64% COD removal efficiency and less sludge generation.

Keywords: Wastewater treatment, Chlorination, Calcium Hypochlorite, COD Removal.

I. INTRODUCTION

In India, there are so many small and medium scale industries which are very important for economy but these industries are generating large amount of wastewater which are most polluting to the environment. These industries do not have their individual treatment plants due to lack of financial funds and land required. So wastewater from these industries are treated in common effluent treatment plant which can control the pollution of environment. But industries like dye, pigment, pesticides, dye and intermediate generating wastewater which contain many complex organics and inorganics which are nonbiodegradable organics. These pollutants are difficult to treat with conventional biological processes like activated sludge process. So these organics contributes COD in the treated effluent which will not meet the discharge limit. These requires some advanced oxidation process in which nonbiodegradable organics are oxidized. Chlorination is one of advanced oxidation process which oxidize nonbiodegradable organics.

In this study calcium Hypochlorite chemical is used for the treatment of wastewater of CETP situated in Vatva. Calcium Hypochlorite contains at least 70% chlorine and available in

off white colour in granular or powder form. Reaction in water is as follows:



Calcium Hypochlorite has highest oxidation power than other chlorination compounds as shown in table 1.

Table 1 oxidation potential of chlorination chemicals

Chemical	E ⁰ (V)
HOCl/Cl ⁻	+1.49
ClO ₂ /ClO ₂ ⁻	+0.95
ClO ₂ /Cl ⁻	+0.76
ClO ₃ /Cl ⁻	+0.62

In this study treatment of wastewater is done at different contact time and different concentration of chemical. The parameters selected for this study are cod and tss.

The characteristics of wastewater of secondary effluent of CETP at vatva are as shown in table 2.

Table 2 characteristics of secondary effluent of CETP Vatva

Parameter	Value
pH	7.44
BOD	42 mg/L
COD	648 mg/L
BOD/COD ratio	0.064

II. MATERIALS AND METHODS

The chemical used for the treatment of wastewater is Calcium hypochlorite. The wastewater sample used is secondary effluent of treatment plant that means outlet of secondary clarifier. Pulse input method is used for the addition of chemical into the reactor. Sample size is taken as 200 ml for the treatment. Contact time provided for the treatment is between 10 - 90 min which are 10, 30, 50, 70 and 90 min. Concentration of chemicals taken are 300 ppm, 450 ppm, 900 ppm and 1800 ppm. Parameter COD is measured before and

after the treatment at different contact time for different concentrations as mentioned above. For measurement of sludge generation during treatment TSS parameter is measured. All the measurements are done as per the standard methods for water and wastewater.

III. RESULTS AND DISCUSSION

Results for COD and TSS are obtained at different contact time for different concentration. As shown in figure 1 as time increases COD removal efficiency increases. As shown in figure 2 as time increases TSS increases. As shown in figure TSS concentration increases as COD removal efficiency increases. As concentration of chemical calcium hypochlorite increases COD removal increases. COD removal efficiency is varying between 14% to 71 % for different contact time and concentration. So it is necessary to select the optimum condition for efficient COD removal with less sludge generation.

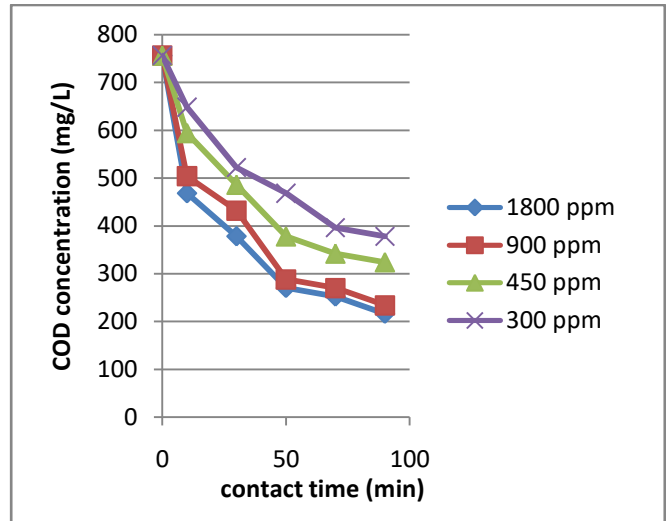


Figure 3 Concentration of COD with contact time

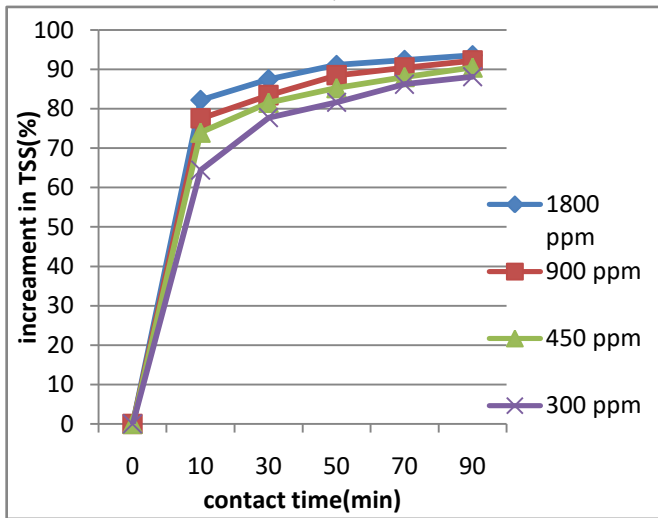


Figure 1 increase in TSS with contact time

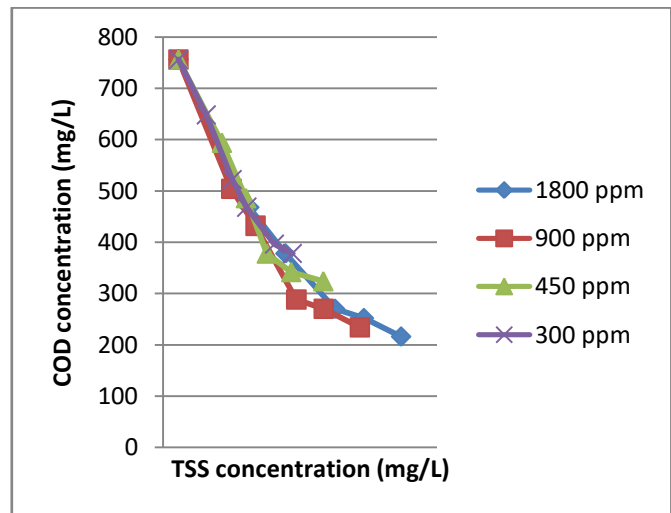


Figure 4 COD concentration with TSS concentration

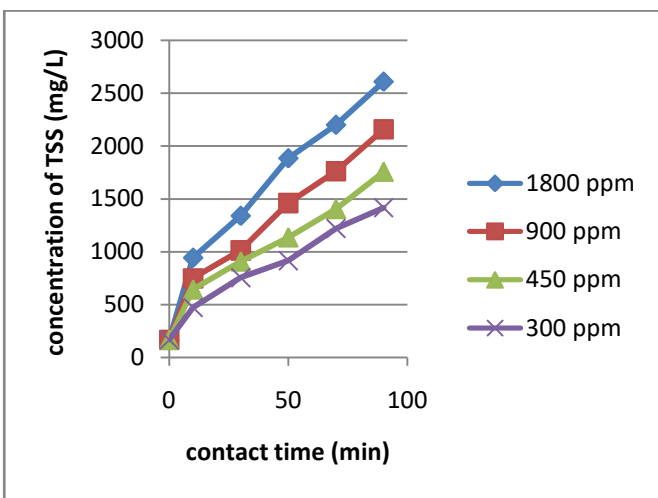


Figure 2 Concentration of TSS with contact time

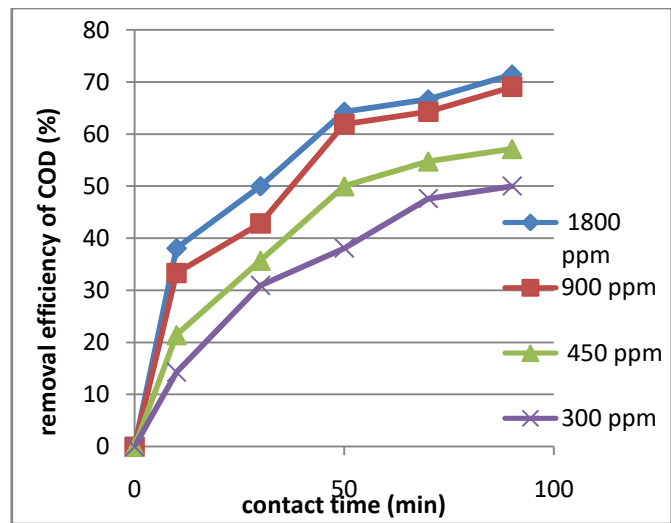


Figure 5 removal efficiency of COD with contact time

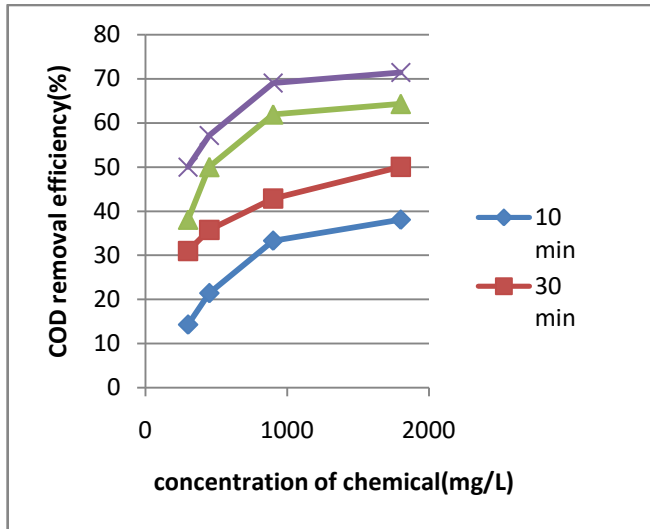


Figure 6 COD removal efficiency with Chemical concentration

IV. CONCLUSION

As shown in results maximum COD removal efficiency is achieved for 90 min contact time and 1800 ppm concentration which is 71%. But TSS concentration for this condition is 2608 ppm. As per results optimum condition selected for the treatment with calcium hypochlorite is for 50 min contact time and 900 ppm concentration which gives 64% efficiency with 1460 ppm TSS concentration and COD concentration is 270 mg/L.

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