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PERFORMANCE EVALUATION OF COMMON EFFLUENT TREATMENT PLANT AT DELHI

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ABSTRACT

A common effluent treatment plant offers an alternative to the practice of better utilization of resources of an industrial area. The monitoring and performance evaluation studies were carried out for an effluent treatment plant of a common effluent treatment plant at Delhi. The samples from the inlet, before aeration process and outlet locations were collected at regular intervals and were analyzed for different parameters. The pH, TSS, TDS, BOD, COD were found to be reduced significantly. The wastewater discharge is as per the standards prescribed by pollution control board and the plant is working satisfactorily.

INTRODUCTION

Most of the small-scale industrial units cannot individually afford to set-up their own effluent treatment plants to meet the prescribed pollution control norms. This has been responsible for the origination of the concept of CETP. Concept of common effluent treatment plant (CETP) was originally promoted by the Ministry of Environment and Forests (MOEF) in 1984 for the treatment of wastewaters from a large number of small and medium scale industries (CPCB 2001). Cost function estimates for CETPs provide evidence of significant scale economies and high marginal abatement cost in wastewater treatment by small-scale factories (Bishwanath, 2001). Potential causes for the improper waste management by industry and suggestions with regards to the role and responsibility of the Statutory Boards in discharging their duties were made. The need and importance of co-ordination among the polluting industries, the local administration, the regulatory agencies and the public were also emphasized (Ramakrishna 2000). Performance of a CETP at Manickapurampudur, Tirupur, handling dying effluent from over 900 small-sclae dying units, had been studied and found that the treated effluent, except for TDS, was in compliance with the effluent discharge norms of the Tamil Nadu Pollution Control Board (Eswaramoorthi *et al.* 2004). The authors have suggested a multitude of technologies, such as the following, for tackling the water pollution problems, including reverse osmosis (for water reuse), nano-filtration (for salt recovery) and multiple effect evaporator and solar evaporation ponds (for reject management). For Manikkapuram-pudur CETP, Cleaner Production (CP) approach for tackling the two principal issues of concern, namely, TDS and colour was suggested

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(Kurian 2000 and 2004). The influence of hydraulic shock loads and total dissolved solids (TDS) on the performance of three large-scale common effluent treatment plants (CETPs) of Rajasthan (two at Pali and one at Balotra) treating textile effluents, were studied (Pophali *et al*.2003). The cost and quality of treatment of tannery wastewater by two CETPs both serving tannery clusters in Uttar Pradesh was compared (Tare *et al*. 2003). In the present study an effort has been made to evaluate one of the CETPs provided for the treatment of effluent generated by combination of domestic and industrial sector.

MATERIALS AND METHODS

The samples were collected with utmost care to ensure that no contamination occurs at the time of collection, prior to examination. The samples were collected from the inlet, before aeration and outlet of treatment plant and brought to the laboratory for the analysis of different physio-chemical parameters. The samples were analyzed using the standard methods for the examination of water and wastewater (APHA 2005).

TREATMENT PHILOSOPHY FOR CETP

The treatment method adopted for the water is physio-chemical route with sedimentation by tube settlers, followed by tertiary treatment with filtration and chlorination. The plant receives waste water from both the sources in a stilling chamber, from pump house through individual rising main pipe fitted with magnetic flow meter. The stilling is provided with slotted pipe while skimmer is provided for the removal of free oil, which is collected in a tank and suitably disposed off. The waste water then passes through fine screen for the removal of floating matters and grit chamber under gravity. Exit discharge from the grit chambers is collected in equalization basin which is designed to attenuate the variation in wastewater flow rates and characteristics. In order to ensure that solid remain suspension in the equalization basin, floating aerators are provided. The basin also achieves the partial stabilization of organic matter in waste water. After equalization, it passes to pre-chlorination tank from where it is pumped to flash mixer cum flocculator for coagulation and flocculation. Alum and polyelectrolyte solution are dosed for coagulation. The wastewater discharge is then fed to the tube settlers where further settling of suspended solids in the wastewater takes place. The clarified waste water is pumped through dual media filter for the removal of remaining suspended particles and then through activated carbon filter for the removal of organic matters. The treated waste water is then chlorinated for removal of residual pollutants and then is then sent for reuse or disposal into the existing drain through clear water sump and pumps. The sludge from the tube settlers is discharged to sludge thickeners by gravity. The thickened sludge is collected in a sludge holding tank and pumped to vacuum filters, from where it is suitably disposed off manually by tractor and trolley. The filtrate from the vacuum filter is fed to the equalization tank by filtrate pumps and supernatant from the sludge thickener is collected in a filtrate holding tank and pumped back to the equalization tank.

RESULTS AND DISCUSSION

Flow: As evident from Fig. 1, a wide variation in flow is observed over the period of study. A minimum flow of 777m3 and a peak flow of 2219m3 are received by the CETP with an average flow of 1389.2m3.

pH: On an average a neutral effluent is being received by the CETP with a minimum pH of 7.03 and a maximum of 8.50, sometimes showing a very slight inclination towards the basic side. As shown in Fig.2 , after treatment no significant variation in the value of pH is being observed. An average pH of 7.43 is obtained after settling and 7.38 pH in the final treated effluent; whereas the minimum value is 6.30 and maximum value is 7.65.

TSS : As shown in Fig.3, raw effluent entering the CETP has a maximum TSS of 480mg/L and a minimum of 387mg/L. After settling operation, significant reduction is observed reducing the average TSS from 410.6mg/L to 138.3mg/L giving a reduction of 66.3%. Further reduction is obtained after chlorination reducing TSS to an average value of 63 mg/L with a maximum of 74mg/L and a minimum of 53mg/L in the treated effluent. As compared to the raw effluent a reduction of 84.7% is obtained in the final treated effluent.

TDS: Raw effluent received by the CETP has a maximum TDS of 5470mg/L and a minimum of 2450mg/L with an average value of 4804.7 mg/L. As shown in Fig. 4, no significant reduction in TDS is observed. An average TDS of 4748.7mg/L is obtained in the effluent after settling operation varying from 2480mg/L to 5370mg/L. In the final treated effluent a similar situation is observed with no change in the value of

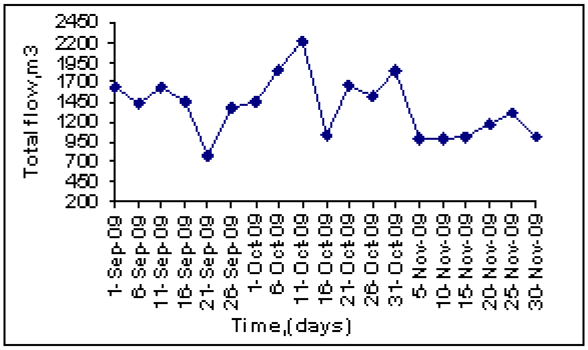

Fig. 1 Variation of flow with time

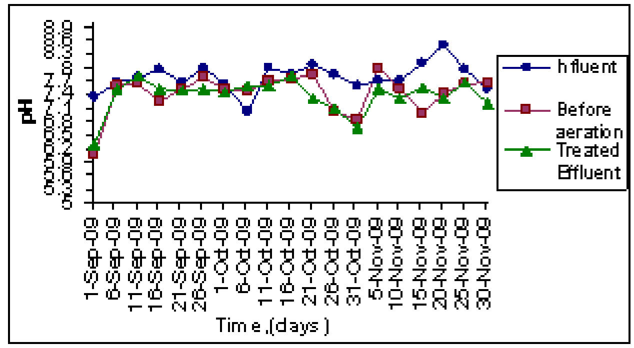

Fig. 2 Variation of pH with time

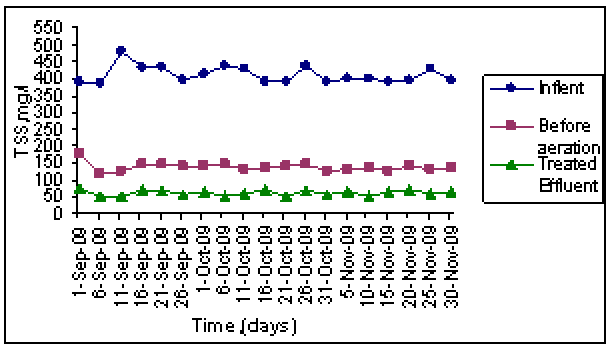

Fig 3 Variation of TSS with time

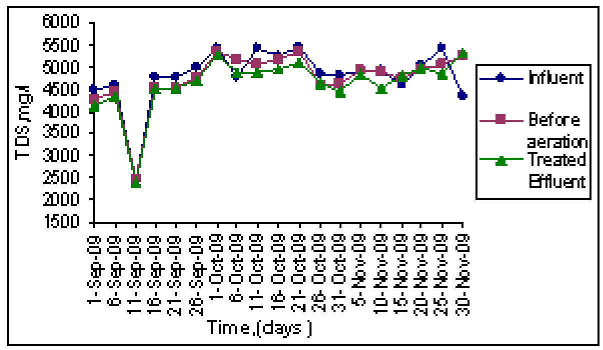

Fig 4 Variation of TDS with time

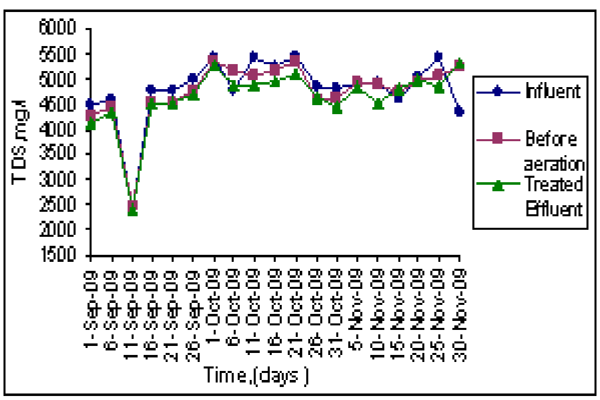

Fig 5 Variation of COD with time

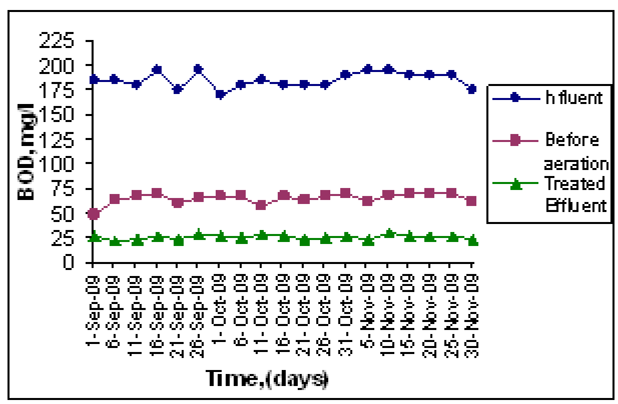

Fig 6 Variation of BOD with time

dissolved solids giving an average value of 4642.9mg/L.

COD: As evident from Fig.5, a significant reduction is observed in the organic load of the three streams being analyzed viz. raw effluent, effluent after settling operation and the final treated effluent. Analysis showed that the value of COD in the three streams were consistent without showing any great variation. COD in the raw effluent varies from 344mg/L to 448mg/L. In the stream after treatment in the tube settlers shows an average COD of 158.8mg/L providing a reduction of 60.6%. After chlorination, treated effluent has a maximum COD of 84mg/L and a minimum of 64mg/L. Overall treatment brought about a significant reduction of 81.5% in the final treated effluent.

BOD: Raw effluent with an average BOD of 185 mg/L is received by the CETP, which is being reduced to an average of 64.7 mg/L after treatment in the tube settlers releasing an effluent with a minimum BOD of 48mg/L and a maximum of 70mg/L. Results of analyses (Fig. 6) shows further reduction in BOD after chlorination, producing an effluent with an average value of 25.8 mg/L. Treatment of raw effluent brought about a reduction of 65.0% after settlement and 86.1% in the final treated effluent.

CONCLUSIONS

As per the observations and results obtained during study, the following conclusions were recorded. The common effluent treatment plant receives an inlet from both domestic and industrial sources. Influent to the treatment plant consist of loads with an average value of the pH 7.03-8.5, BOD 185 mg/l, COD 344-448 mg/l, TDS 2450-5470 mg/l and TSS 387-480 mg/l. After treatment the pollutant load in the waste water has been reduced to an average value of 6.3-7.65 for pH, 25.8mg/l for BOD, 64-84 mg/l for COD, 2480-5370 mg/l for TDS and 53-74 mg/l for TSS. The plant is quite efficient in treating the combined wastewater and following the norms prescribed by the pollution control board.

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