Performance Evaluation of a Common Effluent Treatment Plant

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Abstract

Small Scale Industries occupies an important place in Indian economy for their contribution to industrial production, exports and employment. SSIs contribute 40% of the total industrial output of the country. But generate over 44% of the hazardous wastes while contribution by the large-scale industry is 13%. Quantity of waste generated by individual SSIs may not be large, but combined effect of operation of a large number of SSIs units on the environment can be high, especially when they are clustered in certain locations closer to residential or commercial centers. Effluents generated by SSIs need treatment prior to disposal in order to comply with the prescribed effluent standards. 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. 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. Performance Evaluation: is the systematic evaluation of the performance of CETP and to understand the Technical abilities of a treatment parameters for further growth and development. Performance Evaluation is generally done in systematic ways. The parameters measure the performance of Treatment plant and compare it with standards and carry out their evaluation.

Keywords*: Performance Evaluation, Wastewater Analysis, Wastewater Treatment, Treatment Efficiency*

1. INTRODUCTION

The Present study has been undertaken to evaluate performance efficiency of a CETP located in Kalol, (Gujarat). The CETP is operating on conventional treatment method with an average wastewater inflow of 400 m3/day. It has been considered for case study. The effluent is coming from Small Scale Industries like Dyes Intermediates manufactures, direct acid dyes, Solvent dyes, Steel pipe, Pat bottle washing, Food Products manufacturers and Surgical Cotton manufacturers.

Many CETPs have been installed and operated all over the country for tackling the water pollution problems arising from the clusters of SSIs. All is not well even with the CETPs. There are very few CETPs, which have been successful in tackling the water pollution problems from SSIs. Heterogeneous nature of the effluent generated by different units of the cluster is seen as one of the major causes for the failure. Thus, Performance evaluation study is to be done.

2. MATERIAL AND METHOD

Samples were collected from the three sampling locations i.e. from the influent, Primary Clarifier and Final outlet of the plant. Collection of Samples once in a week. Before collection of samples containers were rinsed with the samples being collected. Composite type sampling technique was used to collect the samples. Collected samples were analyzed for the parameters pH, BOD, COD, TSS, TDS and Ammonical Nitrogen. As possible samples were analyzed on the same day whenever it was possible; otherwise these samples were preserved at 4^{o}C. Analysis was done in the laboratory by determining various parameters according to "standards methods for examination of water and waste water.

3. ANALYSIS RESULTS

Sampling Location : Inlet

Date	pH	TSS	TDS	COD	BOD	AN
12/12/2016	6.84	425	16221	2784	625	26.28
19/12/2016	7.83	356	19354	2331	521	28.93
26/12/2016	7.78	465	19423	2094	534	23.45
02/01/2016	7.64	412	15367	2204	634	26.68
09/01/2016	7.42	426	12331	2394	522	27.75
16/01/2017	7.23	332	18435	2273	516	24.46

Sampling Location : Primary Clarifier Outlet

Date	pH	TSS	TDS	COD	BOD	AN
12/12/2016	7.81	298	10394	1885	430	18.35
19/12/2016	7.82	229	9875	1659	390	19.53
26/12/2016	7.76	308	11435	1541	378	16.75

02/01/2016	8.01	390	8654	1613	508	18.34
09/01/2016	7.88	329	7234	1678	340	19.12
16/01/2017	7.61	220	10764	1646	378	17.47

Sampling Location : Final Outlet

Date	**pH**	**TSS**	**TDS**	**COD**	**BOD**	**AN**
12/12/2016	7.32	146	4532	498	140	15.54
19/12/2016	7.43	137	3946	490	112	13.12
26/12/2016	7.75	198	5349	474	108	11.21
02/01/2016	7.70	216	2987	409	178	11.61
09/01/2016	7.85	178	3124	454	98	11.09
16/01/2017	7.82	141	5125	423	120	11.07
Average	**7.64**	**169.33**	**4177.16**	**458**	**126**	**12.19**

From the above parameters analysis:

The pH and Ammonical Nitrogen are within permissible limit. The COD, BOD, TSS and TDS are higher than the permissible limit.

4. FEASIBLE TECHNOLOGY IDENTIFICATION

The different technologies for organic and inorganic solids removal are PSF (Pressure Sand Filter), RO (Reverse Osmosis), GAC (Granular Activated Carbon), PAC (Powdered Activated Carbon). PSF and RO are both having same problem of clogging and need backwash in very short time period. Also it needs the more cost for operation phase. PAC is a viable alternative to granular activated carbon tertiary treatment for meeting proposed 1983 Best Available Technology Economically Available (BATEA) effluent quality standards as required by the Environmental Protection Agency (EPA). Moreover, preliminary estimates indicate that capital and operating costs for the granular carbon adsorption and regeneration facilities may equal or exceed those of the entire current activated sludge process. Use of powdered activated carbon is an attractive approach for improving activated sludge process.

The proposed process involves adding powdered activated carbon to the aeration tank of the activated sludge process, achieving cost effectiveness by operating at a very high sludge age and a low carbon dose. Activated carbon is produced from any carbonaceous material like Eucalyptus, Rice husk, Coal, Wood, Lignite and coconut shell. But

in this case activated carbon is manufactured from coconut shell only. So, It is hard compared with other carbon and has a high surface area. Coconut shell based activated carbon gives more adsorption capacity due to its microspores structure and superior hardness. Activated carbon is carbon that has been exposed to very high temperatures, creating a vast network of internal pores. Two types of activated carbon, granular and powdered have been used widely in water treatment.

Studies indicate that powdered activated carbon may be a practical and economical substitute for granular carbon. For example, powdered carbon costs only about one-half as much as granular. In addition, recent studies have shown that powdered carbon can be added directly to the mixed-liquor in activated sludge aeration tanks. Activated carbon removes contaminants through adsorption, primarily a physical process in which dissolved contaminants adhere to the porous surface of the carbon particles. Appropriate alterations in operating procedures may eliminate the need for regeneration by making it economically feasible to discard the spent carbon with the waste sludge. The activated carbon powder was dosed 200 mg/l, 100 mg/l, 25 mg/l and 10 mg/l. The best result found in 25 mg/l dose of activated carbon powder.

Sampling Location : Final Outlet

Date	pH	TSS	TDS	COD	BOD	AN
23/01/2017	7.83	126	2631	274	90	17.40
30/01/2017	7.37	94	2332	241	56	15.19
06/02/2017	7.43	86	2207	178	42	12.13
13/02/2017	7.75	97	2129	186	67	11.16
20/02/2017	7.84	89	2256	198	43	10.75
27/02/2017	7.84	92	2159	210	58	13.09
Average	**7.67**	**97.33**	**2285.66**	**214.5**	**59.33**	**13.28**

4. CONCLUSION

The study indicates that all major pollutants were reduced in the wastewater after treatment. the ph, tss, tds, cod, bod and ammonical nitrogen at the influent were recorded to be 7.88, 435 mg/l, 17931 mg/l, 2622 mg/l, 615 mg/l and 34.02 mg/l for cetp. while the average values of the same parameters in the effluent were 7.67, 97.33 mg/l, 2285.7 mg/l, 214.5 mg/l, 59.33 mg/l and 13.88 mg/l respectively. the bod and cod, tds and tss values were reduced to much extent which shows the removal of organic and inorganic content. the percentage removal of tds was found to be comparatively low than other parameters. the study indicates that all major pollutants were reduced after the treatment and the effluent values for this cetp were well within limit of discharge as per gpcb and cpcb standards.

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