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BOD Reduction of Industrial Wastewater at MIDC Waluj Area, Aurangabad, Maharashtra (India)

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ABSTRACT: Rapid industrialization, urbanization, and other developmental activities pollute environment, which is considered as one of the major drawback in the nation's development and sustenance of life. The present research work represents the analysis of water released from industries in the form of effluent from MIDC, Waluj area of Aurangabad. The initial results of pH ranged in between 7.3 to 7.9. Average pH was 7.63. After the treatment pH of the samples was ranged in between 7.3 to 7.8. Average pH was 7.54. The initial results of TSS of the samples ranged in between 2250 to 3250. Average TSS was 2830.1. After the treatment TSS ranged in between 80 to 98. Average TSS was 89.6. The initial results of TDS of the samples ranged in between 2150 to 3252. Average TDS was 2689.4. After the treatment TDS ranged in between 1700 to 2100. Average TDS was 1876. The initial results of BOD of the samples ranged in between 180 to 1620. Average BOD was 2830.1. After the treatment BOD of the samples ranged in between 21 to 28. Average BOD was 24. Significant variation observed in the BOD values. From the analysis of waste water it is revealed that high concentration of pollution load is observed.

KEYWORDS: analysis, wastewater, BOD, reduction, pollution.

I. INTRODUCTION

Water is the largest common liquid of the Earth, very important to all life forms. It is the best dispersion medium for all biochemical reactions of the living process on the earth. Water is an essential nutrient and is a crucial component of every cell, tissue, and organ. Water has many applications and since every organism need it, a study of water from different aspects becomes essential [1]. The consideration of efficient utilization of the available water resources needs optimum emphasis. There is need to give serious consideration while making decisions concerned with water management in the future. Water pollution is a major problem at all levels. It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the many issues like contamination of water bodies, deaths of organisms due to water pollution are about more than 14,000 people per day. The rapid industrialisation and urbanization, wastewater has been continuously and excessively released into the environment, causing significant impacts on human and wild life [2]. There is an increase in the use of sewage water for irrigation especially in the out skirts of the cities, particularly in the dry area where there is scarcity of natural water [3]. Sewage and other industrial effluents rich in organic matter and plant nutrients are finding agricultural application as cheaper way of disposal [4]. The addition of wastewater fits in with the comprehensive term sanitation, much the same as the mixing of strong waste and storm water [5]. Wastewater can starts from a mix of household, modern, business or horticultural activities, surface spillover or storm water, and from the sewer inflow or basic penetration. Urban wastewater is typically passed on in a joined and treated at a wastewater treatment plant [6]. Common effluent treatment plants (CETPs) are systems specifically designed for collective treatment of effluent released from small scale industrial facilities in an industrial clusters proved to be a potential plant [7]. Individual effluent treatment plants (ETPs) in a region generally face problems like lack of space, resources, capital cost, and trained manpower for operation and maintenance of the unit, which are especially aggravated for small-scale industrial facilities [8].

II. RELATED WORK

Today, treating wastewater is generally a complex, multi-step industrial process [9]. Due to improper design, poor maintenance, frequent electricity break downs and lack of technical man power, the facilities constructed to treat wastewater do not function properly and remain closed most of the time [10] of the major problems with waste water treatment methods is that none of the available technologies has a direct economic return [1]. Due to no economic return, local authorities are generally not interested in taking up waste water treatments [11]. Equalization tanks present as a part of primary treatment in the CETP which act to cause steady-state mechanisms in the effluent released for further processing, there are a multitude of probable reasons for failure, involving shock loads, harm to mixers, and clogging of pumps system and the plumbing [12, 13]. The closest alternative to study the efficiency of a CETP is the removal efficiency (RE), which is defined as the overall percentage of a pollutant reduced by the CETP [14]. It is used as a best alternative for understanding the efficiency of a CETP at any point of time [1].

III. METHODOLOGY

Aurangabad District is situated mainly in the Godavari river basin and partly in the Tapi river basin. The district is from 19 to 20 degrees north longitude with 74 to 76 degrees to the east latitude [15]. Waluj industrial area located near Aurangabad city 12- 15 KM away from Aurangabad Central Bus Stand as well as Aurangabad Railway Station. This Area is one highly grown industrial area of Maharashtra Industrial Development Corporation. In this area many large, medium and small scale industries and export oriented units available. As a part of National Environmental Policy and to abet industrial pollution, it is proposed to set up common effluent treatment plant (CETP) by Maharashtra Industrial Development Corporation (MIDC) and Maharashtra Pollution Control Board (MPCB).



Fig. 1: Study area selected for the analysis

The CETP Design, construction, installation, commissioning and operation and maintenance are on BOOT basis for 17 years. Aurangabad CETP have capacity is 10 MLD, which is treated or untreated effluent from various Industries located in Waluj MIDC area. Common Effluent Treatment Plant concept is for treating effluents by means of a collective effort mainly for a collect of small scale industrial units. This concept is similar to the concept of Municipal Corporation Sewage Treatment Plants. The Incoming effluent or waste water from different types of industries received in this collection tank. It is having arrangement of screen chamber as well as grit chamber. Provision of screen chamber is to remove floating solid waste like as paper, poly bag and wooden chips. Provision of Grit Chamber is to remove coarse grit or small particles of stone, other floating foreign impurities as well as any suspended larger particles which can damage internal parts of pump and other rotating equipment.



IV. EXPERIMENTAL RESULTS

The quality of water is vital concern for mankind since it is directly linked with human welfare. The present study was undertaken to analyze the physicochemical parameters of the waste released from the industrial region of MIDC Waluj and tabulated in the following tables.

Table 1: Values of physico-chemical parameters at Equalization Tank

Parameters/Sample	pH	TSS	TDS	Acidity	Alkalinity	BOD
Sample 1	7.5	2700	2500	320	1400	1200
Sample 2	7.7	3200	3150	252	1350	1250
Sample 3	7.8	2700	3252	258	1300	1050
Sample 4	7.9	3250	3112	310	1250	820
Sample 5	7.7	3200	2500	350	1300	1620
Sample 6	7.6	2952	2150	252	1050	180
Sample 7	7.5	2627	2650	288	1000	1300
Sample 8	7.4	2780	2800	300	980	720
Sample 9	7.3	2642	2280	242	1020	710
Sample 10	7.9	2250	2500	268	1250	852
Average	7.63	2830.1	2689.4	284	1190	970.2
Max.	7.9	3250	3252	350	1400	1620
Min.	7.3	2250	2150	242	980	180

(Note: Except pH all the values are expressed in mg/litre)

The initial values of analysis of physico-chemical parameters of the waste water are interpreted and discussed. The observed values show the significant variation in the values. The pH of the samples ranged in between 7.3 to 7.9. Average pH was 7.63. The TSS of the samples ranged in between 2250 to 3250. Average TSS was 2830.1. The TDS of the samples ranged in between 2150 to 3252. Average TSS was 2689.4. The Acidity of the samples ranged in between 242 to 350. Average Acidity was 284. The Alkalinity of the samples ranged in between 980 to 1400. Average Alkalinity was 1190. Significant variation observed in the BOD values. The BOD of the samples ranged in between 180 to 1620. Average BOD was 970.2.

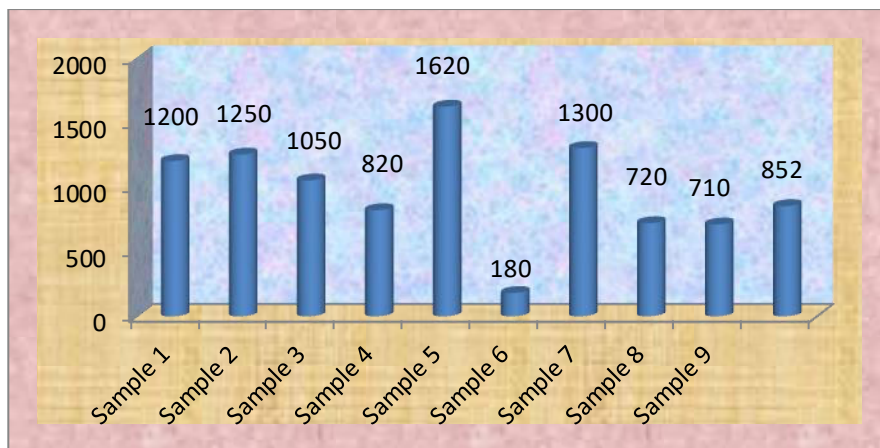


Fig 2. Initial values of BOD analysis before the treatment

The fig. 2 shows the variation observed in the BOD values before the treatment. It shows that highest BOD value observed in the sample no.5 and lowest value observed in the sample no. 6.



Table 2: Values of physico-chemical parameters at Aeration Tank and after treatment

Unit	Aeration Tank		Treated Effluent				Overall BOD Reduction in (%)
	MLSS	DO	pH	TDS	TSS	BOD	
Sample 1	3500	3.2	7.5	1850	90	22	98.17
Sample 2	2995	3.1	7.6	1800	88	21	98.32
Sample 3	3100	2.8	7.6	1900	80	22	97.90
Sample 4	3250	3.2	7.5	2000	85	28	96.59
Sample 5	3100	2.9	7.3	2100	95	21	98.70
Sample 6	2950	3.1	7.8	1750	96	23	87.22
Sample 7	2850	2.9	7.6	1800	84	28	97.85
Sample 8	3100	2.8	7.5	1880	95	25	96.53
Sample 9	3250	3.0	7.4	1700	85	28	96.06
Sample 10	3500	3.3	7.6	1980	98	22	97.42
Average	3159.5	3.03	7.54	1876	89.6	24	96.476
Max.	3500	3.3	7.8	2100	98	28	98.7
Min.	2850	2.8	7.3	1700	80	21	87.22

(Note: All the values are expressed in mg/litre)

The values after treatment analysis of physico-chemical parameters of the waste water are interpreted and discussed. The observed results show the significant reduction in the values after the treatment. The pH of the samples ranged in between 7.3 to 7.8. Average pH was 7.54. The TSS of the samples ranged in between 80 to 98. Average TSS was 89.6. The TDS of the samples ranged in between 1700 to 2100. Average TSS was 1876. Significant variation observed in the BOD values. The BOD of the samples ranged in between 21 to 28. Average BOD was 24.

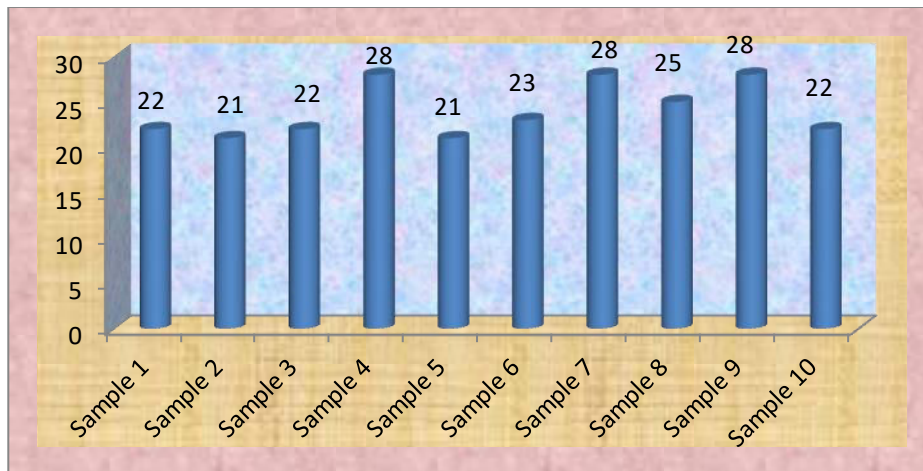


Fig 3. Values of BOD analysis after the treatment

The fig. 3 shows the variation observed in the BOD values after the treatment. It shows that highest BOD value observed in the sample no.4, 7 with 9 and lowest value observed in the sample no. 2 and 5.

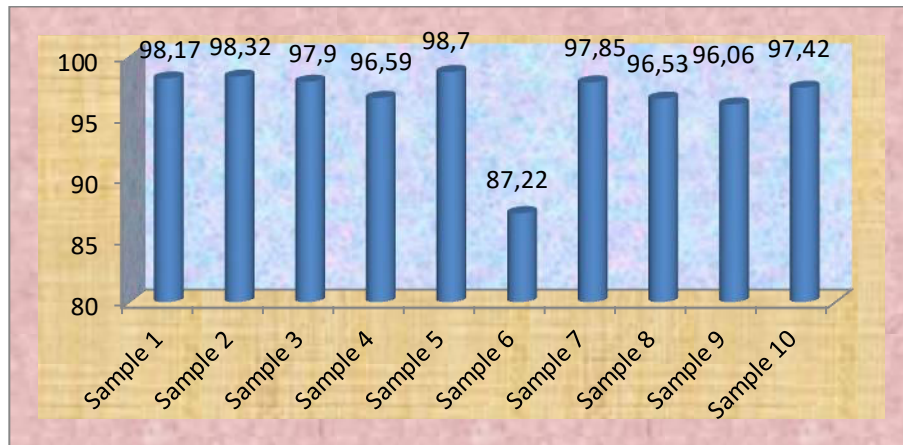


Fig 4: Average reduction (percentage) of BOD after the treatment

The reliability of a CETP is its capacity to maintain and regulate the consistency in the system's performance to predict the values obtained through treatment in the future by the system [16]. A CETP is said to be most efficient and reliable when the concentration of pollutants in the effluent treated by the plant fulfil the set discharge standards more often as compared to CETP's that exceeds the standards frequently [17]. For the successful plant operation it is very essential to have uniform or even or homogenized quality effluent available to feed for treatment facility. Equalization tank is provided to take care of variation in effluent quality and quantity. It is provided with minimum 8 hours hydraulic retention time and also be provided with floating type submerged mixer for complete mixing of Effluent. Complete mixing helps to avoid settlement of suspended particles in equalization tank bottom which in long turn reduces tank operating condition and develop septic condition at the bottom of equalization tank. Chemical Dosing tanks required solutions were prepared & stock for dosing purpose. With the help of Dose pump set optimum level dose & maintains pH level 8.5 – 9.5 as well as solid separation. Primary Clarifier is the conical shape at bottom to settle down the sludge & even lauder is provided for supernatant overflow of effluent. After the removal of sludge, the effluent, water is brought in aeration tank. The aeration tank compressed air continuously provided to the survival of bacteria or maintains DO levels of aeration tank and nutrients. The Bacteria's degrade the organic load which is present in Effluent known as COD & BOD values. This process also known as Activated sludge process. In the secondary clarifier incoming microorganism or sludge settled down to bottom of clarifier, the same procedure takes place as in primary clarifier tank. The sludge is drained out in sludge collection sump and recycles in same aeration tank to maintain MLSS level in aeration tank i.e. 3500 ppm (+1000 ppm) the excess sludge is transfer to Filter press for further treatment. For the estimation of parameters like COD and BOD standard methods were used.

V. CONCLUSION

Supply of Clean water is most essential need for the establishment and maintenance of various human activities. Waste water treatment process plays crucial role and is an effective means in the water conservation because the treated water can be used in different types of activities in place of fresh ground and surface water. Present study was undertaken to study the physicochemical parameters of waste water from the industrial area and the effort was made to minimise the BOD levels of wastewater. The initial results of pH ranged in between 7.3 to 7.9. Average pH was 7.63. After the treatment pH of the samples was ranged in between 7.3 to 7.8. Average pH was 7.54. The initial results of TSS of the samples ranged in between 2250 to 3250. Average TSS was 2830.1. After the treatment TSS ranged in between 80 to 98. Average TSS was 89.6. The initial results of TDS of the samples ranged in between 2150 to 3252. Average TDS was 2689.4. After the treatment TDS ranged in between 1700 to 2100. Average TDS was 1876. The initial results of BOD of the samples ranged in between 180 to 1620. Average BOD was 2830.1. After the treatment BOD of the samples ranged in between 21 to 28. Average BOD was 24. Significant variation observed in the BOD values. From the analysis of waste water it is revealed that high concentration of pollution load is observed. Though wastewater has significant pollution load, given treatment was so crucial by which there is significant reduction in the pollution load is observed. Biochemical oxygen demand is one of the fundamental parameter has great potential to cause detrimental effects on the water ecological parameters.



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