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Original Research Article

Characterization and Treatment of Industrial Effluent by Activated Sludge Process

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ABSTRACT

Wastewater treatment is common research interest among environmentalists. Treatment of wastewater for organic matter removal can be carried out by various physical, chemical and biological methods. Treatment by using various biological methods is effective way of organic matter removal. In the present research, characterization of effluent is carried out. The effluent is treated for organic matter removal by using activated sludge. In this investigation about 77 % removal was organic matter was obtained.

Key words: Chemical oxygen demand, biological oxygen demand, dissolved oxygen.

INTRODUCTION

Wastewater treatment consists of applying known technology to improve or upgrade the quality of a wastewater. Usually wastewater treatment will involve collecting the wastewater in a central, segregated location (the Wastewater Treatment Plant) and subjecting the wastewater to various treatment processes. The disposal of untreated wastewater from municipal sewage is the major environmental problem. Industrial effluent contains various organic and inorganic pollutants. In past few decades, pollution control has given full attention and knowledge of biological processes was successfully developed with the aim of low utilities and process operation costs. The effluent can be treated for removal of organic matter by using various treatment methods such as physical, chemical and biological. [1-5] Adsorption on various adsorbents is very economical method for wastewater treatment. [6-8] various membrane separation operations also find wide applications in wastewater treatment. [9,10] Various techniques like advanced oxidation process, electrodialysis finds wide application in wastewater treatment. [11-15] In the present research industrial wastewater from dye industries is treated for organic matter removal. Measured in terms of chemical oxygen demand (COD).

EXPERIMENTAL SET UP AND METHODOLOGY

Fig 1: Activated Sludge Tank

Since the tank includes cylindrical as well as conical shapes the dimensions are as follows:

Dimensions for cylinder

Diameter of cylinder = 25 cm

Length of cylinder = 27 cm

Dimensions for cone

Diameter of cone = 25cm

Length of cone = 13cm

The first step in the activated sludge process is to bring the microorganisms in contact with the organics of the wastewater. This is generally accomplished by the rapid mixing of the return sludge with the wastewater at the inlet of the aeration tank. In some cases small mixing chambers are provided, but this is not the common practice.

Preparation of solution

- **Manganese sulphate solution**: 48gms of $MnSO_4.2H_2O$ was dissolved in water and volume was made up to mark in 100ml volumetric flask.
- **Alkaline Potassium iodide solution**: 125 gm. NaOH & 37.5 gm. at KI was dissolved in D.W. (H_2O) & diluted to mark in 250 ml volumetric flask.
- **Standardization of sodium thiosulphate:** about 0.6-0.7 gm of AR grade $Na_2S_2O_3$ $5H_2O$ was dissolved in 100 ml distilled water, next 10ml of 0.025 N ($K_2Cr_2O_7$) & potassium dichromate and 10ml of conc. HCL acid were mixed in conical flask. To the mixture was added 6ml of 10% KI and kept in dark for 5 minutes to liberate I_2. The sides of the flask were washed with 10ml water and shaken well. It was then titrated with newly prepared thiosulphate solution till strew yellow colour was obtained. Then starch solution was added and titrated to a light green & product
- **Starch solution** A small quantity of distilled water was also added to about 0.5mg of soluble starch (A.R.) taken in beaker. The mixture was stirred with a glass rod and heated to make transparent paste this was added to 100ml of boiling distilled water with constant string & Cooled.
- BOD bottle was taken & 200 ml of water sample was added into it.
- 2 ml of manganese sulphate & 2 ml of alkali iodide solution was also added to the BOD bottle. The top of the pipette should below the Liquid level, while adding these agents.
- Bottle was stoppered with cone to exclude air bubble and mix by repeatedly inserting the bottle 2-3 times.
- If no O_2 is present the manganese ion reacts with hydroxide ion to form white ppt. of $Mn(OH)_2$ if O_2 is present Mn^{++} is oxidized to Mn^{+} and ppt. is brown coloured.
- After shaking and the allowing sufficient time for all O_2 to react, clear liquid within upper portion was separated.
- 2ml of concentrated H_2SO_4 was added.
- The bottle was mixed by inverting until the suspension completely dissolved and yellow colour was uniform throughout the bottle.

  $MnO_2+2I^-+4H^+ \rightarrow Mn^{++} +I_2 +2H_2O$
- A volume of 20 ml was taken to conical flask and titrated into conical flask with 0.025N sodium thiosulphate solution until yellow colour iodine turns to pale straw colour.
- Since it was impossible to accurately titrate the sample to colourless, liquid 1- 2 ml of starch was added.
- Continued titration was made to the 1st disappearance of the blue colour.

Table 1: Dissolved Oxygen Characterization

Wastewater (ml)	$K_2CR_2O_7$(ml)	Burette reading (ml)	DO (mg/lit)
190	10	4.3	4.3
180	20	5.6	5.6
170	30	6.2	6.2
160	70	8.4	8.4
150	50	9.9	9.9

Table 2: COD Characterization

Sludge(ml)	Effluent(ml)	CBR (ml)	COD (mg/lit)
40	10	13.5	240
30	20	7.7	704
20	30	6.9	768
10	40	6.7	784
50	0	3.5	1040

RESULTS AND DISCUSSION

Table 3: COD, DO and pH of Treated Effluent

Tests	Initial	Final
Ph	5	6
DO(Mg/L)	1.32	9.9
COD(Mg/L)	1040	240

It can be observed from above results that is was possible to remove 77 percent organic matter and DO level of treated water increased 7.5 times.

CONCLUSION

Biological treatments are effective for removal of organic matter from the effluent. In the present investigation 800 mg/l of chemical oxygen demand, about 80 percent of initial was treated successfully.

REFERENCES

1. Sunil Jayant Kulkarni, A Review on Packed Bed Removal of Organic Matter from Wastewater, Int. Journal on Scientific Research in Science, Engineering and Technology, 2015,1, (2), 27-30.
2. R Kumaresan, N. Sundara Ramakrishnan and C. Premalatha, Aerobic Treatment of Distillery Wastewater in a Three Phase Fluidized Bed Biofilm Reactor, International Journal of Chemical Engineering Research, 2009,1(1), 13–20.
3. Sonali R. Dhokpande, Sunil J. Kulkarni, Dr. Jayant P. Kaware, A Review On Research On Application Of Trickling Filters In Removal Of Various Pollutants From Effluent, International Journal Of Engineering Sciences & Research Technology, 2014, 3(7),359-365.
4. Pallavi Amale, Sunil Kulkarni, Kavita Kulkarni, A Review on Research for Industrial Wastewater Treatment with Special Emphasis on Distillery Effluent ,International Journal of Ethics in Engineering & Management Education, 2014, 1(9), 1-4.
5. Sunil J. Kulkarni, Removal Of Organic Matter From Domestic Waste Water By Adsorption, International Journal Of Science, Engineering And Technology Research, 2013, 2(10),1836-1839.
6. Sunil J. Kulkarni, Ajaygiri K. Goswami, Adsorption Studies for Organic Matter Removal from Wastewater by Using Bagasse Flyash in Batch and Column Operations, International Journal of Science and Research, 2013, 2(1), 180-183.
7. Sunil J. Kulkarni, Suhas V Patil, and Y. P. Bhalerao, Flyash Adsorption Studies for Organic Matter Removal Accompanying Increase in Dissolved Oxygen, International Journal of Chemical Engineering and Applications, 2011, 2(6), 434-439.
8. Madhura Chincholi, Priyanka Sagwekar, Charmi Nagaria, Sunil Kulkarni, Sonali Dhokpande, Removal of dye by adsorption on various adsorbents: A review, International Journal of Science, Engineering and Technology Research, 2014, 3(4), 835-840.
9. Sunil J. Kulkarni, Ajaygiri K. Goswami, Applications and Advancements in Treatment of Waste Water by Membrane Technology- A Review, International Journal Of Engineering Sciences & Research Technology, 2014, 3(9), 446-450.
10. Pawar Avinash Shivajirao, Treatment of Distillery Wastewater Using Membrane Technologies, International Journal of Advanced Engineering Research And Studies, 2012, 1(3), 275-283.
11. Sunil J. Kulkarni, Pallavi M. Kherde, A Review On Advanced Oxidation Method For Waste Water Treatment, International Journal Of Engineering Sciences & Management Research, 2015, 2(8),33-38.
12. Geeta Chittala, G Sekaran, Paul S Mogadati and M Anjireddy, "Chemoautotrophic Activated Carbon Oxidation: An Advanced Oxidation Process for The Reduction Of Sulphate In Pharmaceutical Effluent", Int. J. LifeSc. Bt & Pharm. Res., 2012, 1(1), 327-324, 2012.
13. Sunil J. Kulkarni, A Review On Studies And Research On Applications Of

Ozonation And U.V. Treatment With Emphasis On Water Disinfection, International Journal Of Research And Review,2(12),764-768,2015.
14. V. De Bock, H. De Backer, R. Van Malderen, A. Mangold, and A. Delcloo, Relations between erythemal UV dose, Global Solar Radiation, Total Ozone Column and Aerosol Optical Depth at Uccle, Belgium, Atmos. Chem. Phys., 2014, 14, 12251–12270.
15. Gil Crozes, Robert Cushing, Jason Rennecker, Chris Cleveland, and Harold Wright, Synergies of UV Disinfection and Ozone in Water Treatment, 2003, International UV Association- Vienna, Austria, 1-5.

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