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Determination of BOD, COD, DO and Other Physico-Chemical Properties of Sugar and Cement Industries.

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ABSTRACT

Wastewater was collected from the sugar and cement industrial area situated in North Karnataka. Samples were collected determined the following parameters, pH, EC, Conductivity, total dissolved solid (TDS), chemical oxygen demand (COD), Biological oxygen demand (BOD), dissolved oxygen (DO), calcium, magnesium, alkalinity and chloride. The concentrations of the metals in the wastewater were higher limits set by W.H.O. and the maximum contaminant levels (MCL Thus, the wastewater around the North Karnataka industrial area highly polluted. Domestic and industrial waste should be properly disposed and or recycled. Relevant agencies should make continuous effort to control, regulate and educate populace on indiscriminate waste disposal from domestic and industries within the study area

Keywords: Physicochemical, Pollutant, Industrial Wastewater, North Karnataka

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INTRODUCTION

Water is our most precious resource. The cleanliness of our lakes, rivers and oceans is one of the pressing goals for environmental protection. The balance of nature depends therefore on the comprehensiveness of our approach to solve the problem of wastewater disposal. Chemical oxygen demand (COD) and biological oxygen demand (BOD_5) are two of the most common generic indices used to assess aquatic organic pollution. Concentrations of BOD_5 readings will generally report as lower than COD. This is due to differences in the methods of oxidation of the samples. While BOD_5 provides a good approximation of the biologically consumable organic fraction in waterways, the test takes 5 days. Alternatively, COD is able to provide a rapid and reliable estimate of the biogeochemical interactions in waterways. Chemical Oxygen Demand (COD) is the amount of oxygen consumed by the organic compounds and inorganic matter which were oxidized in water. Biological Oxygen Demand (BOD_5) is the amount of oxygen consumed by the organic and inorganic compounds which were oxidized by biological-oxidation effect in a certain condition. Both of them reflect the pollution degree of the water, and are the comprehensive index of the relative content of organics. As the main comprehensive index of the organic pollution, COD and BOD_5 are important in the control of the total con-tent of pollution and the management of water environment. So it is significant to further research and develop the simple and rapid method for the determination of COD and BOD_5. At present, potassium dichromate method is generally used to determine the value of COD [1] at home and abroad and other methods like spectrophotometer [2] and coulometric method [3] were reported. Wastewater discharge from sewage and industries are major component of water pollution, contributing to oxygen demand and nutrient loading of the water bodies, promoting toxic algal blooms and leading to a destabilized aquatic ecosystem [4].

Global industrialization is a very important and critical issue in context of the present society. It is often extremely difficult, especially in developing countries, to handle the situation properly ensuring sustainable green environment in and around the state. Certain chemicals or organic matters have caused serious damage to the environment and to human health resulting in suffering and premature death. Many activities are known to cause contamination of soil, surface and groundwater [5, 6], that is why, it is very important to possess the knowledge of the eco-toxicological properties of chemicals or organic matters to maintain environmental stability [7, 8]. 'Biodegradability' is an important parameter due to the simple fact that it allows to know the ecological behavior of substances and products. Information on the degradability of chemicals may be used for hazard and risk assessment [9]. The rapid growth and proliferation of industrial sector have contributed to severe deleterious effect on the environment. Good engineering practice dictates that waste materials can be discharged into receiving water in such a way that nature's ability to assimilate these wastes is utilized without any deleterious effects on the water quality. It is however necessary to analyze the industrial wastewater to determine its suitability for reuse, the degree of treatment required prior to its disposal or to device suitable measures for the recovery of useful products. It is of great importance in water quality control that the amount of organic matter present in the system be known and that the quantity of oxygen required for its stabilization be determined. Over the past few years, a number of different tests have been developed to determine the organic content of wastewater [10, 11].

MATERIALS AND METHOD

Sample area and Sampling Points

Wastewater samples were collected from the North Karnataka industrial area for the analysis of physicochemical parameters.

Sample Collection

Wastewater samples were collected in plastic containers previously cleaned by washing in non-ionic detergent, rinsed with tap water and later soaked in 10% HNO_3 for 24 hours and finally rinsed with deionised water prior to usage. During sampling, sample bottles were rinsed with sampled water three times and then filled to the brim at a depth of one meter below the wastewater from each of the four designated sampling. The samples were labeled and transported to the laboratory, stored in the Refrigerator at about 4°C prior to analysis. Wastewaters were also collected for Analysis. The dependent variables analyzed were pH, EC, TDS,

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CO,.DO,BOD, Calcium, Magnesium, Alkalinity and Chloride etc. Standard methods were followed in determining the above variables (APHA, 1998).

Table 1: BOD.COD, DO and other Physico-chemical properties of North Karnataka Industrial effluents.

Sl. No.	Sample	pH	EC	TDS ppm	COD	DO	BOD	Ca^{++} ppm	Mg^{++} ppm	Alkalinity	Cl^{-}
1	The Ugar sugars PVT ltd	6.2	188	928	9.6	6.2	2.018	256		0.0732	0.156
2	Athani former sugar factory	5.7	74	377	6.4	7.6	2.018	96	31.72	0.0854	0.0923
3	Nirani sugars Mudhol	6.2	388	211	105.6	5.4	0.864	84	47.58	0.5612	0.734
4	Prabhulingeshwar sugars Siddapur	6.9	89	490	156.8	6.6	2.450	64	52.46	0.1342	0.156
5	Jamkhandi sugars	5.8	161	846	48	6.0	0.432	40	37.82	0.244	0.248
6	Athani former sugar factory (Kempawad ETP)	6.0	545	295	425	6.2	0.144	378	22.5	0.323	1.263
7	Cement factory Muddapur	6.5	177	940	56	6.6	1.873	124	78.08	0.0732	0.3408
8	Sangur sugars	3.3	60	313	60.8	6.2	3.603	74	30.5		0.486
9	Godawari Bio-refineries,Sameerwadi	1.2	60	345	38.4	6.0	1.153	244	45.2	0.125	2.481
10	Renuka sugars, Kokatanoor	4.9	686	118	28.8	7.2	1.873	24	10.98	0.0122	0.0747
11	Shiraguppi Coworkers pvt ltd Kagawad sugars	2.1	22	176	10.5	6.0	3.02	590	11.6	0.115	
12	Nandi sugars	2.6	250	142	13.5	0.3	0.201	490	13.5	0.250	1.1644

RESULT AND DISCUSSION

Table 1 shows values of industrial water and pH value ranged from 1.2 to 6.9. The pH of water is a measure of the acid–base equilibrium and in most natural waters is controlled by the carbon dioxide–bicarbonate–carbonate equilibrium system. An increased carbon dioxide concentration will therefore lower pH, whereas a decrease will cause it to rise. All the pH values were above the permissible limits for industrial effluents set by NEQS (Appendix-A). Acid deposition has many harmful ecological effects when the pH of most aquatic systems falls below 6 and especially below 5. Electrical conductivity of industrial water varied from 22 to 686 micro mhos/cm which is acceptable limits of BIS standards. Total dissolved solids (TDS) are the terms used to describe the inorganic salts and small amounts of organic matter present in water. Water containing TDS concentration below 100mg /lit is usually acceptable to consumers. However the presence of high levels of TDS in water may be objectionable to consumers owing to the resulting test and to excessive scaling is water pipes, heaters, boilers, & household appliances [13] . In the study area, water samples recorded TDS values in the range of 118-940mg/liter & three samples exceeded the acceptable limits of 500mg/liter prescribed by BIS. COD is indirect measure of organic compounds in the water. In the present study, COD values of industrial waste water sample ranged between 6.4 & 425mg/liter. Athani formers sugar factory (420mg/liter) water sample exceeded the acceptable limits of 250 prescribed by BIS. Dissolved oxygen varied from 0.3 to 7.6ppm. Dissolved oxygen plays an important role in water quality determination. The introduction of oxygen demanding materials either organic or inorganic into well land causes depletion of the dissolved oxygen in the water this poses a threat to fish & other higher form of aquatic life if the concentration of oxygen falls below critical point. There exist no better general indicators of water quality than DO [14]. DO levels were found to be low this is due to the addition of agriculture industrial & domestic effluents containing oxidizable organic matter & subsequent biodegradation &decay of vegetation which leads consumption of oxygen present in water [15]. BOD values varied between 1.876 to 18.144ppm these higher values indicate that untreated organic wastes are permissible limits for BOD as per WHO [13] is 5mg/liter calcium contents of samples ranged from 24 to 590mg/liter any values above 25 mg/liter indicates calcium rich water. All the water samples are above the permissible limit of WHO. In the study area water samples recorded a magnesium values is the range of 10.98 to 78.08 mg/liter water samples from Muddapur Cement factory exceeded the acceptable limits 75mg/liter prescribed by BIS . Alkalinity is measures of the ability of the water to neutralize water neutralize acidity. Alkaline water may decrease the solubility of metals. The alkalinity varies in accordance with the fluctuation in pollution load [18] .Alkalinity values of water samples ranged between 0.0732 &0.5612 mg/liter & are lower than the BIS values. The chloride content ranged from 0.0734 to 2.48 mg/liter is within the permissible limit of BIS.

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CONCLUSION

Results of present study revealed the pollution associated with the physco-chemical parameters are induced by the discharge of untreated or partially treated industrial waste water illegally into the water body. This clearly indicates that water resources management is incomplete & ineffective in these regions of North Karnataka & that no effectively implemented methods of integrated management exist. It is thus recommended that waste treatment plants must be established with each industry with proper follow up. Further efficient environmental laws & social awareness programme must be undertaken with respective potential threat of industrial & other waste to the management.

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