International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.6, pp 745-748, 2017

An Analysis of Water Quality Parameters of Vennaimalai in Karur District, Tamilnadu, India

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Abstract : Three water samples were collected from vennaimalai study area. These samples are subjected for analyzing water parameters in Karur water testing laboratory .Nearly 24 water parameters were analysed.This analysis includes 18 chemical water parameters and 6 physical water parameters.. This analysis revealed that there were considerable variations in the samples with respect to chemical characteristics A comparison of physico-chemical characteristics of ground water samples and dye effluent samples has also be made with WHO (1984) and BIS 1998 standards.

Introduction

Out of the about 487 yarn / fabric bleaching and dyeing units in Karur, located in cluster, 391 units have joined the 8 CETPs with design capacity of about 15 MLD. The remaining units have individual ETPs. The treatment scheme adopted by the CETPs / ETPs consists of equalization, chemical coagulation using ferrous sulphate, lime and polyelectrolyte, filtration and chemical oxidation using hypochlorite. Some of the CETPs have also incorporated aerobic biological treatment systems prior to the chemical treatment. The sludge from the treatment plants is dewatered to a solids concentration of 30% and stored within the premises of the treatment units. The CETPs / ETPs have served decolourisation of the effluents as seen from the effluent characteristics reported by TNPCB. However, solutions for the TDS in the effluents and disposal of sludge from the CETPs / ETPs are yet to be implemented.. The farmers reported that the well water quality has been affected by effluents. The productivity of almost all the crops was found higher in 172 unaffected villages compared to affected locations. Ten years back sugarcane, turmeric and paddy were the major crops grown in both affected and unaffected villages. These crops occupied an area of about 60% of the total cultivable lands. By now, the area under turmeric is almost zero in the affected villages. Sugarcane paddy occupied only less than 20 % of total cultivated area. Total area under cultivation had also declined during recent years. The groundwater quality and soil characteristics of the study area Available[1-5]

Experimendal:

The sampling of two water dye effluent samples(inlet and outlet)from dyeing effluent industry were collected after running them for 10 minutes was done during the month of September to November – 2008. The water samples were analyzed in Tamil Nadu water testing laboratory at Karur. Before collecting water samples, the plastic water bottles were rinsed with concentrated hydrochloric acid and then with ground water to be analyzed totally about 26 water parameters were analyzed. Turbidity was measured by turbidity meter and TDS was measured by gravimetric method. Electrical conductivity was measured by electrical conductometer. pH was measured by using pH meter. The phenolphthalein alkalinity (PA), total alkalinity (TA),hardness, chloride, chemical oxygen demand (COD) , biological oxygen demand (BOD), dissolvedoxygen (DO) and Tidy's test were measured by using titration methods. The amount of Na, K, Fe, Mn,free ammonia, nitrite, nitrate, sulphate and phosphate were measured by using spectrophotometer method. Fluoride was measured by visual comparison method.

Results and Discussion

The water parameters of the collected samples are given in following table

Table 1 Water Parameters For Collected Samples

1.Physical Examination	**Sample 1**	**Sample 2**	**Sample 3**
1.Appearance	Turbid	Clear	Clear
2.Colour (pt.co-scale)	Brownish	C&C	C&C
3.Odour	Acid smell	None	None
4.Turbidity NT Units	5	1	3
5.Total dissolved solids mg/L	5401	247	1329
6.Electrical conductivity micro mho/cm	7716	353	1893
2.Chemical Examination			
7.P^H	4.09	6.83	7.01
8.P^H Alkalinity as $CaCO_3$ mg/L	0	0	0
9.Total Alkalinity as $CaCO_3$ mg/L	0	116	252
10.Total hardness as $CaCO_3$mg/L	2700	152	360
11.Calcium as Ca mg/L	600	38	100
12.Magnesium as Mg mg/L	288	9	26
13.Sodium as Na mg/L	458	16	256
14.Potassium as K mg/L	124	6	86
15.Iron as Fe mg/L	0.8	0.23	0.27
16.Manganese mg/L	1.99	0	0
17.Free Ammonia as NH_3 mg/L	0	0.01	0.04
18.Nitrite as NO_2 mg/L	1.54	0.02	0.01
19.Nitrate as NO_3 mg/L	277	5	25
20.Chloride as Cl mg/L	2300	28	260
21.Fluoride as F mg/L	1.2	0.2	0.8
22.Sulphate as SO_4 mg/L	401	31	218
23.Phospate as PO_4 mg/L	0.02	0.02	0.02
24.Tidys Test 4 hrs as O_2 mg/L	0.04	0.32	0.36

The water has alkaline nature with pH, ranging from 4.09 to 7.01; this indicates that it has no direct effect on human health. Since recommended value for drinking purpose by WHO is 6.5 to 8.0 and BIS standard is 6.5 to 9.2.The EC values varied from 383 to 7716 micro mho/cm. The S1 had high EC due to inlet from dye effluent and S2 had low EC value. The constituents of alkalinity in natural system mainly include carbonate, bicarbonate and hydroxide. These constituents result from dissolution of mineral substances in the soil and atmosphere. The WHO acceptable limit of 200 to 600 mg/L. S1, S2 and S3 had no had no PA.The TA range varied from 0 to 252 mg/L. S1 had no total alkalinity value .BIS and WHO standard 200 to 600 mg/L showing that all parameters were well within prescribed drinking water standard .Hardness in water is caused by metallic ions dissolved in water due to the presence of Ca^{2+} and Mg^{2+} ions; also the heavy metals such as Fe and Mn contribute to hardness.The amount of TH in potable water ranges from 200 to 600 mg/L for BIS standard and 100 to 500mg /L for WHO standard where as in this investigation total hardness ranged from 152 to 2700 mg/L.

The S1 had high TH values which were beyond the permissible limit ..A chloride in excess imparts the salty taste to water and people who are not accustomed to high chlorides are subjected laxative effect. The WHO limit for chloride in drinking water 28 to 2300 mg/L and BIS standard is 200 to 1000 mg/L, but chloride content ranged from 28 to 2300 mg/L. The S1 had high chloride content. The S1 had no drinking water quality.

The Ca content of sample ranged from 38 to 600 mg/L. Almost all the samples were within permissible limit of BIS and WHO standard is 75 to 200 mg/L. S1 had high ca value .The Mg range of samples varied from 9 to 288 mg/L and within permissible limit of 30 to 150 mg/Lbut S1 had high ca value .The Na range of permissible limit of WHO standard is 200 mg/L, but S1 and S2 have sodium content 16 to 458 mg/L due to direct dye effluent samples which were beyond the permissible limit. K content of S1 and S2 were 6 to 124 mg/L. The Fe content of samples varied from 0.8 to 0.27 mg/L. The S3 had high Fe content but above permissible limit . BIS of Fe is 0.1 to 1.0 mg/L and WHO standard is 0.3.

The BIS and WHO acceptable limit for Mn is 0 to 1.99 mg/L. But all the samples 1 had high Mn content above permissible limit .13.present studies findings sulphates values varied from 31 to 401 mg/L. However, these values where below the recommended limit.except S1. Phosphorus is an essential element for sustained primary productivity in the ecosystem. The form of phosphorus is ortho phosphate which is in natural water in the range of 0.001 to 0.24 mg /L, but in our study area phosphate concentration varied from 0.02 to 0.02 mg/L, it is within permissible limit of both WHO and BIS Standard.Tidy's test (as O) mg/L varied from 0.04 to 0.36 but S1 has high tidy's test value , it shows that ground water gets polluted due to dye effluents industry.

The free ammonia ranges of the samples were 0 to 0.04mg/L. But samples 1 had no free ammonia. The permissible limit for nitrite as per WHO norms is 0.1 mg/L. The nitrite content of samples varied from 0.01 to 1.54 mg/L. The nitrate content of samples varied from 5 to 277 mg/L, but permissible limit of BIS is 45 to 100 mg/L. and WHO permissible limit is 4.5 mg/L. The S1 had high nitrate content and remaining samples were within permissible limit of nitrate content. The WHO permissible limit of fluoride is 1.5 mg/L and BIS standard 1.0 to 1.5 mg/L, but fluoride content of samples varied from 0.22to 1.2 mg/L which were within permissible limit .The sulphate in ground Water takes place from break down of organic substances in the soil, leachable sulphates present in fertilizers and other human influences. Hence ,the recommended content of sulphate in drinking water is 150 to 400 mg/L.

Remedial measures have been suggested for water pollution in our study area and also we created awareness among the people about water pollution

Conclusion:

Proper monitering is required for polluted areas in karur district.in order to find a solution for the above water pollution, TNPCB is now insisting all the bleaching and dyeing units to provide reverse osmosis (RO) plant with complete reject management system and reuse the treated effluent for the process and ensure for zero liquid discharge (ZLD). now the dyeing units are in the process of installing RO plant to meet ZLD. the bleaching and dyeing units in karur shall also go for cleaner production including elemental chlorine fee bleaching, hydrogen peroxide bleaching, and environmental friendly dyes [6-11]

Acknowledgement:

The authors thank the management and UGC for providing opportunities to do this work.

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