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Research Article

STUDIES ON SEWAGE POLLUTION IN SOME RESIDENTIAL AREAS OF VISAKHAPATNAM

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ABSTRACT

Sewage is water-carried wastes, in either solution or suspension that is intended to flow away from a community .This study comprises of analysis of domestic sewage from ten different residential sampling stations of Visakhapatnam city, Andhra Pradesh. This study also includes the determination of physico- chemical parameters of the water samples in those selected areas .The values of BOD and Hardness obtained were above the prescribed limits. The probable reason for higher values may be due to the sampling was done during the pre-monsoon period.

Key words: Domestic Sewage **--**Pollution**-**Visakhapatnam**.**

INTRODUCTION

Sewage is water-carried wastes, in either solution or suspension that is intended to flow away from a community. It is more than 99.9% pure water and is characterized by its volume or rate of flow, its physical condition, its chemical constituents, and the bacteriological organisms that it contains.

The spent water from residential areas -- body wastes, washing water, food preparation wastes, laundry wastes, and other waste products of normal living, are classed as domestic or sanitary sewage. Wastes that result from an industrial process or the production or manufacture of goods are classed as industrial wastes. Their flows and strengths are usually more varied, intense, and concentrated than those of sanitary sewage.

Wastewater from these sources may carry pathogenic organisms that can transmit disease to humans and other animals; contain organic matter that can cause odor and nuisance problems of receiving water bodies; and can lead to ecotoxicity. Excessive deposition of chemical nutrients in water bodies is called eutrophication. It is one of the numerous problems created by sewage water pollution. Degradation of the quality of water, reduction in the number of fish and increase in BOD, are the effects of eutrophication. Proper collection and safe, nuisance-free disposal of the liquid wastes of a community are legally recognized as a necessity in an urbanized, industrialized society [1]. Sewerage being the pipes, pumps and infrastructure through which sewage flows.[2]Power can also be obtained from sewage water. The technique uses Microbial fuel cells. Characterization of the sewage becomes essential for an effective and economical waste management program and to choose the treatment processed, deciding the extent of treatment methods and assessing the beneficial uses of the wastes. Some heavy metals such as Zn, Pb, which are present in lower concentration or below detection limits in supply water, tend to increase more than 98% in used water (i.e., domestic sewage). Reasons for their increment in sewage are not only because of domestic uses, but also from other sources. For example, lead (Pb) may be entering into the sewage

system through dust fall, soil erosion, leaching, urban waste discharges and runoff from streets and other surfaces. This toxic metal may cause anemia, kidney disease and nervous disorders above the tolerance limits 0.05 mg/L. Similarly, zinc (Zn) is an essential element in human metabolism. A child requires 0.3 mg of Zn/kg of body weight, the deficiency of which may cause growth retardation. But excessive concentration in the drinking water may cause undesirable aesthetic effects. Characteristics of drinking water as well as discharge of effluents are shown in Table 1.

A Case Study on Sewage Analysis

The study has been conducted during the pre - monsoon period, i.e. during the month of April 2011 in a residential area situated in (GVMC) Visakhapatnam, A.P, India. The main source of water supply in this area is by deep bore wells and local municipality. The water supply system in this area is of continuous type with discrete pumping system. The colony residents are having their individual overhead tanks. From this community, domestic or residential establishments contribute the main waste water portion. It is mainly the spent water from kitchens, bathrooms, lavatories etc. Domestic sewage water samples were collected from 10 different resenditial areas of the town S1- A.U. Engg. college -, S2 -Maddilapalem, S3 – CBM compound, S4 -Isukathota , S5 – MMTC Colony, S6 –HB colony S7 - MVP Colony, S8 - Seethammadhara, S9 – LIC colony and S10 – Gurudwara junction. The samples were stored in plastic bottles. Parameters like pH, conductivity. TDS, chlorides, hardness were determined standard method[3]. The concentrations of Fe, Pb, and Zn were determined with the help of atomic absorption spectrophotometer). The results obtained are compared against standards.

RESULTS AND DISCUSSIONS

The results obtained during the course of present investigations are given in Table 1.

Colour and Odour

Domestic sewage has a slightly alkaline condition and earthy odor and a cloudy appearance. With lapse of time, due to microbial action, it darkened in colour and the smell of the sewage became more pronounced.

pH and Conductivity

The pH of domestic sewage from different Indian cities has specified by WHO standards vary from 7.0 to 7.5. In the present investigation the pH of the fresh well water samples are within the limits (Table-1) [4]. The conductivity of the present water samples found varied between 0.6 – 1.7mmhos. The reason of this is the contamination of the sewage effluents by ionic pollutants like NaCl etc. in some stations.

TDS and SS

The total dissolved solids (TDS) in the domestic sewage are found in the range 319-715 and 22-78 mg/L. A comparison between the two results clearly indicates that the sewage effluents are contaminated with water insoluble solids more than water-soluble, solids. The SS concentrations of the domestic sewage in the present case generally ranges from 48 to 85 mg/L. Knowledge of the classification of these solids is important, as it constitutes lad on biological treatment processes.

Chlorides, Nitrates and Hardness

Chloride content of the water samples found in the range 64.8-128.1 mg/L after domestic use. The reason for the sharp increment is that the human excretions contain chlorides equal to the chlorides consumed (commonly NaCl as common salt) with food and water. This amount averages from 8gm of chloride/person/day. The nitrate - nitrogen concentration in the water samples has been found out to be (in the range 25-51 mg/L) after domestic use. This may be due to the presence of urea [$CO(NH_2)_2$] which is the major source of nitrogen in the domestic sewage. Generally, the nitrate pick-up in the Indian domestic sewage has been reported as 20-40mg/L[5]. The total hardness of the water samples was found in the range of 363 to 508mg/L. This may be due to addition of certain compounds (which may impart hardness) after domestic use of the water. This parameter also does not pose problems in the congenital water treatment process. It can be considered that the sampling was dine during pre-monsoon period, so the sewage was raw and highly concentrated.

Biochemical oxygen demand (BOD)

The BOD of the sewage obtained in the range of 40 to 74 g/capita-day (present

investigation), which is above reported value for different domestic sewage is 45-54 g/capita-day[6]. The probable reasons for this slightly higher value may be that the sampling was conducted in the pre monsoon period, so the sewage was raw and concentrated. A high BOD value may pose a great problem for the conventional water treatment processes, as it constitutes a high load.

Chemical Oxygen Demand (COD)

The COD of the domestic sewage comes found in the range of 98 to 163 mg/L in the present study. Generally the range of the COD for the Indian domestic sewage is about 1.6 to 1.9 times the value of BOD. In the present study, COD coming to be in the range of 1.7 to 1.9 times the value of BOD. If the ratio between COD to BOD is known, it becomes easier to assume the value of BOD of the sewage in a very short time. The ration will vary from one waste to other and will change for the same waste as it is subjected to various treatment operations.

Heavy Metals

A high iron (Fe) content of >2 mg/L imparts a taste to drinking water besides leaving stains on laundry and plumbing fixtures. In the present study, the maximum Fe constant in the drinking water measured 0.16 mg/L, which is not very high. In the domestic sewage the iron content is < 0.006mg/L[7]. The reason of such increment can be attributed due to the fact that water being stored in the overhead iron tanks before being supplied. The maximum permissible limit of Zn in the drinking water is 5 mg/L. In the present study, the Zn as well as Pb contents lie within the prescribed limit (Table-1).

Table -1: Analysis of sewage waters Collected in April 2011

Parameter	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	Effluent discharge std.	Drinking water std.(ISI)
pH	7.72	7.95	7.60	7.67	8.05	7.82	7.65	7.92	7.36	7.20	5.5-9.0	6.5-8.5
Electrical Conductivity	1.4	1.0	1.5	0.8	1.2	1.4	0.9	1.6	1.8	1.4	-------	-------
TDS	557	479	620	448	754	582	492	519	605	426	2100	500
TSS	62	58	66	76	54	84	69	59	64	72	100	NS
Hardness	433	372	462	458	376	415	508	389	430	363	NS	300
Chloride	104	118.6	114.2	95.5	115.6	128.1	78.6	64.8	83.2	91.8	1000	250
DO	5.3	5.2	4.6	5.2	4.8	4.6	5.0	4.9	4.6	4.9	NS	NS
BOD	60	48	76	52	82	58	79	45	73	54	30	NS
COD	104	142	118	98	145	122	163	138	141	154	250	NS
Iron	0.018	0.042	0.002	0.003	0.028	0.010	0.001	0.005	0.006	0.012	3	0.3
Lead	0.004	0.003	nd	0.004	nd	0.002	0.003	nd	0.004	0.002	0.1	0.05
Zinc	0.168	0.210	0.292	0.242	0.314	0.244	0.291	0.198	0.172	0.228	5	5
NH4-N	37	34	25	43	37	40	44	39	32	36	50	NS

All the parameters expressed in mg/lit. Except pH and EC (mmhos)
*All the data is based on average of five determinations.
Nd – non- detectable; NS- not specified

CONCLUSION

The data presented in Table -1 indicates that the sewage becomes polluted with ionic and organic pollutants. Organic pollutants like NH_4-N, COD and BOD show higher concentration which actually implies that these parameters are generally absent in drinking water and even a slight increment would result in higher value. The movement of these ionic and organic pollutants through the soils enhances the possibility of the contamination of the underground water resources also. Therefore, it is very much needed to make necessary measures have to be taken to treat and dispose the sewage properly and safely to prevent pollution.

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