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PHYSICO- CHEMICAL ANALYSIS OF WASTE WATER FROM CEMENT UNITS

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Key words : Trade wastes, effluents, clinker, waste lime.

ABSTRACT

Two major cement industries of the Ariyalur and Reddipalayam were selected, the waste water discharged from these units were collected and subjected to analysis. The values of different parameters were compared with the standard values given by Tamil Nadu Pollution Control Board. The reasons for variations are analysed and remedial measures are suggested.

INTRODUCTION

Pollution has seeped into the very fibre of human society all over the world. The industrial pollution has spoiled the three wealth of life water, air and soil The trade wastes and effluents of industries play a significant role in pollution of water. Water required in industries is mainly for sanitary facilities meant for factory workers and for the residential quarters in the premises. Water may be required in the manufacturing process in industries. Industrial effluents containing chemicals and other harmful products spoil the soil, plants and aquatic life and through various sources they enter into man's body causing number of disorders in various parts and even cancer (Kudesia, 1996).

Cement is manufactured in rotary kiln from the raw materials, clay, limestone and gypsum. Clay and limestone are mixed in the ratio 1: 3, the mixture is powdered, (made into a slurry with water in the wet process) and fed into the rotary kiln from the top.

A flame from a coal or oil fire leaps up the tower. At around 1400 ^{0}C, cement is formed. Cement is a mixture of silicates and aluminates of calcium.

The main four components are dicalcium silicate, tricalcium silicate, tricalcium aluminate and tetracalcium aluminoferrate. A mixture of the above occurs as clinker, which is cooled, powdered and mixed with 3 % gyspum (Balasubramanian *et al*., 1999).

The waste charactristics of cement industries are waste lime, iron from washing and highly suspended solids in which, water is used for washing of various units and cooling purposes. The treatment method followed in cement industries is neutralisation followed by sedimentation. The industrial wastewater is supposed to be toxic, (Kudesia, 1996).

MATERIALS AND METHODS

Ariyalur, a taluk of Perambalur district blessed with lots of limestone deposits which contain nearly ten cement industries large scale and small scale altogether in and around it. Of these, two major cement industries of the places Ariyalur and Reddipalayam were selected, the waste water discharged from these units were collected and subjected to analysis. The waste water samples provide a main source of irrigation WWS1 for the people of Manaleri Village and WWS2 for the people of Reddipalayam, Nayakarpalayam and Selathankadu.

The waste water samples were collected during November 2003 in polythene containers of 2 litres capacity and labelled with necessary requirements. The temperature and pH were measured at sampling sites itself. The DO and

Table - 1
Values of physico chemical parameters of two different waste water samples

Sr. No.	Parameter	WWS1	WWS2
1.	Temperature	30^0C	32^0C
2.	Colour	Colourless	Pale yellow
3.	Odour	Fishy odour	Fishy odour
4.	Taste	Oily taste	Alkaline taste
5.	Turbidity	12 NTU	17 NTU
6.	pH	6.45	8.60
7.	Specific Conductance	267 mmhos/cm	1164 mmhos/cm
8.	Total dissolved solids	173.55 mg/L	756.6 mg/L
9.	Total hardness	290 mg/L	650 mg/L
10.	Chloride	124.96 mg/L	553.8 mg/L
11.	Salinity (%)	0.255	1.029
12.	Total acidity	11.20 mg/L	7.46 mg/L
13.	Total alkalinity	199.92 mg/L	553.8 mg/L
14.	Carbonate	38.08 mg/L	95.20 mg/L
15.	Bicarbonate	161.84 mg/L	458.60 mg/L
16.	Phosphate	0.0204 mg/L	0.016 mg/L
17.	DO	8.08 mg/L	6.63 mg/L
18.	BOD	24.3 mg/L	20.0 mg/L
19.	COD	10.0 mg/L	8 mg/L

WSS1- Wastewater Sample No. 1
WSS2- Wastewater Sample No. 2

BOD bottles were taken to the sampling sites and fixed immediately after collecting the samples. Fresh samples were collected and analysis were conducted immediately and on that day itself. Standard solutions and ragents were prepared with distilled water. All the chemicals used are of A.R. grade. The physico-chemical parameters were analysed based on the procedures given by Trivedy and Goel (1986). The values of the different parameters were compared with the standard values given by Tamil Nadu Pollution Control Board. The reasons for variations are analysed and remedial measures are suggested.

RESULTS AND DISCUSSION

The different physical parameters studied are temperature, colour, odour, taste, turbidity, pH, specific conductance and total dissolved solids (TDS). The differnt chemical parameters studied are total hardness, chloride, salinity, total acidity, total alkalinity, carbonate, bicarbonate, phosphate, DO, BOD, COD and residual chlorine.

TNPC Board has given tolerance limit values for different physico-chemical parameters. Considering the values of the parameters obtained by systematic analysis and comparing with those given by TNPC Board, the values of the parametrs are well within the standard values of TNPC Board.

Considering the increasing demand for irrigation water, people have tried to use such waste water profitably for agriculture giving due consideration for quality and quantity of effluents. Considering the values of total hardness , total alkalinity and total chloride, WWS2 has greater values than WWS1. Since the DO value is also not so low, the water samples may be useful for irrigation.

Comparing the values of TH, TA and DO with the values obtianed from sugar industrial effluent, WWS1 is highly comparable with these values (Matkar and Gangotri, 2003). The values reported by Mishra and Patel (2004) for the parameters BOD and COD are closer to our values. Comparing the values of industrial effluents of Bharuch/ Ankleshwar of Gujarat (Patel *et. al*., 2003) with our values, the values of certain parameters are close to our values (pH, EC, DO and PO_4^{3-}) and there is very high variation for some other parameters (TDS, BOD, COD, HCO_3^- etc).

Considering the general guidelines for water in agricultural irrigation (TDS < 500 mg/L and EC < 0.75 mmhos/cm) WWS1 is preferable for irrigation compared to WWS2. The phosphorus provides nutrient for plant growth. Since the concentration values of chloride and bicarbonate separately exceeds 100 mg/L, both the waste water samples may not be suitable for sprinkle irrigation (Vinod Kumar *et al*., 2004). For other parameters turbidity, salinity and total acidity, values are not so high. The fishy odour is due to continuous circulation of water in cooling systems for a long period and oily taste is due to the oil applied to cooling systems for lubrication.

CONCLUSION

The waste water produced by an industrial unit will depend upon the type and size of the industry, the process being used, and the extent of its reuse within the industry. The wastewater should be completely segregated and separately treated chemically and biologically. Regular monitoring of quality and quantity of wastewater should be intesified.

From the analysis of the samples, WWS1 and WWS2, we may conclude that though these samples may be used directly for irrigation, it is preferred by the public to adopt better treatment process to make it apt for all types of irrigation and also for domestic pruposes. Since the impurities in WWS2 are seemed to be dissolved inorganic solids, purification methods like ion-exchange process, reverse osmosis, and electro dialysis may be adopted to make the wastewate suitable for all purposes (Peavy *et al.,* 1987).

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