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Studies on Industrial Effluent Quality With Reference to Heavy Metals Content

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The industrial effluents contain large number of heavy metals with high concentrations. The heavy metals are probably the most harmful pollutants. The toxicity of the heavy metals is becoming an important environmental concern. In view of this, this paper reports the heavy metals content in some industrial effluents from Maharashtra Industrial Development Centre (MIDC) area of Ambarnath. MIDC area of Ambarnath is one of the most polluted industrial areas. The effluent in the area is discharged into Waldhuni Nallah and finally goes to the creek. The metals monitored are Fe, Cr, Cd, Ni, Zn, Cu and Pb. The findings are compared with WHO and Indian standards.

Key Words: Industrial effluent, Heavy metals content.

INTRODUCTION

The heavy metals are the most harmful and insidious pollutants hecause of their non-biodegradable nature and their potential to cause adverse effects on certain levels of exposure and absorption. The industrial effluents directly or indirectly get discharged into the creek and thus pollute the creek water[1]. The industrial effluents also affect the nearby soil, vegetation and ground water quality[2].

Ambarnath is a town at a distance of 67 km from Mumbai. The MIDC area of Ambarnath is in existence since 1960s. Today more than 300 industrial units are there in the area. The area is divided in to two blocks *viz.*, Kansai and Morivali block. The area comprises industries like chemical manufacturing, engineering units, dyes and paints industry, glass, rubber processing units, stone crushers, etc. Many times the untreated or partially treated effluent is discharged in Waldhuni Nallah. Hence it is essential to assess the heavy metals content in the effluents generated from different industries.

EXPERIMENTAL

Different types of industries generate different types of effluents. Hence, the sampling stations were so chosen that they represent the different kinds of industries. The sampling stations are as follows:

S-1 : Extreme end at MIDC area, in Nallah.
S-2 : Near A.L.A. Chemicals.
S-3 : Near dyes industries (flyover bridge).
S-4 : Near rubber processing unit.
S-5 : Near stone crusher, Transchem.
S-6 : Near engineering units.

The study was carried out from January 2000 to June 2000. The samples were collected in between 7 to 9 AM and 7 to 9 PM. The standard methods of sample collection, preservation and analysis were adopted as per APHA[3]. The samples were collected once in a month and analysed within 48 h. The pH-meter used was Elico-Li 120 and Perkin-Elmer atomic absorption spectrophotometer was used for metal content estimation. Double distilled water and AR grade chemicals were used whenever required.

RESULTS AND DISCUSSION

The results obtained are shown in Tables 1 for three representative months.

Iron is the fourth most abundant element in the earth's crust. Iron is mainly used in alloy industries, building construction and also in pharmaceutical industry. The TLV for iron is 3.0 mg/L and it is observed to be ranging from 1.5 to 11.0 mg/L. An immediate cause of death from inorganic iron compounds is respiratory failure. Diarrhoea, loss of body weight are some of the symptoms. Chromium is again used in alloy and plating industry. It is present in variable oxidation states and varying from 17 mg/L at S-5 to 8.6 mg/L at S-4. The chromium salts are carcinogenic.

Cadmium is used in industries like electroplating and Ni-Cd batteries. Organo-cadmium compounds act as catalyst. Though the TLV is 2.0 mg/L, Cd content ranges between 1.7 to 8.1 mg/L. Nickel is used in electroplating. High concentrations of Ni are found in fossil fuels. It is present virtually in every kind of sample including water, plants and animal tissues[4]. Its concentration is found to be very high in all the samples ranging from 4.8 to 7.5 mg/L, where the TLV is 3.0 mg/L. The toxicity of nickel is basically due to carcinogenic nickel carbonyls.

Zinc is used mainly in alloy industry, also in galvanizing process. Zinc amount in the samples is ranging from 2.8 mg/L to 8.9 mg/L. The TLV for Zn is 5.0 mg/L. Industrial hazards arise from exposure to Zn fumes. Extensive fibrosis of lung, ending in teeth due to higher exposure of zinc has been reported[5]. Copper is one of the most common metals which is used extensively from domestic utensils to conducting wires, alloys, batteries, etc. The amount of copper ranges from 2.9 to 9.7 mg/L. The poisoning is basically due to copper sulphate intake. The cases of copper fever in a paint industry are known. Lead is used in the manufacture of metal products, pigment, etc. Though its TLV is just 0.1 mg/L, its concentration in the sample is varying from 0.3 to 8.1 mg/mL. Anemia, acute abdominal colic, peripheral neuropathy are some consequences of excess lead ingestion.

TABLE-1
CONCENTRATIONS OF THE HEAVY METALS PRESENTS IN THE INDUSTRIAL EFFLUENTS COLLECTED FROM DIFFERENT SAMPLING STATIONS

	Fe	Cr	Cd	Ni	Zn	Cu	Pb
				Station-S_1			
January	2.5	2.0	6.2	4.8	6.6	3.1	2.9
March	2.0	2.2	7.4	5.0	6.8	2.9	2.7
May	3.0	1.8	8.1	5.2	7.2	3.1	2.5
				Station-S_2			
	Fe	Cr	Cd	Ni	Zn	Cu	Pb
January	1.5	3.6	2.1	5.9	2.8	6.8	0.5
March	1.5	4.2	1.7	6.4	2.8	7.3	0.6
May	2.0	4.1	2.0	6.6	3.1	7.2	1.3
				Station-S_3			
	Fe	Cr	Cd	Ni	Zn	Cu	Pb
January	9.5	6.6	7.1	6.5	7.4	4.7	8.0
March	9.0	6.7	7.3	7.3	7.1	4.9	8.1
May	9.5	6.9	7.5	7.5	7.9	4.8	8.1
				Station-S_4			
	Fe	Cr	Cd	Ni	Zn	Cu	Pb
January	2.5	7.9	2.1	6.8	6.4	6.2	1.2
March	2.0	8.4	2.2	7.2	6.5	6.5	1.6
May	2.5	8.6	2.4	6.4	6.4	6.2	1.0
				Station-S_5			
	Fe	Cr	Cd	Ni	Zn	Cu	Pb
January	9.5	1.7	4.7	5.2	8.5	5.6	0.3
March	11.0	1.9	4.4	5.8	8.7	5.8	0.5
May	10.5	2.3	4.7	5.7	8.9	6.0	0.5
				Station-S_6			
	Fe	Cr	Cd	Ni	Zn	Cu	Pb
January	7.0	4.3	1.9	4.9	6.0	9.3	1.4
March	7.0	4.7	2.5	5.4	5.8	9.7	1.7
May	6.5	4.5	1.9	5.8	6.1	9.6	1.4

All values are expressed in mg/L.

Conclusions

It is difficult to trace the exact source of metal contamination as the samples are collected from nearby streams. It is observed that about 75% of the results are above WHO and Indian standards[6]. This effluent gets discharged in the Nallah

and finally goes to the creek. During this process the concerned ecosystem is disturbed. In the area only one common effluent treatment plant is working which takes care of few industries. Hence, some new treatment methodologies are recommended for checking and controlling the effluent quality.

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