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MONITORING AND ASSESSMENT OF HEAVY METAL IN WASTE WATER EFFLUENT COLLECTED FROM BADLAPUR INDUSTRIAL AREA,(MAHARASHTRA)

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Abstract:

Last few year's industrial development and progress is responsible for discharge of effluent into environment, and this waste water consist toxic and hazardous substance which is harmful to human health, aquatic life and soil pollution. This study has been carried out in Badlapur industrial area. There are 10 different sampling stations of Badlapur industrial area. Industries like textile, paper, pulp, andPharma release too much heat in water. It was observed that, Paint manufacturing industries are the major contributor of toxic Cr,Zn and Pb to 37.2,31.5 and 36.1 mg/L respectively. It was also observed that major contribution of Cu(40mg/L) was from Dyesmanufacturing unit, while maximum Zn concentration of (38.6 mg/L)was found effluent sample released from textile industry. The effluent from Chemical industry having maximum value of Cr,Pb amounting to 38,36.1mg/L respectively. The result shows that, the effluent discharge from paint, textile industries have polluted ground water as well as surrounding area

Introduction

In last few years Indian industries have contributed in high economic growth but simultaneously it has also given rise to environmental pollution. In natural water heavy metals are usually present in trace amount even at low concentration but their concentration increases into water due to addition of industrial wastes and sewage(1).The quality of water is seriously affected which is far lower in comparison to Indian standards. It is observed that one-third of the total water pollution comes in the form of effluent discharge, solid wastes and other hazardous wastes. Out of this a large portion can be traced in the processing of industrial chemical to the textile industry. The surface water is main source of industries for waste disposal. Untreated or treated effluent has increasedlevel of surface water pollution up to 20 times the safe level in 22 critically pollutedareas of the country. It is found that almost all rivers are polluted in most of the stretches by some industry (2-3).In India (Lokhande and Kelkar 1999) they observed the serious effect on the health of Indian ecosystem (4).Before and after the treatment of industrial effluent and sewage contains variable amount of heavy metals such as Ni,As,Zn,Cr,Cu,Hg, which have the highly contaminate crop growing under irrigation. The heavy metals are widely distributed in the environment, soil, plant and animals in most of the tissue and marked effect on aquatic flora and fauna which bio-magnifications enter in the food chain and ultimately affect the human beings. Pollution of heavy metal is the biggest problem of our oceans, lake and rivers. Large amount of heavy metal accumulate in fish,oyster,sediment and other components of aquatic ecosystem have been observed globally(5-8).Some toxic heavy metals are absorbed into the particulate matter although they can form free metal ion and soluble complexes that are available for quickly by biological organism(8).

The environmental pollution problem caused due to heavy metal has occurred now in most of the major metro cities in India. Tremendous industrial pollution is increasing day by day which made us to carry systematic and detail study of pollution.The toxic heavy metals industrial effluent are collected from Badlapur Industrial estate so it is is considered as one of the fastest developing industrial belt in Mumbai.

Study Area:

The study was carried at the Badlapur area which is one of the most rapidly developing zone and may be the heavily polluted industrial belt of Mumbai. Badlapur M.I.D.C are situated on the Kalyan-Badlapur highway. Residential area is occupied in Badlapur M.I.D.C.like Shirgaon, Mankavali, and Kharivali.

The industrial area spread over 107 hectares of land consisting about 384 large and medium scale industries like engineering unit, steel processing industries,chemical,paint,textile,pharma industries etc.

The study area i.e. Badlapur M.I.D.C.lengths in 4.39 km.The main water source for industrial consumption is Maharashtra Industrial Development Corporation. The effluent discharge, treated and untreated amounts to 8000m^3/day.This created health hazards for local population.

Climate Conditions:

In Badlapur M.I.D.C.weather is sultry and humid. Rainfall average rainfall records 1,500nm to 2,000nm.The average temperature recorded varies from 25 to 38 degrees.

Requirements:

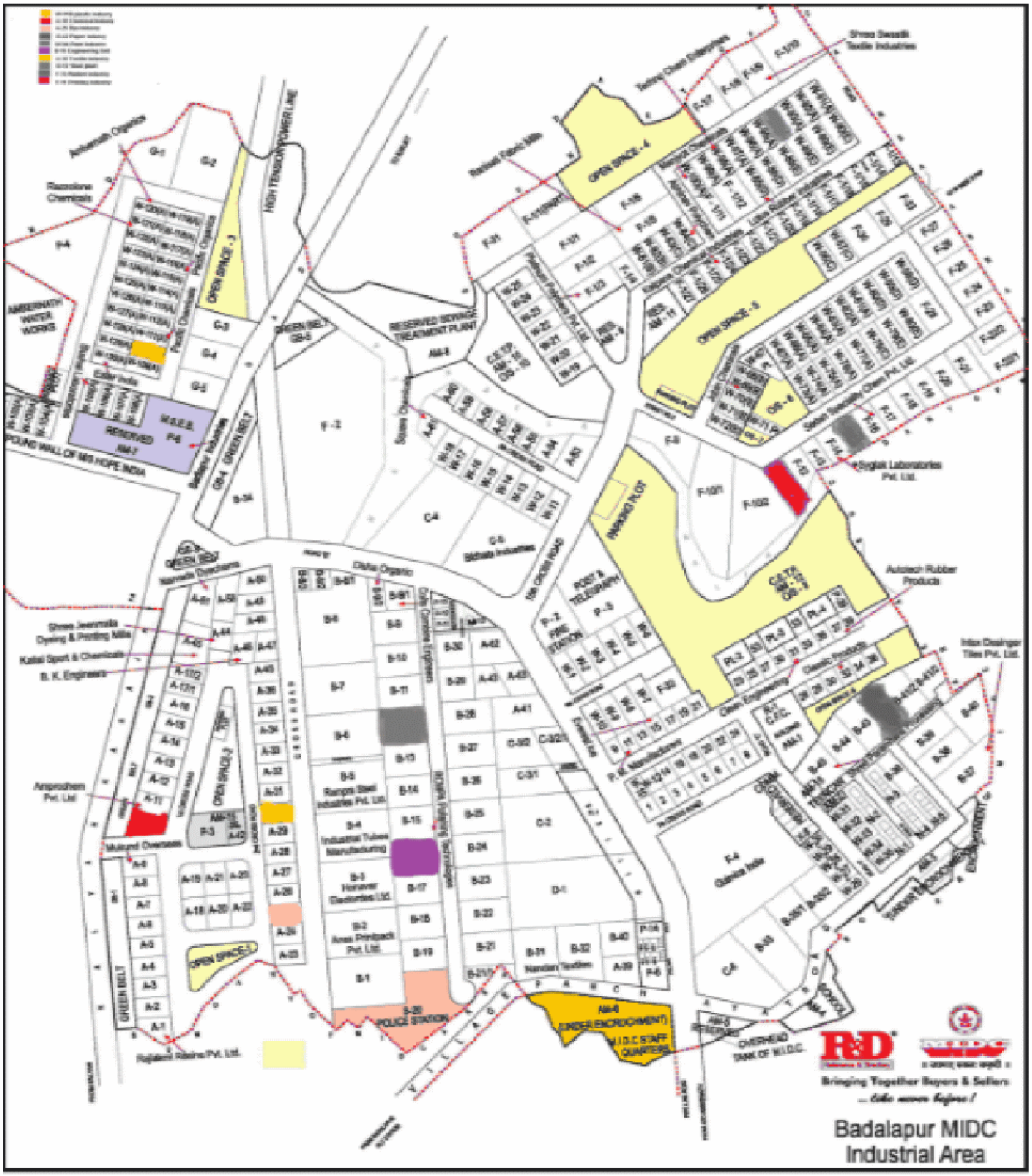
- Pipettes, glassware, buretteshould first clean with tap water thoroughly and finally with distilled water.
- Before and final use pipettes and burette were rinsed and cleaned with solution.
- The procedure for calculating the different parameters were conducted in laboratory.

Sampling Method ofIndustrial Effluent:

The industrial effluent sample was collected twice in month in morning and afternoon session from different industries like engineering unit, paper mill, and fine chemical manufacturing unit, dyes industries, paint industries, pharma, and textile industries of Badlapur Industrial belt. For each type of industry two representative units were selected. The effluent samples from different industries were collected every alternate month from July 2013 to July 2014. The sampling was done in two shiftsi.e. morning shift between 8.00 a.m.to 10.00 a.m.and afternoon shift between 2.00 p.m. to 4.00p.m.

Following photograph shows graph of Badlapur M.I.D.C.and different stations of Industrial effluent drainage from where the samples were collected.

Graph of Badlapur M.I.D.C:



Stations of Industrial effluent drainage:

Fig 1.

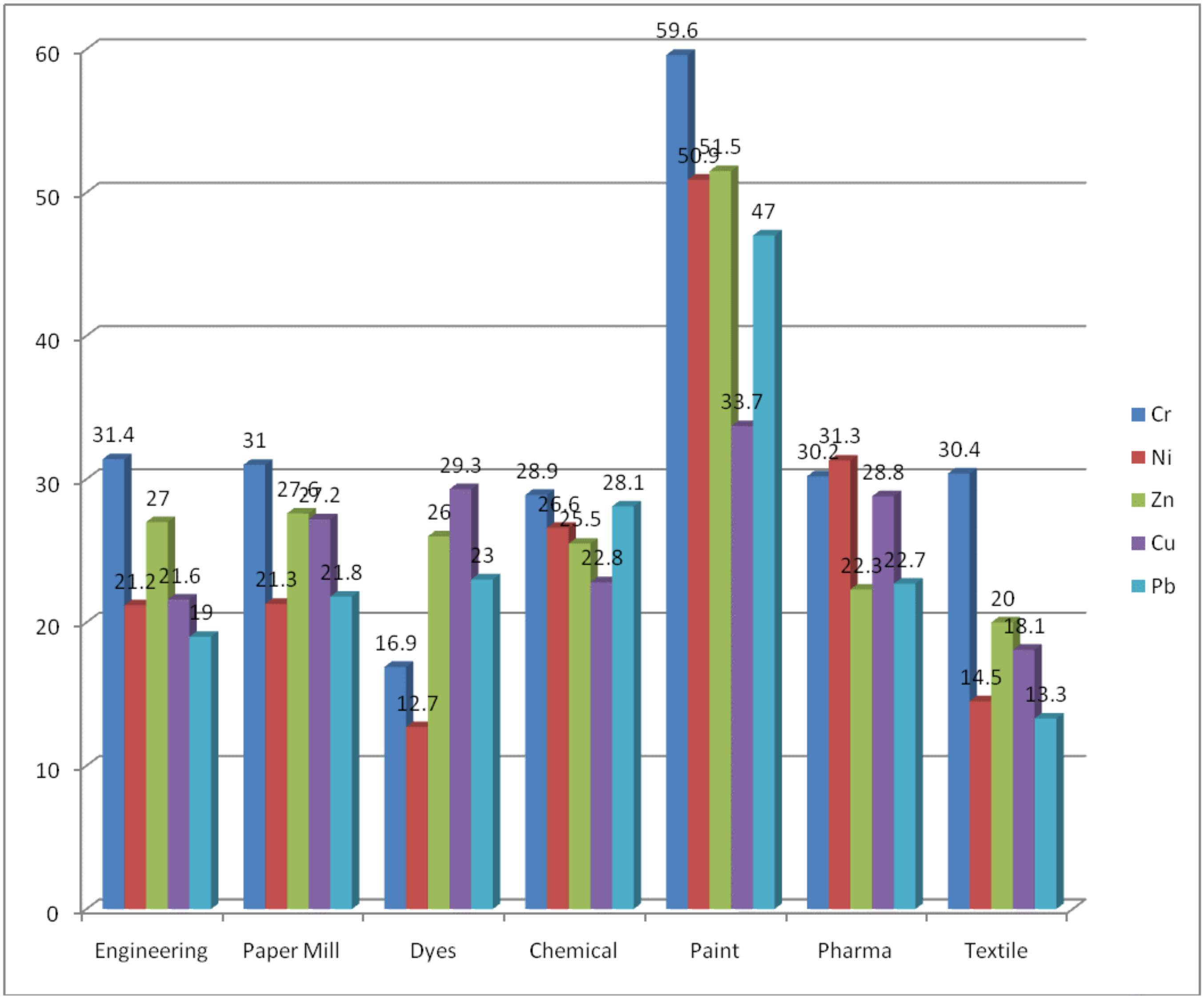


Fig.1 seasonal Variation in Heavy Metal Content in the industrial effluent released from different industries of Badlapur industrial Estate of Mumbai for years 2013-2014.

Table:1 Seasonal Variation in Heavy metal content in the waste water released from different industries of Badlapur Industrial Estate for the year 2013-2014.

Industry	Heavy Metals(mg/L)	Year 2013					Year 2014				
		June	August	October	December	Average	January	March	May	July	Average
Engineering	Cr	28	24.8	28	38	**29.5**	31	35	40	27.5	33.3
	Ni	20	11.1	20	24	**18.8**	20	24	27	24	**23.7**
	Zn	27	20.1	24	32	**25.7**	27	30	32	25.2	**28.4**
	Cu	26	13.1	15	23	**19.3**	19	24	32	20.1	**24.0**
	Pb	20	11.9	13	17	**15.5**	19	23	27	20.4	**22.5**
Paper Mill	Cr	30	32.7	30	35	**32**	28	28	39	26.9	**30.6**
	Ni	22	11.4	14	21	**16.9**	22	27	30	24.8	**25.9**
	Zn	25	19..9	21	25	**22.6**	22	37	42.2	29	**32.6**
	Cu	30	19.8	21	30	**25.1**	29	33	38	22.8	**30.7**
	Pb	22	13.7	17	16	**17.1**	24	27	31	23.8	**26.5**
Chemical	Cr	38	29.1	27	28	**30.4**	29	28	33	19.6	**27.5**
	Ni	32	21.5	20	28	**25.2**	34	27	38	13.3	**28.1**
	Zn	28	20.3	23	26	**24.1**	31	20	38	18.3	**26.9**
	Cu	30.1	19.1	22	23	**23.3**	23	25	26	15.5	**22.3**
	Pb	36.1	28.7	27	28	**29.9**	27	19	35	24	**26.4**
Dyes	Cr	13	9.6	14	21	**14.2**	17	20	23	18.7	**19.7**
	Ni	21	17.9	21	26	**21.5**	8	9.3	13	7.7	**9.5**
	Zn	30	21.6	37	38.6	**32.4**	17	19	22	14.6	**18.1**
	Cu	21	17.2	20	17	**18.9**	37	39	40	35.2	**39.9**
	Pb	21	9.9	11	15	**14.2**	20	37	46	34.8	**34.5**

Result:

Detailed experimental analysis on heavy metal content in waste water effluent sample collected from different industries of Badlapur industrial estate of Mumbai for the assessment year 2013 and 2014 is presented in Tables 1 and Table 2. The average values from last one year of heavy metal content in mg/L for different industries are graphically represented in(figure1).Due to suction of special group of Heavy metal by soil which results in definite health hazards when taken up by plants.

Average Cr content in waste water samples in present year was found to be minimumOf 9.6 mg/L in effluent collected from paint industry(Figure1),which was very higher than permeable limit of 0.05mg/L by WHO(9).In textile and dyes industries Cr is used pigment agent in leather. Detail of experimental data indicates that paint manufacturing industries are major source for release of toxic Cr metal. Chlorinated hydrocarbon in metallic compound such as Cr, Pb, Ni salt containsharmful pigmentwhich can cause injury to blood forming structure which causes anemia and cancer for human.(10).At higher temperature Cr is generally more toxic, but for an animal without backbone and fishes its toxicity is not much chronic.(11).Hexavalent Cr is highly unstable and powerful oxidizing agent that cause serious damage tohealth. It causes lung and skin cancer.

The yearly average Ni content in the different waste water sample was found to be minimum of 7.7mg/L in the effluent samples collected from dyes manufacturing industries, while higher concentration of 38.6mg/L was found effluent sample collected from pharmaceutical industries (Figure 1). Ni content in the effluent sample collected from paint manufacturing industries was 32.3mg/L which is the second largest content for contribute ion of toxic Ni metal. Total average concentration of Ni in the effluent sample collected from different industries was very much higher than maximum limit of 0.1mg/L set by WHO. Ni is considered as a goitrogenic agent. Due to the long-term exposure can cause chest pain, dry cough with shortness of breath, liver damage (12).Sunderman was reported carcinogenic action on rat due to most toxic nickel carbonyl compound(13).

Duringlast year average concentration of Zn was maximum (29.1mg/L) in waste water effluent samples collected from paint manufacturing industries.Second largest contribution of toxic Zn metal was from paper mills which contribute to 42.2mg/L while a dye manufacturing industries and textile mill each contribute to 24.5mg/L of Zn. Average result of the present investigation indicate concentration of Zn in different industrial effluent samples was above the permissible limit of 5.5mg/L as per USPH standard. Most common source of Zn poisoning in humus are metal fumes and acidic food prepared in zinc galvanizing container. When its concentration is beyond certain limit, symptoms of zinc toxicity includes vomiting, dehydration, stomach pains.

From the results it appear thatyearly average Cu content was minimum of 19.2mg/L in the effluent samples collected from pharmaceutical industries. While maximum concentration of Cu content of 35.2mg/L was found in the effluents from dyes industries (Fig.1).It was observed that the average Cu content was minimum of 19.2mg/L was found in the effluent from dyes manufacturing industries (Fig.1).It was observed that paper mills are the second largest contributor of toxic Cu in the environment showing 27.5mg/L of Cu in their effluent sample. The observedconcentration of Cu in the effluent samples collected from different industries were above limit of 0.05mg/L set by WHO.

Lead stay in environment forever and oldest metal known to man. It is discharged in the surface of water through paint, solders, pipes, building material, and food wrapped newspaper etc. have greater ability to absorb lead.(14)It is observed that, in second investigation, the maximum yearly average concentration of Pb was 36.1mg/L in effluent sample collected from paint industries, while second largest contribution of 27.1mg/L was found in the effluents of fine chemical manufacturing industries (Fig.1). In overall cases concentration of toxic Pb in the effluent sample was found to be extremely above the permissible of <0.05mg/L drinking water according to the UPSH drinking water standard(15).

Conclusion:

In present study at Badlapur Industrial estate it was concluded that, industrial effluent are the main source of pollution in water and soil. IndianGovernment is taking efforts to increase direct investment with foreign country. This huge investment is also expected in manufacturing chemicals, pesticides, textiles and every imaginable product which has more waste output and spreads toxic hotspot across the country. Due to rapid industrialization in India there is degradation of growing ecosystem and more damaging to the vast population of poor in the country. The detailed experimental analysissuggests urgent need for proper management of waste water.

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