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SOURCES AND CHARACTERISTICS OF GALVANIZING INDUSTRY EFFLUENT

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ABSTRACT

Present communication deals with the sources and physico - chemical characteristics of effluent of Galvanizing Industry. Analysis of effluent revealed acidic pH, high BOD and COD load. The effluent contained number of metallic pollutants comprising Fe, Zn, Pb and Cr.

INTRODUCTION

Pollution of environment by industrial effluent has been a major concern in recent years. The raw materials, variety of chemicals and metals and the technologies used are the primary factors determining the quality of released effluent of an industry. The components of the effluent contributed to the characteristics of the effluent and capable of altering the physical, chemical and biological characteristics of receiving ecosystem. The study of the industry effluent helps to understand quality of effluent and its impact on ecosystem.

Studies on physicochemical characteristics of industrial effluent were carried out by Dhaneswar *et al.* (1970), Mohanrao and Subrahmanium (1972); Agarwal and Kumar (1978); Choubey *et al.* (1986); Bhaskaran *et al.* (1989); Shaw *et al*. (1990); Sinha (1993); Baruah *et al.* (1996), Amudha and Mahalingan (1999); Das *et al.* (2000); Sundarmoorthy *et al.* (2000) and recently by Kumar *et al*. (2001). Due to dearth of literature on galvanizing industry, the present investigation was carried out to study the sources and physicochemical characteristics of galvanizing industry effluent.

Sources of effluent

There are two common galvanization methods i.e. Hot dip method and Electrolytic methods. The hot dip method is predominant in utility specially for galvanization of large size materials. During this process the mild steel materials are subjected to series of treatments including initial cleaning by bathing in acids, in water and in alkali followed by baths in molten lead, in ammonium compound ,in molten zinc and finally washed in hot water. Later, the materials are packaged and dispatched to market. The effluent is generated from the bathing, washing and cooling units and is almost regular in flow. The bathing units are emptied for the rejection of liquors as effluent after they assume the limiting concentration of raw materials. The volume of affluent depends upon the nature and quantity of product of galvanization.

MATERIALS AND METHODS

The effluent was collected in sterilized plastic container from the outlet of effluent treatment plant of a galvanizing industry located at the periphery of Guwahati city. The samples were brought to laboratory and analysed by following standard methodology of APHA (1985) and Trivedy and Goel (1986). The study was carried out monthly for a period of two years ie.2003 and 2004.

RESULTS AND DISCUSSION

The result of physicochemical analysis is presented in Table 1-2.The pH value indicated extremely acidic nature of effluent due to presence of acids originated primarily from the cleaning units of the industry. The high conductivity value suggested the occurrence of large amount of inorganic compounds in the effluent. The elevated value of turbidity also indicated the presence of sizable amount of suspended solids derived from washing and bathing units of the industry.These observations were in the line of Das *et al.* (2000) in waste water of open cast mining and Sundarmoorthy *et al.* (2000) in fertilizer factory effluent.

The analysis of effluent recorded high load of biochemical oxygen demand (BOD) and chemical oxygen demand (COD). The BOD load was associated with the presence of organic materials perhaps in the form of organic waste and the COD load was linked with the oxidisable chemicals in the effluent. Similar findings were reported by Mohanrao and Subrahmanium (1972); Sinha (1993); Baruah *et al*. (1996); Das *et al.* (2003), in the effluent of dairy, sugar, paper and oil industry respectively.

The analysis further revealed large amount of iron and zinc and marginal amount of lead and chromium. All these metallic substances originated from the raw materials ,bathing and washing units of the industry. The presence of different metals contributed to the toxicity of the galvanizing industry effluent and to the living organism also. Presence of toxic metals was earlier reported by Shaw *et al.* (1990); Baruah *et al.* (1996); Devi *et al.* (2001) in the effluent of chloro-alkali, paper and galvanizing industry respectively.

From the above findings it can be concluded that the galvanizing industry

Table 1
Results of analysis of Galvanizing Industry Effluent (2003).

Characteristics	January 2004	February 2004	March 2004	April 2004	May 2004	June 2004
pH	3.13 ± 0.159	3 ± 0.093	2.89 ±0.104	2.99 ±0.076	2.9 ±0.051	3 ± 0.109
BOD mg/L	48.5 ± 2.167	49.17 ± 3188	36.08 ± 20248	38.5 ± 0.837	36.27 ± 2.33	45.67 ± 2.58
COD mg/L	1071.5 ± 21961	1009.33 ± 14.935	984.83 ±30.727	993.67 ± 11.893	840.33 15.706	898.33 ± 9.438
Conductance mmho/cm	11709.17 ± 483.243	14036.67 ± 112.901	12130 ± 84.617	13000.89 ± 759.76	11835.83 ± 114.91	10434.83 ± 1204.07
Turbidity NTU	66.33 ± 1211	67 ± 1.265	62.67 ± 0.894	58.33 ± 2.422	63 ± 0.894	60 ± 1265
Iron mg/L	29.67 ± 1.751	25.17 ± 1.602	26.67 ± 0.816	26.5 ± 1.049	29.33 ± 1.033	31.67 ± 1.211
Zinc mg/L	365.17 ± 12561	373.17 ± 12.968	363.67 ± 15.358	467.67 ± 11.255	437.17 ± 10.815	386 ± 8.579
Lead mg/L	0.33± 0.014	0.24 ± 0.015	0.25 ± 0.011	0.178 ± 0.010	0.285± 0.022	0.548 ± 0.027
Chromium mg/L	0.04 ± 0.0075	0.05 ± 0.0081	0.055 ± 0.0104	0.04 ± 0.0103	0.03 ± 0.008	0.048 ± 0.0075

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Characteristics	July 2004	August 2004	September 2004	October 2004	November 2004	December 2004
pH	3.02 ± 0.049	2.78 ± 0.064	2.89 ± 0.036	2.79 ± 0.072	2.8 ± 0.116	2.86 ± 0.084
BOD mg/L	41.17 ± 2.137	45.17 ± 1.169	40.74 ± 2.927	53.22± 2.733	60.24± 3.559	41.43 ± 2.229
COD mg/L	898.33 ± 9.438	1001.5± 16.0489	923.17 ± 15.955	848.33 ± 5.955	897.67 ± 8.501	1044.33 ± 59.149
Conductance mmho/cm	15614.17 ± 137.565	14780 ± 122.257	11236.67 ± 133.866	13791.67 ± 119.066	14148.33 ± 104.387	16018.33 ± 154.456
Turbidity NTU	58.33 ±1.032	53.67 ±1.366	63.33±2.338	58.83 ±1.472	61 ±0.894	58.83 ±0.753
Iron mg/L	21 ± 1.414	32.5 ±1.378	22.33 ± 1.861	25.5 ±1.049	29.67 ±0.816	25.5 ±1049
Zinc mg/L	277.67 ± 12.437	348.67 ± 11.553	354.67 ± 11.148	283.5 ± 7.12	352.67 ± 13.736	455.33 ± 11.860
Lead mg/L	0.23 ± 0.027	0.295 ± 0.025	0.366 ± 0.033	0.415 ± 0.015	0.46 ± 0.028	0.278± 0.017
Chromium mg/L	0.048 ±0.0089	0.05 ± 0.0075	0.03 ± 0.009	0.06 ± 0.008	0.05 ± 0.008	0.03 ± 0.008

Table 2
Results of analysis of Galvanizing Industry Effluent (2004).

Characteristics	January 2004	February 2004	March 2004	April 2004	May 2004	June 2004
pH	3.05 ± 0.058	3.13 ± 0.416	2.86 ±0.137	2.88 ±0.115	2.97 ±0.1	2.82 ± 0.081
BOD mg/L	47.17 ± 1.169	37.5 ± 1.871	39.33 ± 1.966	46 ± 1.414	35.67 ± 1.366	34.67 ± 1.966
COD mg/L	1012.5 ±9.544	1072 ± 11.296	995 ±21.716	1018.17 ± 7.757	988 ± 6.481	1018.83 ± 9.438
Conductance	12978.33	16263.33	16386.67	17030	16831.67	15066.67
mmho/cm	± 115.311	± 173.743	± 164.884	± 84.617	± 116.347	± 88.468
Turbidity NTU	62.67 ±0.816	60 ± 0.894	57.17 ± 1.472	61.83 ± 1.602	56.33 ± 1.366	61.33 ± 1.506
Iron mg/L	20.83 ± 1.169	23 ± 1.414	28.5 ± 1.049	24.83 ± 1.472	24.33 ± 1.033	27.83 ± 0.752
Zinc mg/L	486.5 ± 8.450	384.17 ± 8.565	345.17 ± 5.231	304.33 ± 10.405	376.17 ± 9.948	358.83 ± 10.998
Lead mg/L	0.52± 0.014	0.42 ± 0.031	0.36 ± 0.017	0.30 ± 0.026	0.41 ± 0.043	0.33 ± 0.028
Chromium mg/L	0.065 ± 0.005	0.05 ± 0.009	0.056 ± 0.014	0.028 ± 0.006	0.048 ± 0.008	0.06 ± 0.005

Contd.....

Characteristics	July 2004	August 2004	September 2004	October 2004	November 2004	December 2004
pH	2.96 ± 0.033	3.04 ± 0.048	2.87 ± 0.043	2.99 ± 0.081	3.01 ± 0.028	3.02 ± 0.045
BOD mg/L	58.17 ± 1.472	59.83 ± 1.169	46 ± 1.095	36.5 ± 0.049	41.5 ± 0.548	43.67 ± 1.033
COD mg/L	1071.83 ± 24.42	1003± 14.54	999.67 ± 15.37	1075.5 ± 11.04	859.3 ± 11.34	1004.67 ± 14.39
Conductance	17121.33	15040.5	14144	9232.50	13114.33	11124.1
mmho/cm	± 153.188	± 110.659	± 73.316	± 83.77	± 494.369	± 320.786
Turbidity NTU	65.17 ±2.48	62.67 ±1.86	58.5 ±2.43	54.67 ±2.16	62.67 ±2.65	62.17 ±2.08
Iron mg/L	28.83 ± 1.471	29.66 ±2.58	21.66 ± 2.160	23.17 ±2.136	21.33 ±1.75	26.67 ±1.75
Zinc mg/L	262.67 ± 12.50	498.5 ± 15.15	359.5 ± 13.62	361.17 ± 17.67	461.33 ± 13.84	284.17 ± 13.48
Lead mg/L	0.33 ± 0.023	0.461 ± 0.038	0.365 ± 0.039	0.28 ± 0.026	0.176 ± 0.024	0.38 ± 0.014
Chromium mg/L	0.045 ±0.01	0.058 ± 0.012	0.05 ± 0.012	0.068 ± 0.009	0.04 ± 0.009	0.06 ± 0.008

effluent is toxic in nature, capable of altering the quality of receiving ecosystem and harmful to the living organisms both plants and animals. The effluent requires appropriate treatment to reduce its toxicity to a minimum level before releasing into nearby areas.

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A HANDBOOK OF ENVIRONMENT IMPACT ASSESSMENT

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1. INTRODUCTION

Concept of EIA, Hierarchy in EIA, Major issues in EIA, Scope for use of Computers in EIA, Scope of Current Research

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