Investigation of Pollutants in the Industrial Effluents

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Summary: Industrial effluents collected from different industries of I-9 sector Islamabad were examined for different physical parameters such as pH, SS, TDS, DS, DO and COD. Various anions such as Cl^{-1}, SO_4^{-2}, NO_3^{-1}, NO_2^{-1} and cations viz Na^{+}, K^{+}, Ag^{+}, Ca^{+2}, pb^{+2}, Ca^{+2}, Zn^{+2}, Mn^{+2}, Cd^{+2} were also investigated in the same effluents. The values were compared with standard, of NEQs and were found all parameters within the permissible limit except COD, Cl^{-1}, I^{-1} and cation like Cu^{+2}, Zn^{+2}, Mn^{+2} and Cd^{+2}. The hazardous effect of these parameters have also been discussed.

Introduction

Water a universal solvent is an essential for life on earth. The discharge of various toxic chemicals and substances into water make the life difficult on land. These substances and chemicals are introduced into water bodies by different means such as transportation, industrialization, urbanization, minings, weathering of soils and growth of population etc. Some of these pollutants causes different acute and chronic diseases, such as skin burns and rashes, causes bone abnormalities, lungs and digestive system disorderness, if discharge directly to the environment without treatment [1].

Earlier workers investigate various anions and cations in the industrial effluents as well as in other water sources and also discussed their implications. Vengosh determined chlorides and fluorides in the domestic sewage [2], nitrites were found in industrial effluents of udaipur (Rajistan) India [3]. Alcaraz found that nitrites causes the mortalities of fish [4], Gonzalves and Souza [5] Hiroyuki [6] determined the concentration of nitrites in waste and drinking water. Sulfate was also found by parie [7] in drinking water. Chlorides were determined by different method [8]. Sulfate arises from acid rain from oxidation of pyrite and its high concentrations causes diarrhoea and dehydration [9]. Polvez, shaun *et al* found SO_4^{-2} in the waste water of textile mills and found acidity in water due to oxidation of sulfur into H_2SO_4 which also affect the soil surface [10].

Earlier workers also investigated the various cations in the industrial effluents and in other water sources. Their implications were also discussed, for example B-utekunst *et al* studied the heavy metal in sewer film and found this sewer bio-film of waste water, which is several millimeter thick is enriched heavy metal [11]. Lin yuh uan *et al* also studied the heavy metal in river poyang lake and found several heavy metal like. Lead, Zinc and Cd [12]. Sarkar *et al* found higher concentration of heavy metals in a soft tissues of Gills and mantle of Molluscs [13]. Mallary et al studied the toxicity of Cu^{++}, Ni^{++}, in some species of fishes at different pH and found variations in toxicity of these metals with pH [14]

The present study was an effort to monitor the concentration of various pollutants present in the industrial effluents of I-9 sector Islamabad and their contribution toward environmental pollution.

Results and Discussion:

The industrial effluents collected from silver star soap, sliver star banaspati, cresent marble and FSL Fazal steel industries of I-9 sector Islamabad were analyzed for various parameters like temperature, pH, conductivity, TDS, DS, SS, total hardness, total alkalinity,. SO_4^{-2}, SO_3^{-2}, NO_3^{-1}, NO_2^{-1}, Cl^{-1} and I^{-1} The results are given in graph and table 1-5. The graphs and tables show that the pH, temperature, TS, TDS, SS, DO, total alkalinity,

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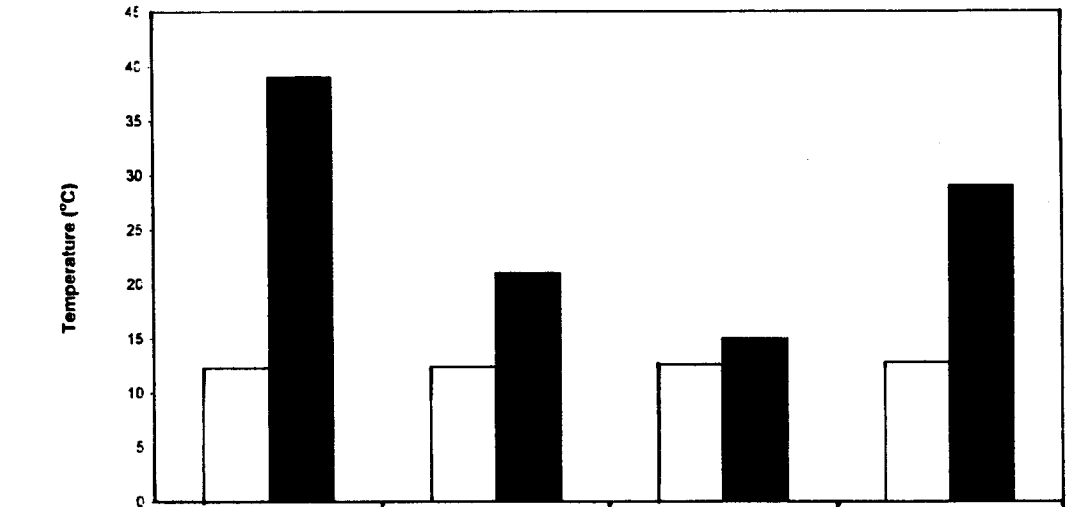
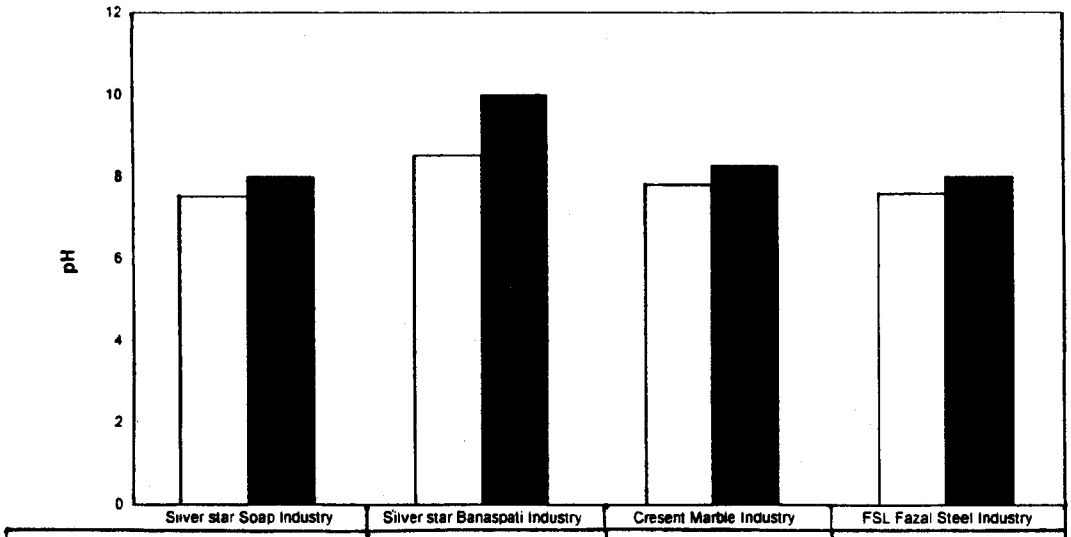


	Silver star Soap Industry	Silver star Banaspati Industry	Cresent Marble Industry	FSL Fazal Steel Industry
Temp. in the Lab	12.3	12.4	12.6	12.8
Temp. at the Spot	39	21	15	29

Fig. 1: Measurement of temperature (°C)



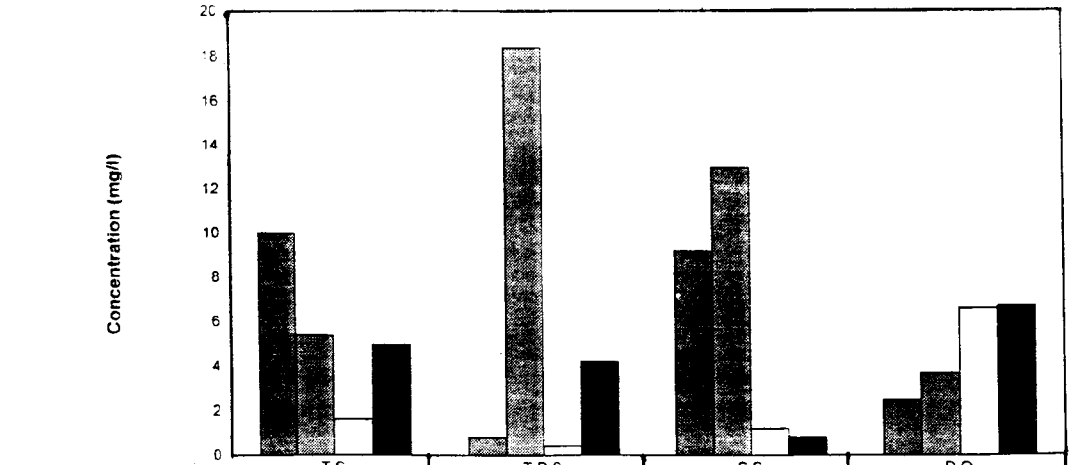
	Silver star Soap Industry	Silver star Banaspati Industry	Cresent Marble Industry	FSL Fazal Steel Industry
pH in the Lab	7.52	8.52	7.8	7.59
pH at the Spot	8	10	8.27	8

Fig. 2: pH determination of 1-9 sector Islamabad (effluents)

SO_4^{-2}, SO_3^{-2}, NO_2^{-1}, NO_3^{-1}, are within the permissible range when compared with NEQS and international standards (Table No. 7) except total hardness, COD, Cl^{-1} and I^{-1}. The total hardness which represent the concentration, of $CaCO_3$, found in high concentra-tion in silver star soap and silver star banaspati than permissible limit as shown in Figure 4. This high concentration may cause corrosion of pipes, and gastro-intestinal irritation, diahrea, dehydration.[1] The chlorides and I^{-1} concentrations were also found above the permissible limit of NEQs standards. Their high concentration

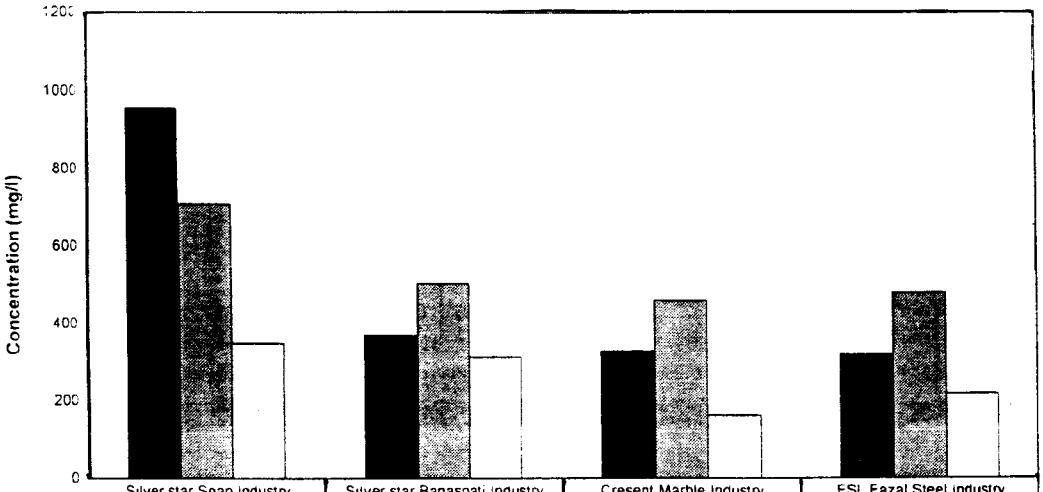
may cause kidney stone and cardiovascular diseases and gas trouble [1]. Chemical oxygen Demand (COD) indicate the concentration of organic matters in the effluents which may be oxidized by strong oxidizing agents, shows higher concentration in the effluents of all four industries (Fig. and Table 4), which is above the permissible limit of NEQs. This high COD may cause the depletion of DO in the receiving water bodies and which in turn may be harmful to (fishes) aquatic life [15].

Various cations were also investigated in the industrial effluents, has been shown the in figures. Fig. 6 indicates that pb^{+2}, Ca^{+2} Ag^{+}, Na^{+} and K^{+} are



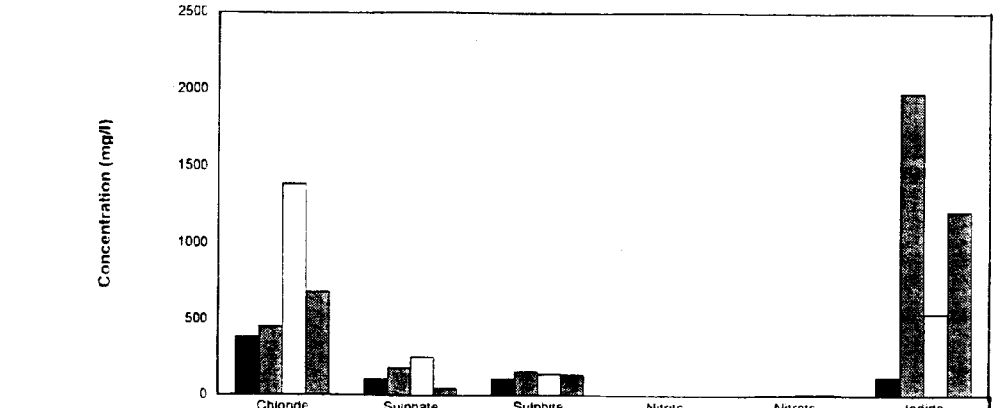
	T.S	T.D.S	S.S	D.O.
Silver star Soap Industry	10	0.8	9.2	2.5
Silver star Banaspati Industry	5.4	18.4	13	3.7
Cresent Marble Industry	1.6	0.4	1.2	6.6
FSL Fazal Steel Industry	5	4.2	0.8	6.7

Fig. 3: Determination of TS, TDS, SS, DO in the industrial effluents of 1-9 sector Islamabad.



	Silver star Soap Industry	Silver star Banaspati Industry	Cresent Marble Industry	FSL Fazal Steel Industry
COD	956	372	330	321
T.Hardness	710	505	460	480
T.Alkalinity	350	315	162	220

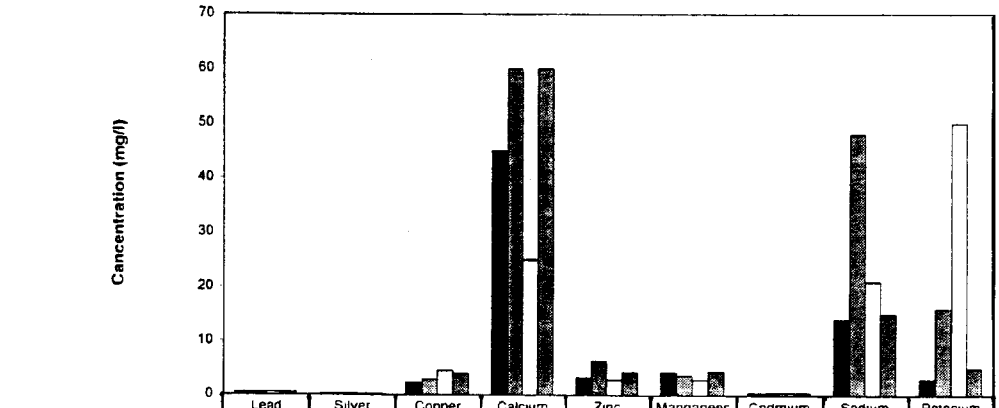
Fig. 4: Determination of COD, total hardness and total alkalinity in the industrial effluents of 1-9 sector Islamabad.



	Chloride	Sulphate	Sulphite	Nitrite	Nitrate	Iodide
Silver star Soap Industry	382	105	107.1	0.23	4.5	121
Silver star Banaspati Industry	451	182	156	0.31	2.61	1983.1
Cresent Marble Industry	1385	252	138.2	0.011	5.8	542.1
FSL Fazal Steel Industry	681.2	45	134.8	0.032	9.3	1210

Anions

Fig. 5: Determination of anions in the industrial effluents of 1-9 sector Islamabad.



	Lead	Silver	Copper	Calcium	Zinc	Manganees	Cadmium	Sodium	Potasium
Silver star Soap Industry	0.5	0.2	2.3	45	3.2	4.2	0.5	14	3
Silver star Banaspati Industry	0.5	0.2	2.9	60	6.3	3.7	0.5	48	16
Cresent Marble Industry	0.5	0.2	4.5	25	2.9	2.8	0.5	21	50
FSL Fazal Steel Industry	0.5	0.2	3.9	60	4.2	4.3	0.5	15	5

Cations

Fig. 6: Determination of cations in the industrial effluents of 1-9 sector Islamabad.

Table No. 7: National Environmental quality standards (NEQS) for municipal and liquid industrial effluents.(22)

Temperature (C°) (22)	pH value (22)	DO (mg/L) (22)	COD TSS (mg/L) (22)	TDS (mg/L)	Total Alkalinity (mg/L) WHO (23) EWPCA(24) AWWA (25)	Total hardness (mg/L) WHO (23)	Lead Zinc (mg/L) (22)	Calcium (mg/L) (22)	Iron (mg/L) (22)	Maganees (mg/L) (22)	Cadmium (mg/L) (22)	Nickel copper chromium silver (mg/L) (22)	Chlorides (mg/L) (22)	Nitrites (mg/L)
40	6-10	80	150	3500	500	500	0.5	750.	2.0	1.5	0.1	1.0	1000	1.0

below the permissible limit of NEQs standards, with exception to Cu^{+2}, Zn^{+2}, Mn^{+2} and Cd^{+2} which shows higher concentration than that of permissible limit of NEQs in all four industrial effluents. The higher concentration of Cu^{+2} may cause gastro-enterities with nausea and haemochromatosis [16]. High concentration of Zn can cause irritation of respiratory tract and physiological disorder [16]. Greater concentration of Mn^{+2} may cause a disease with effects similar to parkinson disease [1] The greater amount of Cd^{+2} can cause many disease, because it builds up in kidney, it is also carcinogenic [16].

All parameters were found below the recommended limit, of NEQs except Cl^{-1}, total hardness, Cu, Zn, and Cd, which shows some variations from NEQS, which may affect the health but when the waste waters are discharged into nearby water bodies like sea, river, stream may become within the limits of NEQS and may not produce harmful effects. However, it is suggested that the waste water must be treated by various chemical and physical methods such as ion exchange, lime soda, adsorption, chlorination, aeration and ozonation [26], for the recovery of some of the valuable elements before discharging to the water bodies.

Experimental

Samples of Industrial waste water of I-9 sector Islamabad were collected and stored in clean polyethylene bottles. During filling no air bubble was left behind the bottle. Before filling the samples, bottles were first rinsed with the sample water. pH and temperature were noted at collection point. Samples bottles were stored in refrigerator. Physical and chemical parameters such as pH, DO, COD, TS, TDS, SS, total alkalinity, conductivity, total hardness, sulphite, sulphate, nitrite, nitrates, chlorides, Iodide and some cations were investigated in these effluents.

pH was determined by using pH meter (model Hanna HI 8418) and conductivity by conductometer (model pcm^3-Jenway), TDS, SS, TS were measured gravimetrically by standard methods. DO was determined by DO tester (model MDR-r-Japan) and COD by reflux condenser method [17]. Monitoring for total alkalinity and total hardness was conducted by titrating with standard H_2SO_4 and EDTA [18,17] respectively. Chlorides [19], Iodide, sulphite, nitrite [20], nitrate [21] and sulphate [18] were investigated by volumetric methods. The amount of cations in the same effluents were determined by using atomic absorption spectrophotometer (model pu 9100 x).

Iodide (I^{-1})

Procedure:

Neutralized 50 ml sample with H_3PO_3 using methyl orange as an indicator. Added bromine water and boiled (until the colour disappeared). A few crystals of salicylic acid were added and cooled (20°C). Added 85% H_3PO_3 and 0.5 gm KI and titrated against 0.005 N $Na_2S_2O_3$. $5H_2O$ solution.

Calculation:

1 ml of 0.005 N $Na_2S_2O_3$. $5H_2O$ = 0.1058 mg of iodide.

sulphite (so_3^{-2}):

Procedure:

Took 10 ml of 2N iodine solution and 5 ml CH_3COOH in conical flask. Added 10 ml samples to the conical flask with constant stirring. Titrated the contents of conical flask against 0.025 N $Na_2S_2O_3$. $5H_2O$ solution.

The same experiment was followed for blank.

mg/L of $Na_2S_2O_3$. $5H_2O$ = 1 ml of $Na_2S_2O_3.5H_2O$ of blank – $Na_2S_2O_3.5H_2O$ for sample x 15.8.

Each experiment was done in triplicate.

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