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Characterization of Waste Water of Industrial area of Sitapura, Jaipur for Post Monsoon Season (2012)

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ABSTRACT

With increasing population the need of essential things has also increased so various raw materials are needed thus different industries are being setup. As the need of land has also increased industries are using outskirt of major cities like Jaipur, Gurgaon, and Alwar. RIICO is one of the largest industrial area in Jaipur it the largest Export-Park in Northern India. In our project wastewater was collected from various gutters of Sitapura and the sample water was characterized for their pollution characteristic. Results of the characterization analysis show that the total solids (TS), suspended solid (SS) and the dissolve solid (DS) were 5411, 3245 and 2166 mg/l respectively for the 1st week of sample collection in month of October. These values are high in comparison to the values schedule by the Environmental Protection Rules 1989 for effluent discharge standard for the industrial waste water. The result of the analysis of the biochemical oxygen demand (BOD) and Chemical oxygen demand (COD) of the sample waste water were 20-55 and 199-300 mg/l respectively. The analyzed result shows that the wastewater has high pollution potentials and so need to be treated before discharged to the environment. The conductivity of the sample water was found to be between 2846-3846 Scm-1 suggesting that the wastewater contain ions. The concentration of ions supports physicochemical method of coagulation and flocculation. Physiochemical methods may give a good alternative for the treatment of this wastewater. Physicochemical treatment of this wastewater yield substantial reduction in the solid concentration, BOD and COD, and so the treated effluent could be discharged safely into the environment without the fear of pollution. Waste water released can use after treatment for agricultural purpose.

KEY WORDS:- Total Solid, Biological Oxygen Demand, Chemical Oxygen Demand, Dissolve Solid, Sitapura, Jaipur

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INTRODUCTION

India's environment is becoming fragile and environmental pollution is one of the undesirable side effects of industrialization, urbanization, population growth and unconscious attitude towards the environment. At present, environmental protection is the main need of the society. Though industrialization and development in agriculture are necessary to meet the basic requirement of people, at the same time it is necessary to preserve the environment. In India, too, the environmental pollution has become a cause of concern at various levels [1]. In India, due to lack of sewage treatment plants, generally untreated sewage effluents are released either on agricultural land for irrigation or disposed of in nearby water bodies[2]. In general, sewage effluents from industries and municipal origin contain appreciable amounts of plants nutrients and variable amount of metallic cations [3] like Zn, Cu, Fe, Mn, Pb, Ni, Cd, etc . Long-term irrigation with such effluents increases EC, organic carbon content Thus, it becomes necessary to study the composition of sewage waters and heavy metals accumulation, with the help of advance techniques. Therefore, studies have been carried out in Sitapura industrial areas of Jaipur in the state of Rajasthan (India) under the Environmental Engineering laboratory.
Industries are major sources of pollution in this area. Based on the type of industry, various levels of pollutants can be discharged into the environment directly or indirectly through public sewer lines. Wastewater from industries includes employees' sanitary waste, process wastes from manufacturing, wash waters and relatively uncontaminated water from heating and cooling operations. The goals of our project is to characterize the waste water circulating around the Sitapura area of Jaipur in the post monsoon season to reduce pollution inputs, particularly toxicants, to restore natural productivity and to promote sustainable development of the surrounding as well as regulate the quality of the effluent realized into the environment. To fulfill this need specified waste water characterization guideline has been given by "Central Pollution Control Board" of India. These guideline documents are comprehensive, detailing the sampling methods, QA/QC requirements, parameters to be measured for the different types of industry and the analytical methods to be used. . During this I have characterized the wastewater from four different areas using sampling over a one to three day period.

OBJECTIVE

- To collect wastewater samples from four different sites using sampling techniques.
- To perform physical and chemical analyses on the samples and estimate contaminant loadings.
- To incorporate standard parameters into the interpretation of the data generated from this project.
- To provide a scientific and interpretative report on the project results and recommend the future waste water treatment to improve the present conditions.

Study Area

Jaipur district has geographical area of 11,061.44 sq. km forms east-central part of the Rajasthan State. Jaipur is the capital of the state known as Pink city. Jaipur is very much on the world tourist map, known for gem & jewellery and is also popular for Sanganer & Bagru prints. District is blessed by wide spectrum of landscapes including hillocks, pediments, undulating fluvial plains, aeolian dune fields, ravines, palaeo-channels etc. It is undergoing rapid urbanization and industrialization during last two decades. Such areas include Vishwakarma, Sudershanpura , Bais Godown, Jhotwara, Malviya, Sanganer, Sitapura industrial areas, etc., which play a major role in polluting different water resources.

EPIP- Industrial area of Jaipur, Which is a new modern effort mooted by the Government, implemented by RIICO has been built. It is the largest Export-Park in Northern India. RIICO has developed this Export Promotion Industrial Park (EPIP) to assist export oriented projects. It is located 6 Km from Jaipur air port along

NH-12 which is spread across 365 acres. Thousands of residential flats are available in Pratap Nagar Housing Board Colony, 1.5 km away and many colleges like ITI, Polytechnics, Engineering, Medical, Management, IT and Architectural colleges, Fashion Designing Institutes are also here. The wastewaters generated from diverse industries are disposed into water [4]. In our project we have tried to find the final water quality which when released in sewer from individual industries and effect of the effluent in the environment [5].

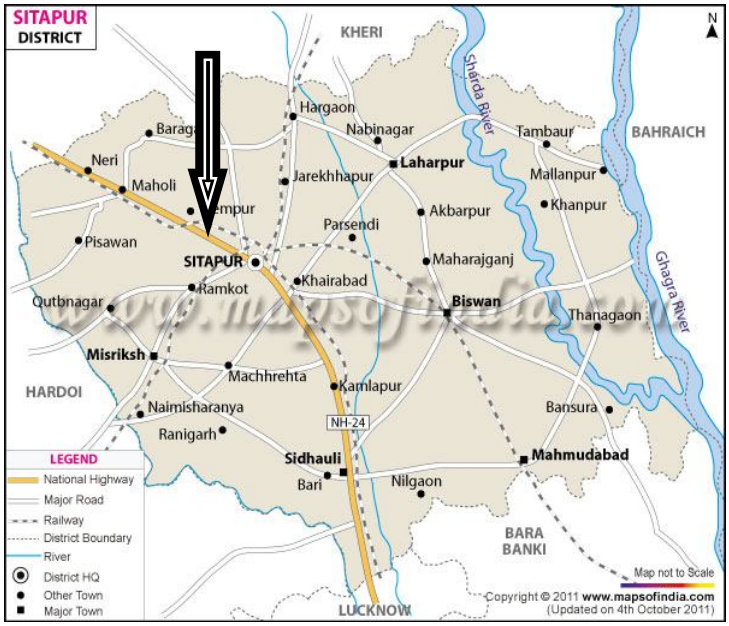

Fig1. Map showing the location of Study Area Sitapura

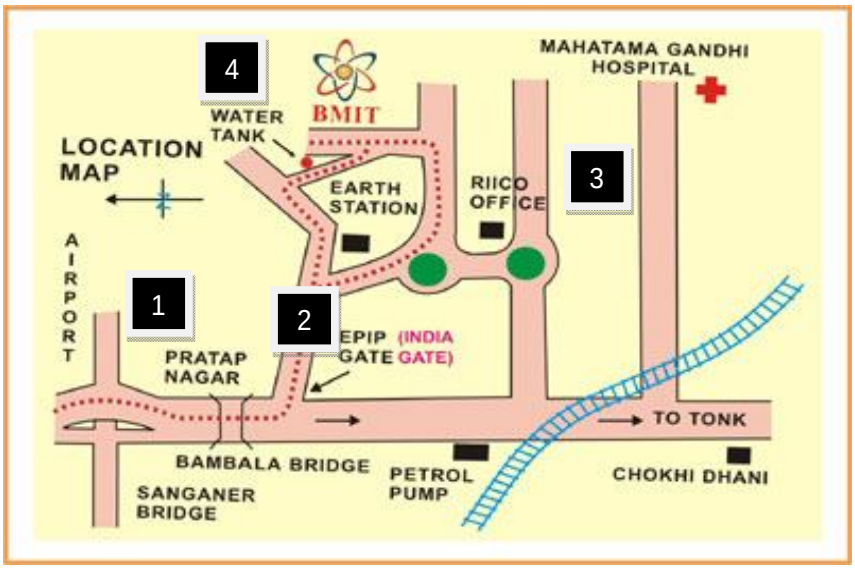

Fig2 map showing the sample collection Location

1. Near Pratap Nagar
2. Near EPIP gate
3. Near CPET
4. Near BMIT

MATERIALS AND METHOD[6, 7]

Various physical and chemical tests were done for the analysis of the sample.

- Colour of the sample was compared with the glass comparator and colourless distilled water. In coloured sample, it is impossible to match the colour with standard so in this case the yellow colour of the sample was assumed.
- pH meter: Consisting of potentiometer, a glass electrode, a reference electrode and a temperature compensating device was used to measure pH of samples
- Conductivity is the capacity of water to carry an electrical current and varies both with number and types of ions in the solutions, which in turn is related to the concentration of ionized substances in the water which was measured by conductivity meter.
- Residue left after the evaporation and subsequent drying in oven at specific temperature 103-105℃ of a known volume of sample help to calculate total solids as well as "Total suspected solids" (TSS) and "Total dissolved solids" (TDS).
- The settleable solids test was done by measuring of the volume of solids in one litre of sample that will settle to the bottom of an Inhofe cone during a specific time period. The test indicates the volume of solids removed by settling in sedimentation tanks, clarifiers or ponds.
- The potentiometric method was used since the sample was colored and turbid.
- The Biochemical Oxygen Demand (BOD) is an empirical standardized laboratory test which measures oxygen requirement for aerobic oxidation of decomposable organic matter and certain inorganic materials in water, polluted waters and wastewater under controlled conditions of temperature and incubation period which was done for 3 days incubated at 27°C in BOD incubator.
- COD was done with open reflux method in which results was obtained in 3-4 hrs The test is useful in studying performance evaluation of wastewater treatment plants and monitoring relatively polluted water bodies.
- Hardness is determined by the EDTA method in alkaline condition. When EDTA was added as a titrant, Calcium and Magnesium divalent ions get complexes resulting in sharp change from wine red to blue which indicates end-point of the titration.

RESULT

TABLE 1.1 *Physico-chemical parameters of wastewater of Sitapura Jaipur in 1 week of Oct 2012*

1	**Parameters**	**Site 1**	**Site 2**	**Site 3**	**Site 4**
2	Temperature (°C)	23	24	24	24
3	Color	Pale white	Pale yellow	grey	grey
4	pH	8.26	8.56	9.12	8.75
5	Electric Conductivity (Scm^{-1})	2846	3846	3246	2846
6	Total Solids (mg/l)	5411	7297	8474	8530
7	Total Dissolved Solids (mg/l)	2166	3400	4226	4420
8	Total Suspended Solids (mg/l)	3245	3897	4248	4110
9	Total Settle able Solids (mg/l)	55 00	7700	8720	9250
10	Chloride	1079.20	979.10	899.20	879.40
11	Total hardness (mg/l)	590	610	659	848
12	BOD (3 days at 27˚C)	20	35	42	55
13	COD	199	300	250	280

TABLE 1.2 *Physico-chemical parameters of wastewater of Sitapura Jaipur in 2 week of oct 2012*

1	**Parameters**	**Site 1**	**Site 2**	**Site 3**	**Site 4**
2	Temperature (°C)	23	24	24	24
3	Color	Pale Yellow	Pale yellow	grey	Greenish black
4	pH	8.3	8.3	8.12	8.75
5	Electric Conductivity	2896	4246	4846	3846
6	Total Solids mg/l	5411	7297	8474	8530
7	Total Dissolved Solids mg/l	2166	3400	4226	4420
8	Total Suspended Solids mg/l	3245	3897	4248	4110
9	Total Settle able Solids mg/l	6200	7900	8900	9300
10	Chloride	1179.20	989.10	879.20	779.40
11	Total hardness	620	630	650	865
12	BOD (3 days at 27˚C)	24	37	47	59
13	COD	219	325	270	300

Temperature

The temperature of wastewater was higher than that of the water supply because warm municipal water october have been added. The measurement of temperature is important because most wastewater treatment schemes include biological processes that are temperature dependent. The temperature of wastewater october vary from season to season and also with geographic location. Here the samples were taken in pre and post monsoon season and temperature varied from 19-25 °C.

Color

Color has help to assess the qualitative characteristic for the general condition of wastewater. Wastewater which was pale white in color was collected from site 1, while a light-to-medium grey color was characteristic of wastewaters that have undergone some degree of decomposition since it was stored for some time. The color of site 4 sample was dark grey or black, showing the wastewater was typically septic, having undergone extensive bacterial decomposition under anaerobic conditions. The blackening of wastewater was October be due to the formation of various sulphides, particularly, ferrous sulphide. This results when hydrogen sulphide produced under anaerobic conditions combines with divalent metal, such as iron, which October be present. Color was measured by comparison with standards.

Ph-Value

Most of the chemical and biochemical reactions are influenced by the pH, it is of great practical importance. The adverse effects of most of the acids appear below pH 5 and of alkalis above pH 9.5. The sewage pH was slightly alkaline, ranging from 7.14-6.84 from site 1 to site 4.

Electrical Conductance (At 25°C)

The electrical conductance is reciprocal to the electrical resistance and the G values show total ions per centimetre. It is a numerical expression of the ability of a water sample to carry an electric current. There was not much variation in the Site 1 samples between 1st and 3rd week but there was significance variation was noted in site 4 sample which was found to be 2846 µS in 1st week and 3846 µS.

Fig3. Conductivity Test Total Solids

The total solids in a wastewater consist of the insoluble or suspended solids and the soluble compounds dissolved in water. The organic matter consists mainly of proteins, carbohydrates and fats. Between 40 and 65 % of the solids in an average wastewater are suspended. In this fig. the sample of 1st week and 3rd week was compare and TS of 3rd week was found to be increased than 1st week.

Total Dissolved Solids (Tds)

TDS has shown subsequent deference between all four sites 2166 µg/L 3400 µg/L 4226 µg/L & 4420 µg/L. Thus the salt concentration in the sewage is much higher than it should be.

Total Suspended Solids (Tss)

The total solids in a wastewater consist of the insoluble or suspended solids and the soluble compounds dissolved in water. The organic matter consists mainly of proteins, carbohydrates and fats. Between 40 and 65 % of the solids in an average wastewater are suspended. In this fig. the sample of 1st week and 3rd week was compare and TS of 3rd week was found to be increased than 1st week. From 3245 µg/L to 4248 µg/L

Settle Able Solids

The settleable solids test is the measurement of the volume of solids in one liter of sample that will settle to the bottom of an Inhofe cone during a specific time period. The test indicates the volume of solids removed by settling in sedimentation tanks, clarifiers or ponds. The settleable solids test indicated that there is a need of primary treatment.

Chloride

Chloride is one of the major inorganic anions in water and waste water. The chloride content showed fluctuations within a range of 879.4 – 1079 mg/L in 1st week in the 3rd week the range was more variant than first results from 779.4 – 1179.2 mg/L.

Hardness

It is produced in waste water due to various reasons by multivalent metallic cations. Such ions are capable of reacting with soap to form precipitates and with certain anions present in the water to form scale, the divalent calcium, magnesium, strontium, ferrous iron, and manganous ions and derived largely from contact with soil and rock formation.

Fig4. Titration process for hardness

Chemical Oxygen Demand

COD determines the amount of oxygen required for chemical oxidation of organic matter using a strong chemical oxidant, such as potassium dichromate under reflux conditions.

Fig5. Open flux method of COD

Biochemical Oxygen Demand

BOD has been used as a measure of the amount of organic materials in an aquatic solution which support the growth of microorganisms .BOD determines the strength or polluting power of sewage, effluents and other polluted waters and provides data on the pollution load in natural waters. Higher values of BOD indicate a higher consumption of oxygen and a higher pollution load. The BOD values . No significant variation in BOD was observed between other sites

Summery & Conclusion

The sample collection procedures for characterizing the effluent loadings specified was found to be effective in quantifying the loadings from various. If the suspended solids are greater than 300 mg/L, the concentrations of parameters associated with suspended solids should be determined from the mean of grab

samples. Although many of the measured parameters were less than detection limits, the list should still be used in the initial characterization. The parameter list can be amended in subsequent characterization measurements to exclude parameters that were found near detection limits (five times the MDL). The sampling program must be site specific and therefore site visits before the sampling program is as an important component of the characterization process. In the bioassay component of the characterization, it was found that it did not matter whether the acute and chronic toxicity procedures were carried out on grab or composite samples as the results for both types of samples were identical.

REFERENCES

1. S. A. Paul*, S. K. Chavan and S. D. Khambe , "Studies On Characterization Of Textile Industrial Waste Water In Solapur City", Int. J. Chem. Sci. 2012; 10(2): 635-642.
2. Ladwani Kiran D., Ladwani Krishna D., Manik Vivek S.and Ramteke Dilip S., "Impact of Industrial Effluent Discharge on Physico-Chemical Characteristics of Agricultural Soil", International Research Journal of Environment Sciences. 2012; 1(3): 32-36.
3. Ram S. Lokhande1, Pravin U. Singare2,*, Deepali S. Pimple3, " Study on Physico-Chemical Parameters of Waste Water Effluents from Taloja Industrial Area of Mumbai, India", International Journal of Ecosystem. DOI: 10.5923/j.ije.20110101.01. 2011; 1(1): 1-9.
4. George S. Russell, " Effect of Industrial wastes on sewerage system", Sewage Works Journal. Published by Water environment Federation, 1929:1(2):242-245.
5. William Marcus Ingram and W. W. Towne, "Effects of industrial wastes on stream life" Proceedings of the fourteenth Industrial Waste Conference. 1959; 678-710.
6. Sharma S. K. Gupta Pankaj and Sharma Sanjay, Published one research paper on "The Biochemical Determination of High Fluoride Concentration in Potable Water, In Relation to Renal Failure" in The Global Journal of Pharmaceutical Research (TGJPR). 2012; 1(4):. 672-676.
7. Gupta Pankaj, Borauh Monalisa and Usmani Nisar Khan, Published one research paper on "A Specific Study of Drinking Water Status in Term of Essential Characteristics Present in Rural and Urban Area of Alwar District (Raj.) INDIA" in International Journal of research in pharmacy and science (IJRPS). 2012; 2(2): 123-129.