Physiochemical Analysis of Pre & Post Monsoon – A Case Study of Amanishah Nala Jaipur

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***Abstract*– Jaipur is one of the developing areas, surrounded by various industrial zones. Most of the industries need water for processing which leading to discharge of waste water into the sewer. Sewage is composed of many materials thatare broken down into three general properties. These properties are the physical, chemical, and biological characteristics of wastewater.Waste water, or sewage, is a complex and variable mixture of industrial, commercial and residential waste. Waste water from different sources differs in individual characteristics, which are extensively studied and analyzed when deciding a viable option for its disposal or treatment.In this project waste water samples collected from 10 different sites from Amanishah Nala, Jaipur 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 present in water in high concentration 3500 ppm, 1000 ppm and 3000 ppm respectively during Pre & Post Monsoon analysis. The result of the analysis of the biochemical oxygen demand (BOD) and Chemical oxygen demand (COD) of the sample waste water were 9.0 – 20.7 ppm and 48- 188.8 ppm respectively. The analysed result shows that the wastewater has high pollution potentials and so need to be treated before discharged to the environment.**

Keywords—Waste water, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand,

I. INTRODUCTION

Former Amanishah Nala is known as "Drvayavati River".AmanishahNala is about 45 km long Starting from Vishvakarma industrial area. Now it is becomes main sewer line of Jaipur which is getting polluted due direct disposal of water from household and industries. Dye industries directly disposed waste matter directly into the AmamnishahNala around it's such as Sanganer town. Also in such areas around Amanishah Nala for agricultural purposes its water is used which is injurious to human health and Cancer Causing.

Sewage is a water-carried waste, in solution or suspension that is intended to be removed from a community. The physical characteristics of waste water include its solid content--suspended organicmatter, floating matter and dissolved matter--its temperature, color, dour /smell, density, conductivity, specific gravity, transmittance and specific weight. According to Marcos von Sperling in the book "Wastewater Characteristics, Treatment and Disposal," the temperature of waste water is slightly higher than regular drinking water and it varies with seasonal change.

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

II. 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. It is undergoing rapid urbanization and industrialization during last two decades. Such areas include Vishwakarma, Sudershanpura, BaisGodown, Jhotwara, Malviya, Sanganer, Sitapura industrial areas, etc., which play a major role in polluting different water resources.Study area of the project is Amanishah Nala former known as "Dravyavati River" which is of about 45 km length, starts from Vishwakarma Industrial area. Amanishah Nala is crosses Jaipur city thus rapidly polluted by disposing domestic and industrial waste.

The sewage sample collected from 10 different sites as sample Collection Sites are Vishkrama Industrial Area, Vidhyadhar Nagar - Swarn Jayanti Park, Sodala - VivekVihar, Mansarovar-Maharani Farm, Sanganer - Near Sanganer over Bridge, Kumbha Marg, Pratap Nagar, PGI, Sitapura, Goner, Ralawata Beri and Barala.

III. METHODOLOGY

There are different physical parameter are checked for all sites selected in this research. Several physical properties of water was checked in this research such as temperature, pH, Colour, turbidity, dissolved solids, settle able solids, DO, BOD and COD.

Temperature is determined using instant temperature at the time collection of sewage sample from the sewer line.The observations of temperature of sewage are useful in indicating solubility of oxygen, which affects transfer capacity of aeration equipment in aerobic systems, and rate of biological activity.The temperature determined is instant temp.pH is determined using pH meter. Consisting of potentiometer, a glass electrode, a reference electrode and a temperature compensating device was used to measure pH of samples. For the calibration of pH meter distilled water is used.

Colour is determined by naked eyes perception by taken sewage Sample into a transparent beaker. Generally colour of the sewage sample vary according to the biological action to decompose the bio – degradable matter. Fresh sewage is of yellow and green colour whereas stale sewage is of black and dark brown colour.Turbidity is determined using "Nephlometer".Nephlometer is a device used for the determination of turbidity. This is based on the principle of scattering of light. Turbidity measured by the nephlometer is in NTU (Nephelometric Turbidity Unit).

Total solid, Total suspended solid & total dissolved solids are determined Using evaporation method. Residue left after the evaporation and subsequent drying in oven at specific temperature 103-105°C of a known volume of sample help to calculate total solids as well as "Total suspected solids" (TSS) and "Total dissolved solids" (TDS).For the evaporation thermostatically controlled oven is used.

Settle able solids are determined using Imhoff Cone of capacity 1 litre. The amount of solids settle down in a specific time are the settle able solid for that sewage water.

DO is determined using Winkler's Titrimetric method. In this method the amount of dissolved oxygen is calculated with respect of amount of Iodine consume in sewage sample

BOD is also determined using Winkler's method. 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 is determined using open reflux condenser 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.

IV. RESULTS AND DISCUSSION

The colour of sewage can normally be detected by the necked eye, and it indicates the freshness of sewage. If its colour is yellowish, grey, our light brown, it indicates fresh sewage. However if the colour is black or dark brown, it indicates septic sewage.Colour has help to assess the qualitative characteristic for the general condition of waste water. The colour of samples during phase 1 is found yellowish majorly and also green & black. Thus major sample collection sites are affected by recent pollution. There is no significant change occurs in phase 2 except sample no. 2, 5, 6, 7, 8, 9, and 10.The temperature has an effect on the biological activity of bacteria present in sewage, and it also affects the solubility of gases in sewage. Temp. Of the samples at the time of collection is vary from 20 to 30 ºC. The temp. of samples during phase 1 or post monsoon analysis is higher than water supply because of warm municipal and industrial waste water added in November. Temp. of samples during pre-monsoon analysis is slightly less than post monsoon analysis because of winter season. The measurement of temperature is important because most wastewater treatment schemes include biological processes that are temperature dependent.

TABLE I. ANALYSIS OF TEMPERATURE FOR SAMPLE

Sample No.	1	2	3	4	5	6	7	8	9	10
Temp(Pre), ºC	30	27	23	28	27	30	29	29	28	28
Temp(Post),ºC	20	29	26	29	29	19	23	21	21	20

Sewage is normally turbid, resembling dirty dish water or waste water from baths having other floating matter like fecal matter, pieces of paper cigarette-ends match-sticks, greases, vegetable, fruit-skins, soaps, etc.Turbidity of the waste water samples vary from 50 – 220 NTU. Turbidity increases as sewage becomes stronger. As per the data turbidity of the Post- Monsoon analysis is higher than the turbidity of sewage samples in Pre monsoon analysis due rain before sewage sample collection.

TABLE II. ANALYSIS OF TURBIDITY OF SAMPLE

Sample No.	1	2	3	4	5	6	7	8	9	10
Turbidity(Pre), NTU	160	180	100	200	160	60	80	110	60	50
Turbidity(Post), NTU	170	182	90	220	165	60	80	116	58	50

The pH value of sewage indicates the negative log of hydrogen ion concentration present in sewage.pH of the sewage samples during post and pre monsoon analysis is vary b/w 6.17- 7.4. In Pre- Monsoon analysis pH of samples is below 7 which is shows the production of acids and oxidation of sewage. In Post Monsoon analysis pH of samples- 1 to 4 is below 7 and pH of samples- 5 to 10 is above 7 which is shows that this is properly oxidized sewage.

TABLE III. ANALYSIS OF PH

Sample No.	1	2	3	4	5	6	7	8	9	10
pH(Pre)	6.86	6.83	6.84	6.60	6.26	6.92	6.63	6.82	6.36	6.17
pH(Post)	6.66	6.83	6.54	6.67	7.3	7.20	7.23	7.33	7.35	7.4

Total solid include suspended solids, dissolved solids, colloidal solids, and settleable solids. Generally the total amount of solids present in the sewage sample is .01% of total volume. The analysis of sewage samples is done in two phases thus two observation tables for total solid is below here.Amount of TS is vary b/w 1000 to 3500 ppm. The value of total solid in Post-Monsoon analysis is higher than Pre- Monsoon analysis.

TABLE IV.ANALYSIS OF TOTAL SOLID OF SAMPLE

Sample No.	**TS in Ppm (Pre Monsoon)**	**TS in Ppm (Post Monsoon)**
1	3000	3500
2	2000	2000
3	2000	2500
4	1500	1000
5	1500	1500
6	3500	2000
7	2500	1500
8	2000	2000
9	1000	1500
10	1000	1000

Total Suspended solids are those solids which remain floating in sewage. These solids are retained by a filter in one micrometer. Total suspended solid is calculated in two phases as given below the amount in two observation tables.The total solids in a wastewater consist of the insoluble or suspended solids and the soluble compounds dissolved in water. The value of TSS is vary from 0 to 1000 ppm.

TABLE V. OBSERVATION OF TOTAL SUSPENDED SOLID

Sample No.	**TSS in ppm (Pre-Monsoon)**	**TSS in ppm (Post- Monsoon)**
1	500	500
2	500	0
3	0.0	1000
4	500	0
5	500	500
6	500	500
7	1000	500
8	0.0	1000
9	0.0	500
10	0.0	500

Total Dissolved Solids are those which remain dissolved in sewage just as salt in water. In dissolved solids generally salts are included which dissolved with sewage water. TDS is also calculated in pre and post monsoon analysis as given below in observation tables.Total dissolved solids shows the concentration of salts dissolve in the sewage. The value of TDS is vary from 1000 to 3000 ppm. Thus the sewage has higher concentration of salts.

TABLE VI. OBSERVATION OF TOTAL DISSOLVED SOLID

Sample No.	**TDS in Ppm (Pre-Monsoon)**	**TDS in Ppm (Post-Monsoon)**
1	2500	3000
2	1500	2000
3	2000	1500
4	1000	1000
5	1000	1000
6	3000	1500
7	1500	1000
8	2000	1000
9	1000	1000
10	1000	500

Settle-able solids are that portion of solid matter which settles out, if sewage is allowed to remain undisturbed for a period of 1 hours. Settle able solids are required to be determined because with the help of this data sedimentation tank is designed for the sewage treatment plant. Settle able solids are also calculated in two phases as given below in observation tables.The settle able solids test is the measurement of the volume of solids in one litter 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 settle able solids test indicated that there is a need of primary treatment. Here the value of settle able solids is varying from 0 to 17 ml/litre.

TABLE VII. ANALYSIS OF SETTABLE SOLIDS

Sample No.	Vol. of Settle able Solid in ml(Pre Monsoon)	Vol. of Settle able Solid in ml(Post Monsoon)
1	Nil	Nil
2	4.0	4.5
3	4.6	5.0
4	8.0	8.0
5	12.0	10.0
6	0.0	0.0
7	12.0	14.0
8	0.0	0.0
9	5.0	4.0
10	6.0	6.0

Dissolved oxygen is the total amount of free oxygen present in sewage. It is generally determined by Winkler's method. Dissolved oxygen is used by the aerobic micro – organisms present in the sewage water for the decomposition of organic water. DO is calculated in two phases as given below.Dissolved oxygen shows the free amount of oxygen present in the sewage sample for the oxidation of organic matter. As per the analysis no sewage has dissolved oxygen above 4 ppm which shows there is anaerobic reaction occurs.

TABLE VIII. OBSERVATION OF DISSOLVED OXYGEN

Sample No.	DO in ppm (Pre-Monsoon)	DO in ppm (Post-Monsoon)
1	0.0	1.1
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	3.0	2.5
8	0.0	0.0
9	1.2	1.0
10	0.0	0.4

BOD is the total oxygen required by the bacteria to use for oxidized the biological active organic matter present in the sewage. BOD shows the degree of treatment required for the sewage water.BOD of the sewage samples during Pre-Monsoon and Post- Monsoon analysis is vary from 9.0 ppm to 20.7 ppm. 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. There is no significant change found in Pre and Post monsoon analysis.

TABLE IX. OBSERVATION OF BIOCHEMICAL OXYGEN DEMAND

Sample No.	BOD ppm (Pre-Monsoon)	BOD ppm (Pre-Monsoon)
1	12.6	13.5
2	12.6	11.7
3	12.6	12.6
4	9.9	9.0
5	10.8	11.7
6	12.6	14.4
7	19.8	20.7
8	15.3	16.2
9	15.3	15.3
10	16.2	18

COD is the total oxygen required for oxidized biological active and inactive organic matter by the bacteria in sewage. COD is a big parameter for the designing of sewage treatment plants. It is calculated in two phases as given below in observation tables. The value of COD found during Pre and Post Monsoon analysis is much more than the amount of BOD which shows the amount of non- biodegradable matter is more the amount of bio-degradable matter in the sewage water.

TABLE X. OBSERVATION OF CHEMICAL OXYGEN DEMAND

Sample No.	COD, ppm (Pre-Monsoon)	COD, ppm (Post-Monsoon)
1	80	112
2	86.4	118.4
3	99.2	156.8
4	92.8	188.8
5	153.6	182.4
6	80	92.8
7	57.6	48
8	54.4	99.2
9	118.4	134.4
10	147.2	156.8

V. CONCLUSIONS

Amanishah Nala is main sewer line of Jaipur and it is getting polluted continuously. Water contamination is a very big problem in Jaipur because of the less concern about the health and environment. During our study we analyzed various parameters such as pH, turbidity, temperature, total dissolved solids, dissolved oxygen, biochemical oxygen demand, conductivity, etc. These study results will be helpful in designing of new treatment plant. The results will be helpful in maintaining human health & safe environment. Some parameters such as Total Solid, Total Suspended Solid, and Total Dissolved Solid are present above 1000 ppm. pH of sample is b/w 6.6 – 7.4. COD is greater than BOD by 2.5 times which shows the presence of inorganic matter in the sewage. DO of the sewage sample is less than 4 ppm which is necessary for aquatic life. Thus water of Amanishah Nala is requiring treatment before disposing since its water is also used for agricultural purposes. Water used for the agricultural purposes is not safe for human health. Physiochemical properties of the sewage water is found to be more than the standards set by Rajasthan Pollution Control Board, Jaipur for the disposal of waste water into any stream line.

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