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Analysis of Characteristics of Wastewater in Meerut

Vinay Kumar Singh[1], Tushar Kumar[2], Tushar Tyagi[3], Vivek Kumar[4], Vinay Vardhan Singh[5], Shubham Taliyan[6]

[1,2,3,4,5,6] Department of Civil Engineering, Meerut Institute of Engineering & Technology, Meerut, Uttar Pradesh, India

ABSTRACT

Wastewater study has made a sincere attempt to characterize the sewage in Meerut. Waste water and its characteristics are important factors to recognize surface water pollution. The study involves dividing the entire city on the basis of various aspects so as to cover maximum variation and to get overall representative data of wastewater generation in the city, sample collection from the marked sites of the city, perform experiments on sewage water and findings to be tabulated so as to compare them with standards of you, chemical and biological characteristics like pH, turbidity, conductivity, COD, BOD etc. have been tested in the laboratory. Different-different results have been obtained for domestic, commercial and industrial wastewater. Huge variation has been found in turbidity of all types of wastewater samples (50-369.33 NTU). The variations in other parameters like pH, conductivity, BOD, COD are not highly significant. All the parameters have been determined for 3 samples and the mean value these 3 values of each parameter has been noted. All values of parameters are as per standards which show all industries are forced by law however implementation of biochemical plants in the city can be a good option for future perspective. All obtained results are useful to get a clear picture of wastewater quality in the city.

I. INTRODUCTION

Wastewater is any water that has been affected by human use. Wastewater is defined as any water that has been negatively affected in quality by humans. It contains physical, chemical and biological pollutants and is composed of liquid and solid waste that is discharged from domestic residences, commercial properties, industrial plants, and agriculture facilities or land. Wastewater contains a wide range of contaminants at various concentrations. Households may produce wastewater from flush toilets, sinks, dishwashers, washing machines, bath tubs, and showers. Households that use dry toilets produce less wastewater than those that use flush toilets. Wastewater is used water from any combination of domestic, industrial, commercial or agricultural activities, surface runoff or storm water, and any sewer inflow or sewer infiltration. Therefore, wastewater is a by-product of domestic, industrial, commercial or agricultural activities. The characteristics of wastewater vary depending on the source. Expansion of urban population and increased coverage of domestic water supply and sewage give rise to municipality waste water. With the current emphasis on environmental health and water pollution issues, there is an increasing awareness of the need to dispose of this wastewater safely and beneficially. Use of wastewater could be an important consideration when its disposal is being planned in arid and semi-arid regions. However it should be realized that the quantity of wastewater available in most regions will amount for a small portion of the total irrigation water requirement. Nevertheless, other wastewater use results in conservation of higher quality water and its use for purposes other than irrigation.

II. STUDY AREA

For the analysis of the city, the study area has been divided into following five different zones. The main purpose of this is to get data of all types of wastewater in the whole city.
(i) Residential colonies- Ganga Nagar, Shastri Nagar
(ii) Commercial area- Begumpul
(iii) Industrial- Partapur
(iv) Industrial cum residential- Kanker Khera

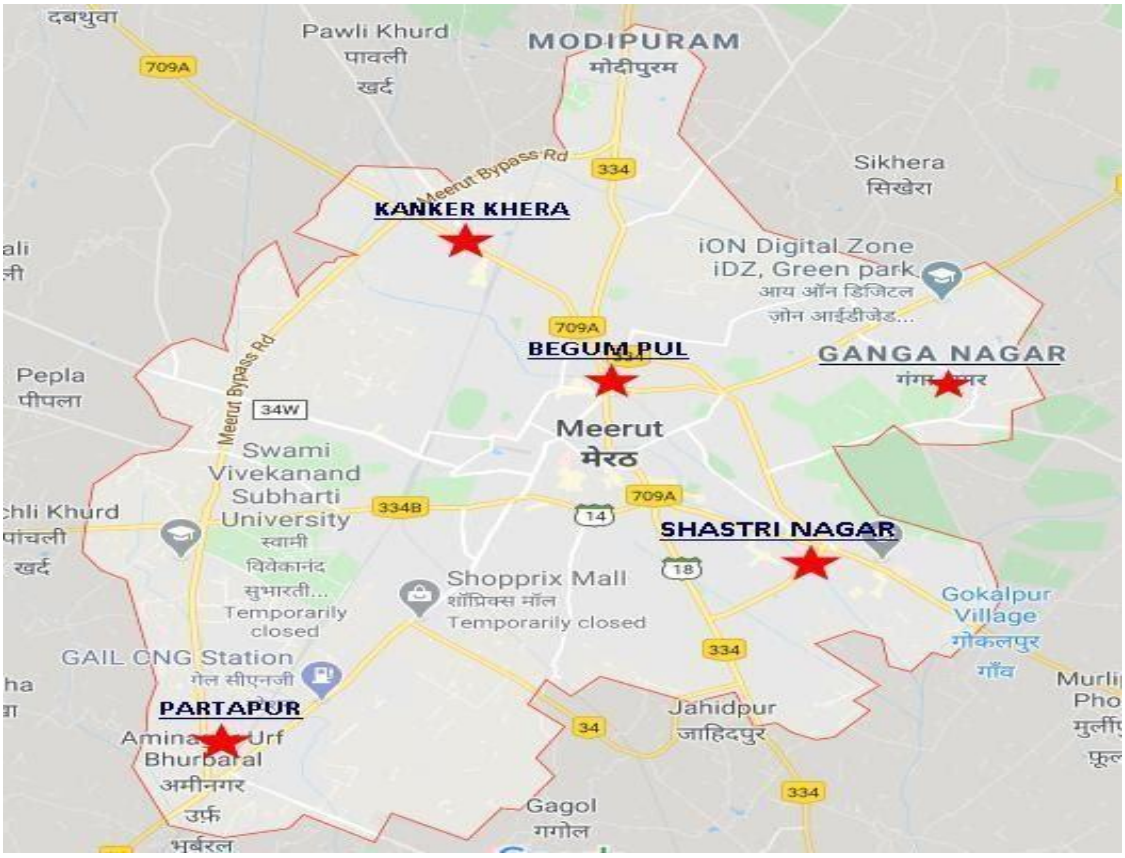

Fig.1Index map of study area (MEERUT)

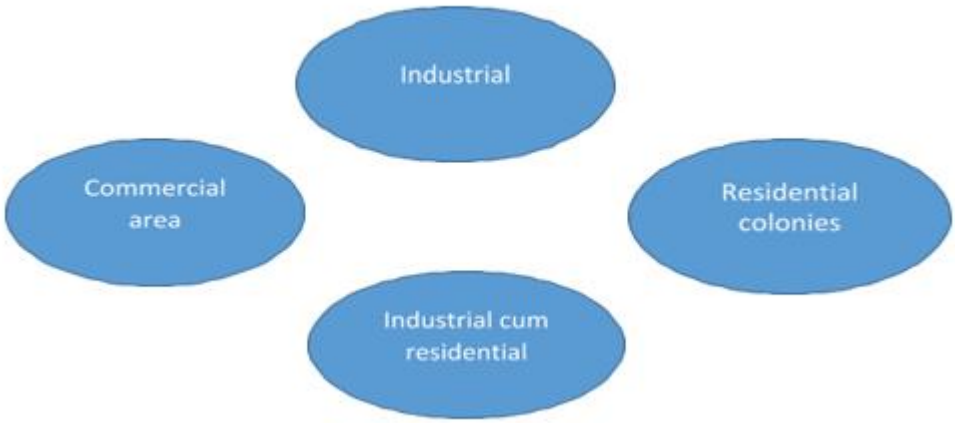

Fig. 2: Aspects considered to select sample collection site

(i) Shastri Nagar: It is also a well established residential area of Meerut city.

(ii) Ganga Nagar: It is a totally residential area. This area has seen a drastic acquisition / purchase of property and further development in the past 15 years. Today it is an abode of nearly 10,000 families.

(iii) Begumpul: It is predominantly a commercial area in Meerut and is also called the heart of the city. It is the commercial hub of the city with markets like Sadar bazaar, Abulane etc.

(iv) Partapur: This area is the industrial heart of the city and consists of government approved Mohkampur industrial area.

(v) Kankerkhera: It is a mixed area consisting of a few industries as well as a huge residential sector-Modipuram. Industries include distillery. It is a residential cum industrial area.

Fig.3: Domestic wastewater sewer of Shastri Nagar

Fig. 4: Main sewer of Ganganagar (Meerut)

Fig.5: Municipal sewer of Begum Bridge

Fig. 6: Industrial sewer Partapur

Fig.7: Main sewer of Kanker Khera (mohammadpur)

III. METHODOLOGY

Following tests have been carried out to achieve research goals.

(i) pH value Test:
The pH values of different samples in different zones were calculated with the help of an apparatus called potentiometer, by dipping an electrode (calomel electrode) in the sample.

(ii) Turbidity Test:
Nephelometer was used to calculate the turbidity of all wastewater samples from different areas of Meerut. Working of an instrument is based on the amount of light scattered at 90 degrees.

(iii) Conductivity Test:
The conductivity of different samples from different zones were calculated by an apparatus called di-ionic tester, in which an electrode is connected and it is dipped in a wastewater sample.

(iv) BOD Test:
BOD of all the wastewater samples were calculated by titrating the samples, after putting them in the BOD incubator for 5 days.

Fig. 8: BOD bottles filled with samples (Before titration)

Fig.9 BOD incubator at MIET

(v) COD Test :
Titration method was adopted for calculating the COD of all samples from different zones. However, titration was carried after heating the sample in COD apparatus for 2 hours.

IV. RESULTS & DISCUSSION

The following are the results that were obtained after the successful completion of tests.

Table 1. Test results of 3 samples from every site.

Sites	Sample No.	pH	Turbidity (NTU)	Conductivity	BOD (mg/l)	COD (mg/l)
SHASHTRINAGAR	1.	8.3	97	1.5	7.4	17.5
	2.	7.8	87	1.4	8.9	16.8
	3.	8.8	105	1.7	9.08	18.6
GANGANAGAR	1.	9.4	48.7	1.156	8.3	17.8
	2.	8.35	51.3	1.31	9.5	19.2
	3.	8.23	50.1	1.23	10.37	18.3
BEGUM BRIDGE	1.	9.10	127	0.540	6.9	19.1
	2.	8.93	119	0.803	8.2	18.3
	3.	7.73	123	1.13	8.69	19.3
PARTAPUR	1.	7.68	380	1.448	3.8	23.5
	2.	7.70	388	1.013	5.1	11.7
	3.	7.5	340	1.345	5.05	9.8
KANKERKHERA	1.	7.94	79.4	1.3	6.4	15.4
	2.	7.45	76.2	1.2	5.9	18.6
	3.	8	81.2	1.3	6.84	19.2

In our experiment work, we have analyzed variations of several wastewater quality parameter of the wastewater collected from five areas in Meerut.

Taking average values of all the five sites for various parameters, the results can be tabulated as:

Table 2: Average test results of 3 samples from all sites.

Site	pH	Turbidity (NTU)	Conductivity(MS/cm)	BOD (mg/L)	COD (mg/L)
Shashtri Nagar	8.3	96.3	1.53	8.46	17.63
Ganga Nagar	8.66	50.03	1.23	9.39	18.43
Begumpul	8.59	123	0.82	7.93	18.9
Partapur	7.63	369.33	1.27	4.65	15
Kanker Khera	7.80	78.93	1.27	6.38	17.73

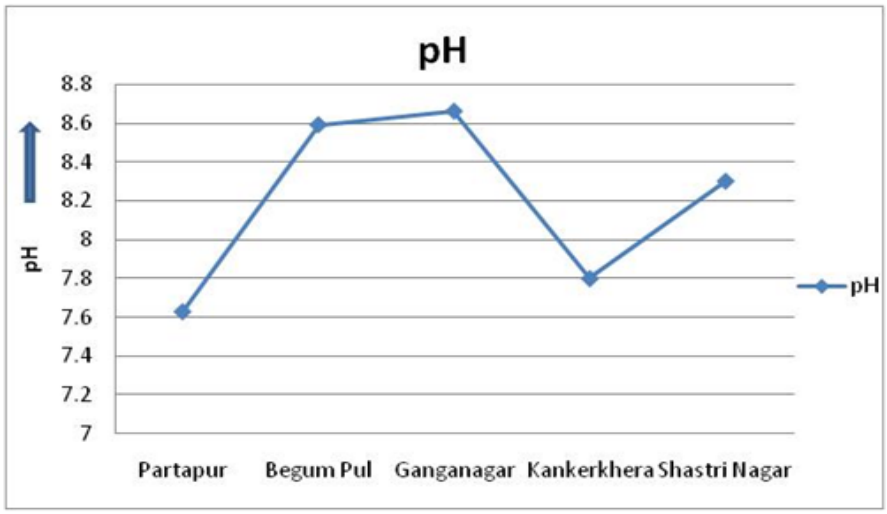

Fig. 10: Graphical comparison of pH from all sites of Meerut

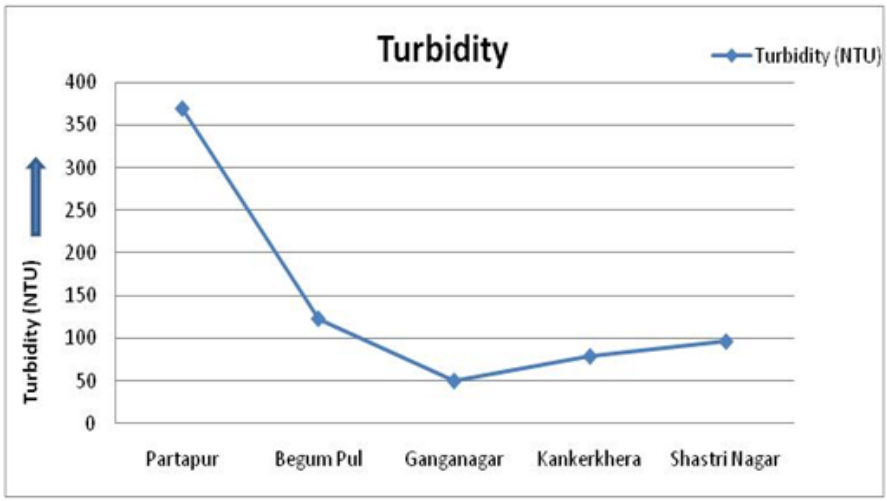

Fig.11: Graphical comparison of Turbidity from all sites of Meerut

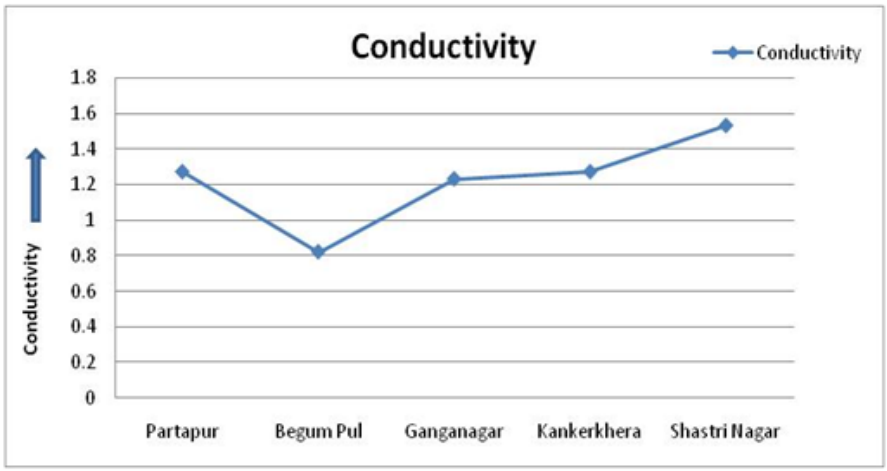

Fig.12: Graphical comparison of conductivity from all sites of Meerut

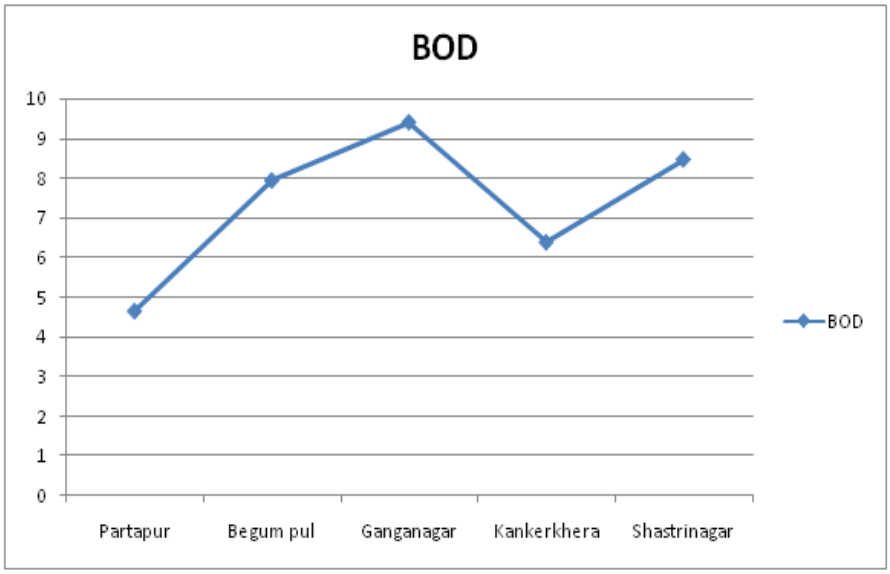

Fig.13: Graphical comparison of BOD from all sites of Meerut

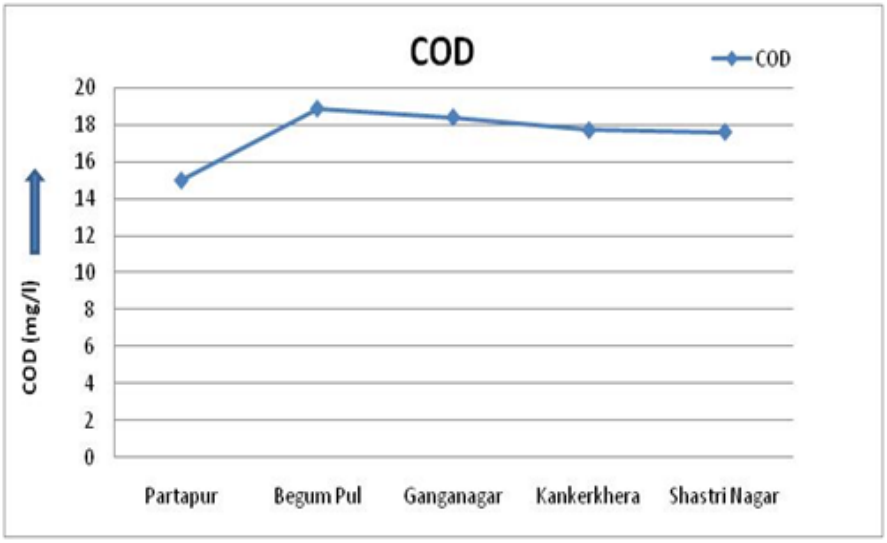

Fig.14: Graphical comparison of COD from all sites of Meerut

The samples of sewage from Meerut city have been collected and tested in a laboratory. The results obtained are compared with the standards provided by Pollution control law. The final results obtained are as follows:

Table.3: Table showing observed values of various parameters with standards at different sites.

S.No.	Parameter	Standards (Public Sewer)	SHASTRI NAGAR	GANGANA GAR	BEGUM BRIDGE	PARTAPUR	KANKER KHERA
1.	pH value	5.5 to 9.0	8.3	8.66	8.59	7.63	7.80
2.	BOD	350 mg/l	8.46	9.39	7.93	4.65	6.38
3.	COD	--	17.63	18.43	18.9	15	17.73

CONCLUSION

In the present study, we have analyzed the variation of several wastewater quality parameters of the wastewater (pH, COD, BOD, turbidity, conductivity) at five collection areas of Meerut, UP. Different results have been obtained from different types of wastewater. All parameters are as per standards. Nevertheless, their values as well as their behavior depend significantly on the collection area.

Significantly smaller pH values were measured in the wastewater with a high industrial load (Partapur and Kankerkhera). It is due to the higher concentration of different chemicals, organic and inorganic materials which are used by the industries on a continuous basis.

The turbidity, as we reckoned before the test, depends on the type of wastewater as well. Industrial wastewater (Partapur and Kankerkhera) have high turbidity.

The COD level clearly depends on the type of wastewater. Higher values were observed for wastewater with domestic & municipal sources, while industrial wastewater has the lowest COD.

Results show that domestic wastewater (Ganganagar) has a higher negative impact on water quality than wastewater with a high industrial load (Partapur).

This is explained by the fact that industrial wastewater undergoes various treatments (as prescribed by the regulatory government forums/ organizations) before being discharged into the city sewage system. Most industries are required, by law, to apply a pre-treatment before discharging wastewater into the city sewage system thus, explaining this phenomenon.

Hence we can undoubtedly say that domestic wastewater affects the mineral content of natural water basins more than Industrial wastewater.

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REFERENCES

[1] Elango L, Ramachandran S, Sreenivasan M (1996) Time series analysis of groundwater quality parameters. In: Muller A (ed) Hydroinformatics ‘96’, Vol 2. Balkema, Rotterdam, pp 613–620. E
[2] Abdullah, M. I. & L. G. Royle, 1972. Heavy metal content of some rivers and lakes in Wales. Nature 238: 329–330.
[3] Ajmal, M., A. A. Nomani & M. A. Khan, 1983. Pollution in the Ganges River, India. Wat. Sci. Technol. 16: 341–351.
[4] Ali W. O'Melia C. R. Edzwald J. K. 1985 Colloidal stability of particles in lakes: measurement and significance. water and science technology 17 (4–5), 701–712.
[5] Obiefuna GI, Sheriff A (2011) Assessment of shallow ground water quality of Pindiga Gombe Area, Yola Area, NE, Nigeria for irrigation and domestic purposes. Res J Environ Earth sci 3(2):131–141.
[6] Brindha K, Elango L (2011) Hydrochemical characteristics of groundwater for domestic and irrigation purposes in Maduranthakam, Tamil Nadu, India. Earth Sci res J 15(2):101–108
[7] Brindha K, Elango L (2012) Impact of tanning industries on groundwater quality near a metropolitan city in India. Water Resour Manag 26(6):1747–1761
[8] Das RM, Pradhan AA, Goswami S (2010) Groundwater quality assessment of Banki subdivision, Cuttack district, Orissa. J life sci 1:35–42
[9] Gupta, I. C. (1999). Evaluation of quality of irrigation water and industrial discharged on land for irrigation Journal of Indian Water Works Association, 31(1), 47–56.
[10] Horton, R. K. (1965). An index-number system for rating water quality. Journal of Water Pollution Control Federation, 37(3), 300–306.
[11] Kazmi, A. A. (2000). Water quality modelling of river Yamuna journal of the Institutions of Engineers, 81, 17–22.

[12] Palalau, L. (1969). Determination of some Organic and Inorganic Hg compounds in wastewater. Rev. Chim.(Bucharest), 20(2), 107–113

[13] Altman S. J. and Parizek R. R., (1995). Dilution of nonpoint source nitrate in groundwater. J. Environ. Quality, 24, 707–717.

[14] Ajmal, M., A. A. Nomani & M. A. Khan, 1983. Pollution in the Ganges River, India. Wat. Sci. Technol. 16: 341–351.