IMPACT ON WATER QUALITY OF TAMSA (TONS) RIVER FLOWING THROUGH SATNA DISTRICT M.P

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Abstract- River is a natural source of water for house use, agriculture use, as well as industrial use. Generally river water is fresh and safe for use. Water is a very good solvent and it can dissolve so many substances either they are organic or inorganic in nature. Quality of water is decided on the basis of its dissolved and suspended substances which are either useful or harmful for the growth of living organisms. Our work was aimed to know the physical and chemical water qualities of Tamsa (Tons) River flowing through Satna district of Madhya Pradesh, India. Quality of River water depends on pollution level in areas from where the river is flowing. Some water quality parameters such as Alkalinity, Total Hardness, pH, Total Solids, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, Chlorides, Fluorides, Sulphate, Phosphate, Calcium Hardness, etc are checked at various points. If limits of these water quality parameter are not as per the W.H.O. guidelines then it will be harmful for users.

Keywords- Physical and chemical water quality, Tamsa River, Satna, Madhya Pradesh, India, W.H.O.

1. Introduction-

The Tamsa River is also known as tons. Tons river origin is at Tama-kund in the Kaimur Range. The origin is at an height of 610 metres (2,000 ft) from mean sea level. Tons River passes through Satna and Rewa district of Madhya Pradesh. Tons forms many waterfalls in Rewa district. The Tons river ends in Belan river Sonbhadra district in U.P. and finally joins the Ganga at Sirsa U.P. Total flow length of the Tons river is 264 kilometres. It has a total drainage area of 16,860 square kilometres.

The Tamsa river is also have its religious importance. As this is the river on which Ram spent his first night at the bank of Tamsa river during his 14 year forest exile. Bharadwaj, Valmiki and many other sages had their ashram at the bank of Tamsa River.

The Tamsa River forms a vertical falls of 70m depth which is known as Purwa Falls. Beehar, Mahana, are the mains tributary of Tamsa River.

After initiation of Tamsa River it passes through many townships of Satna district some of them are Maihar, Unchehra, Madhogarh etc. These townships pollute the river by discharging their sewage discharge into the river. Madhogarh which is situated nearby of Satna City is major pollution causing township for the river. The study is actually limited to the area of Satna district from Maihar to Rashi.

2. Methods and Materials-

2.1 Study Area

Study is carried out about Tamsa River flow course in Satna district of Madhya Pradesh, India.

River Name- Tamsa (Tons)

Country- India

States- M.P. U.P.

District- Satna

Origin- Tamakund, kaimur range, Maihar Tehsil, Satna district, M.P. India

End Point- Ganges, Ballia, U.P. India

Running Length- 264 km

Falls- Purwa Falls

2.2 Selection of sampling site

The study area is shown in map shown below in which red points shows the sampling stations.

Figure 1 Map of Tamsa River flowing through Satna District.

2.3 Sampeling stations

Table 1 Name of Sampling Stations

Code Name	Site Name
A	U/S of mixing point near Maihar
B	D/S of mixing point near Maihar
C	U/S of mixing point near Unchahra
D	D/S of mixing point near Unchahra
E	U/S of mixing point near Madhogarh
F	D/S of mixing point near Madhogarh
G	U/S of influence point of Prism Cement near Rashi
H	D/S of influence point of Prism Cement near Rashi

2.4 Sampling and field work

Samples were collected as per the guidelines of APHA. Each sample was taken in clean plastic bottle and kept in iceberg on the field. Alkalinity, Total Hardness, Calcium hardness, pH, Total Solids, COD, DO, BOD, Chlorides, Fluorides, Sulphates, Phosphates were tested in a laboratory while BOD bottles were filled at site and reagents for DO fixation were mixed at the time of sample collection. The chemical water quality analysis of samples was performed using standard analytical methods. All samples were transported to the Madhya Pradesh Pollution Control Board Jabalpur.

2.5 Methods-

The chemical water quality analysis of water samples was carried out using standard analytical methods as per the guidelines of APHA. Following table shows the chemical water quality parameters and their methods used during testing.

Table 2 Standard chemical water quality parameters determination methods

S.N.	Parameters	Method
1	Alkalinity	2320 B. Titration Method
2	Total Hardness	2340 C. EDTA Titramitric Method
3	Calcium Hardness	EDTA titration
4	pH	pH meter
5	Total Solids	Evaporation Method
6	COD	5220 B. Open reflux method
7	BOD	By DO Consumption Calculation
8	DO	4500-0 C. Azide Modification method
9	Chlorides	4500-Cl B. Argentometric Method
10	Fluorides	4500-F D. Spadns Method
11	Sulphates	4500-SO_4^{2-} E. Turbidimetri Method
12	Phosphates	4500-P D. Stannous Chloride Method
13	Iron	3500-Fe B

3. Results and Discussion

3.1 Chemical water quality parameters

3.1.1 Alkalinity

Alkalinity of Tamsa river water varies from 106.06 mg/l to 233.46 mg/l along the flow of river. Maximum alkalinity was recorded at the downstream of mixing point of cement effluent. Alkalinity level of river water was found above the permissible value (200 mg/l) after the station E. Alkalinity of various points was found as shown below-

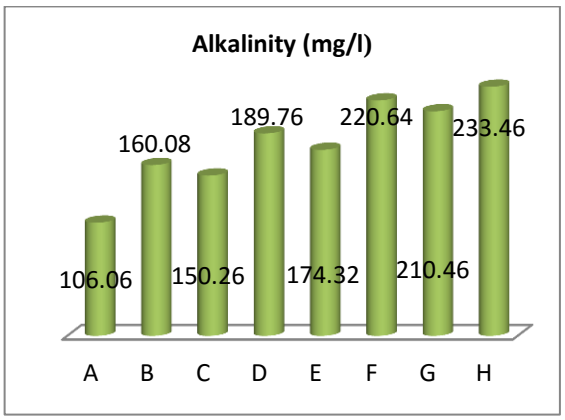

Fig. 2 Alkalinity Variation Chart

3.1.2 Total Hardness

Total Hardness of Tamsa river water varies from 58 mg/l to 215.60 mg/l along the flow of river. Maximum Total Hardness was recorded at the downstream of mixing point of cement effluent. Total Hardness level of river water was found in the range of hard water from station D to station H. This hardness is caused due to the mixing of township waste. Total Hardness of various points is shown below-

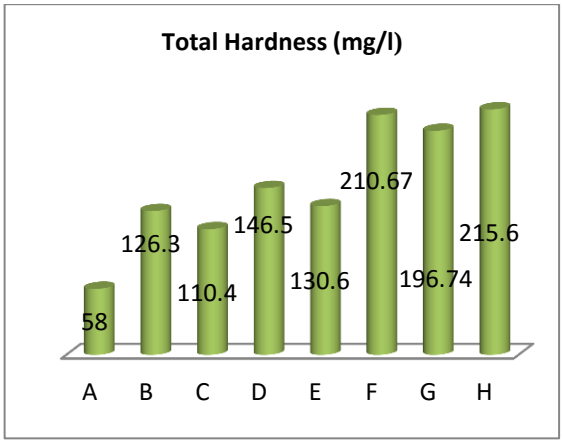

Fig. 3 Total Hardness Variation Chart

3.1.3 Calcium Hardness

Calcium Hardness of Tamsa river water varies from 67.30 mg/l to 156.06 mg/l along the flow of river. Since cement effluent have high concentration of calcium in various

forms, maximum Calcium Hardness was recorded at the downstream of mixing point of cement effluent and it was found 156.08. Calcium concentration at various stations is shown below-

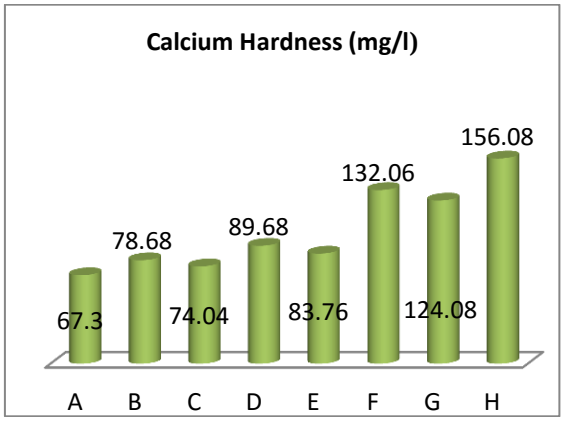

Fig. 4 Calcium Hardness Variation Chart

3.1.4 pH

pH of Tamsa river water varies from 7.3 to 8.82 along the flow of river. Maximum pH was recorded at the downstream of mixing point at Madhogarh Township and it was 8.9. pH level of river water was found above the permissible value (7 to 8.5) after the station E. Maximum pH of pH of various point is shown below-

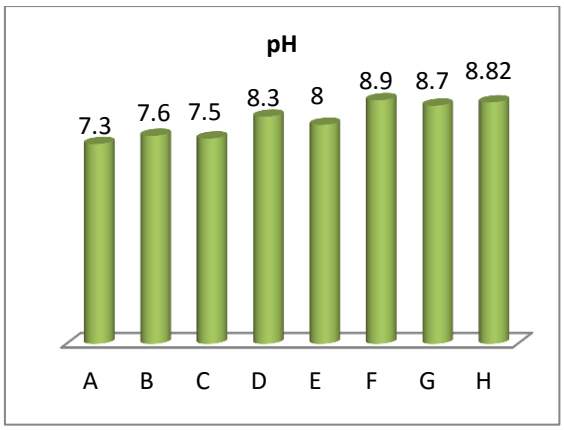

Fig. 5 pH Variation Chart

3.1.5 Total solids

Total solids concentration of Tamsa river water varies from 105 mg/l to 358.76 mg/l along the flow of river. Maximum Total solids concentration was recorded at the downstream of mixing point of sewage water at Madhogarh. Maximum Total solids concentration was recorded as 406.50 mg/l. total solids concentration of various points is shown below-

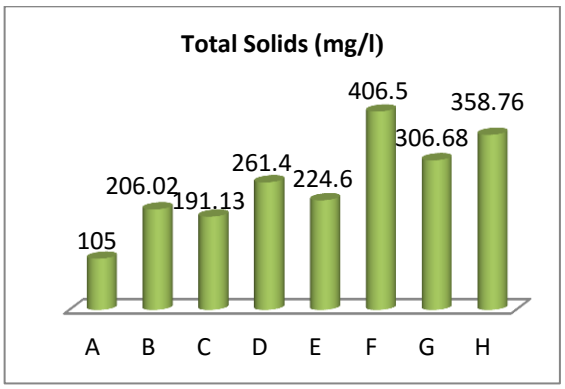

Fig. 6 Total Solids Variation Chart

3.1.6 COD

COD of Tamsa river water varies from 10.68 mg/l to 149.33 mg/l along the flow of river. Maximum COD was recorded at the downstream of mixing point of sewage effluent at Madhogarh. Maximum value of COD 156.89 mg/l at station F. COD of various points is shown below-

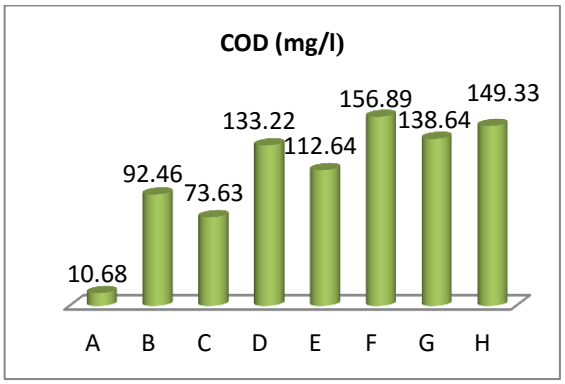

Fig. 7 COD Variation Chart

3.1.7 Dissolved Oxygen

The level of Dissolved oxygen was 7.8 mg/l before the sewage water enters in the river and after entry of waste water the DO level of water goes decreasing and it was minimum at downstream of mixing point at Madhogarh. Minimum DO was recorded as 4.02 mg/l and this DO level is not sufficient for the survival of aquatic life. DO level of various points is shown below-

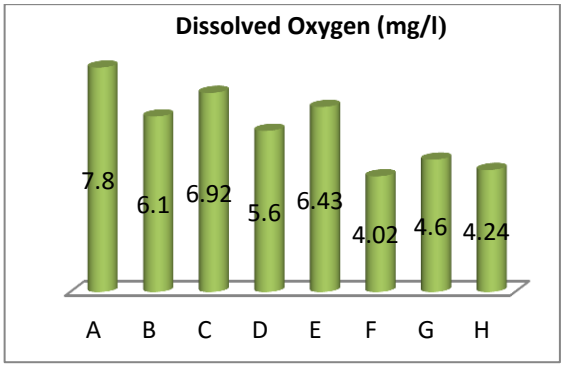

Fig. 8 D.O. Variation Chart

3.1.8 BOD

BOD of Tamsa river water varies from 2.63 mg/l to 130.06 mg/l along the flow of river. Maximum BOD was recorded at the downstream of mixing point of sewage effluent at Madhogarh and was found 136.04 mg/l which is not acceptable for public use. BOD of clear river water was 2.63 mg/l. BOD of various stations is shown below-

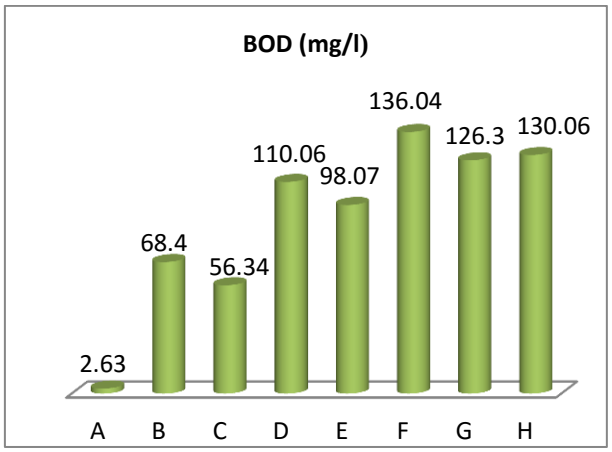

Fig. 9 BOD Variation Chart

3.1.9 Chlorides

Chlorides content in Tamsa river water varies from 39.02 mg/l to 95.75 mg/l along the flow of river. Maximum Chlorides were recorded at the downstream of mixing point of cement effluent, but level of Chlorides was well below the permissible limits. Chlorides concentration at various stations is shown below-

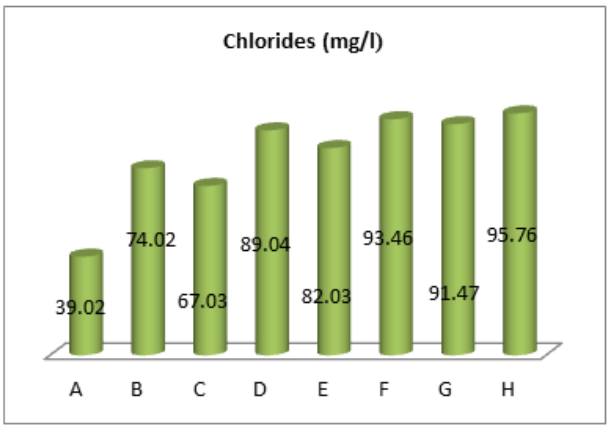

Fig. 10 Chlorides Variation Chart

3.1.10 Fluorides

Fluorides in Tamsa river water varies from 0.63 mg/l at station A to 0.73 mg/l at station H along the flow of river. Maximum Fluorides was recorded at the downstream of mixing point of cement effluent. Fluorides level of river water was found within permissible value (0.5 to 1.5 mg/l). Fluorides concentration at various stations is shown below-

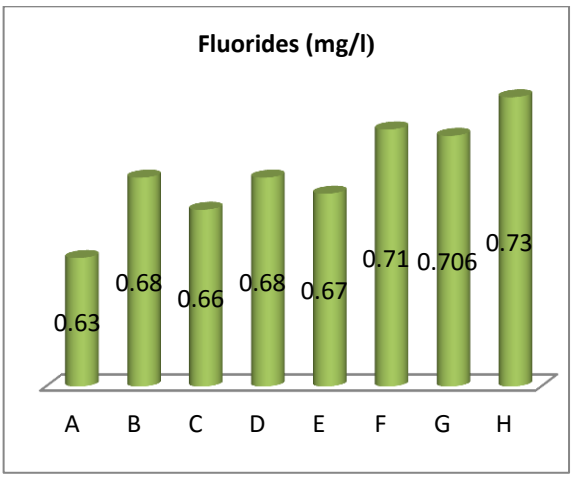

Fig. 11 Fluorides Variation Chart

3.1.11 Sulphate

Sulphates concentration of Tamsa river water varies from 26.75 mg/l to 63.60 mg/l along the flow of river. Maximum Sulphates concentration was recorded at the downstream of mixing point of cement effluent. Sulphates concentration level of river water was found satisfactory and well below the maximum permissible value (250 mg/l). Sulphate concentration at various stations is shown below-

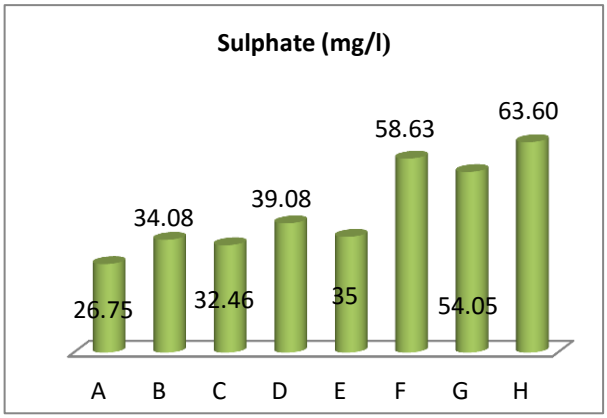

Fig. 12 Sulphate Variation Chart

3.1.12 Phosphate

Phosphate of Tamsa river water varies from 0.012 mg/l to 0.034 mg/l along the flow of river. Maximum Phosphate was recorded at the downstream of mixing point of sewage in Madhogarh and its value was 0.037 mg/l. Phosphate in river water accelerates the growth of algae near the mixing point in Madhogarh also it have laxative effects on public. Phosphate concentration at various stations is shown below-

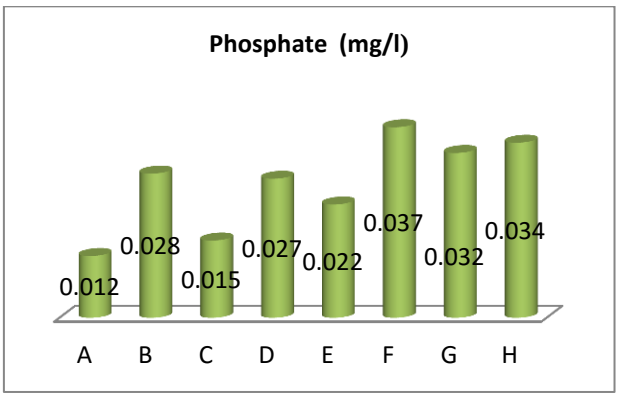

Fig. 14 Phosphate Variation Chart

3.1.13 Iron

Iron of Tamsa river water varies from 0.381 mg/l at station A to 0.49 mg/l at station H along the flow of river. Maximum Iron was recorded at the downstream of mixing point of cement effluent. Iron level of river water was found within the permissible value (0.3 to 1.0 mg/l). Iron concentration at various stations is shown below-

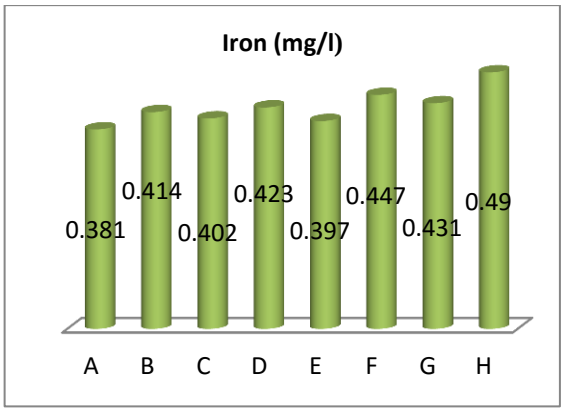

Fig. 15 Iron Variation Chart

3.2 Results of physical water quality parameters-

Sampling Station→	A	B	C	D	E	F	G	H
Calcium Hardness	106.06	160.08	150.26	189.76	174.32	220.64	210.46	233.46
Calcium Hardness	58.00	126.30	110.40	146.50	130.60	210.67	196.74	215.60
Calcium Hardness	67.30	78.68	74.07	89.68	83.76	132.06	124.08	156.08
pH	7.3	7.6	7.5	8.3	8.0	8.9	8.7	8.82
Calcium solids	105.00	206.08	191.13	261.40	224.60	406.50	306.68	358.76
COD	10.68	92.46	73.63	133.22	112.64	156.89	138.64	149.33
DO	7.80	6.10	6.92	5.60	6.43	4.02	4.60	4.24
BOD	2.63	68.40	56.34	110.06	98.07	136.04	126.30	130.06
Fluorides	0.63	0.68	0.66	0.68	0.67	0.71	0.706	0.73
Chlorides	39.02	74.04	67.03	89.04	82.03	93.46	91.47	95.76
Sulphate	26.75	34.08	32.46	39.08	35.00	58.63	54.05	63.60
Phosphate	0.08	0.17	0.11	0.19	0.148	0.28	0.21	0.034
Iron	0.381	0.414	0.402	0.423	0.397	0.447	0.431	0.490

3.3 Conclusion-

Chemical water quality parameters of the river were found satisfactory before inclusion of waste water from township but after mixing of the waste water the quality of water decreases along the course of river and it were not suitable for drinking purpose. Most of the water quality parameters have higher values than the standard values given by Bureau Indian Standard as well as World Health Organization guidelines. Some positive steps should be taken by local authority to improve the water quality of river. Local public should be aware about the water pollution and adopt preventive measures for controlling the river water pollution.

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