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Water Quality Assessment of "River Morna" Through Akola

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Abstrac-t Akola is growing industrial city and also the pilgrim place in Vidarbha region of Maharashtra State popularly known as cotton city, spreading on an area of 10 Sq.km. It is situated on the bank of "River Morna". Nearly 65 MLD of waste water is flowing through the drainage system to the river water. Major part of the waste water is directly discharged into the "River Morna" and further many villages on the downstream side are using the river water for drinking and for irrigation purposes. The higher BOD, COD and other chemical and biological contents are polluting the river water and affecting quality of soil by lowering its fertility and health effect to people of Akola. It was intended to carry out the analysis of waste water of "River Morna". The sampling points were decided for collection of waste water from the "River Morna" and analysis is carried out and the results are discussed in the paper.

Keywords- COD, BOD, Coliforms, Dissolved solids, fluorides

I. INTRODUCTION

Akola is growing industrial city and also the pilgrim place in Vidharbha region of Maharashtra State popularly known as cotton city, spreading on an area of 10 Sq.km. It is situated on the bank of river "Morna" and the subtropical zone at the latitude of 22.42^0 North and longitude of 77.02^0 East, at an altitude of 307.42 meters above the mean sea level and the population of city is more than six lacs The highest temperature of the city in summer is 45.4^0C and minimum is 21.1^0C in rainy season. The main source of water supply to city by Akola Municipal Corporation is from "Mahan Dam". People in the city are also habitual of using ground water to meet their daily water demand. More than 65 MLD water is supplied by Akola Municipal Corporation to Akola city through supply network. About 65 MLD of wastewater is flowing through the drainage system. Major part of the waste water is directly discharged into the "River Morna" and further many villages on the down stream side are using the river water for drinking and for irrigation purposes. The municipal wastewaters of Akola city directly discharge into Morna River without any treatment. Now a day due to short fall in rains and change in climatic conditions the water level in the river is reduced considerably and ample water with current in the flow is not available and thereby this waste water discharge is polluting the river water. The farmers in the vicinity of river use this river water for irrigation of vegetable farming. The hazardous waste containing in the water may create ill effect in the vegetables and there by human health.

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The waste water contains various dissolved impurities which is responsible for the infertility of the land, it has also seen that major communicable diseases are spreading up in the environment due to the polluted water of Morna, Mosquito breeding due to rising of plants and weeds in the stream of Morna River is the common problem in Akola. Therefore, it is necessary to analyse the wastewater qualitatively and quantitatively in order to have comprehensive evaluation of Wastewater quality.

II. SAMPLE COLLECTION

Sample is obtained to meet the requirements of sampling programme and so that it does not deteriorate or become contaminated before it reaches the laboratory. Depending on analyses to be performed, the containers were filled fully (most organic analyses) and space for aeration, mixing etc. (microbiological analyses) was left of about half inch. Representative samples from the sources were obtained only by making composites of samples collected over a period of time. The details of collection vary with local conditions that no specific recommendations would be universally applicable. Sometimes it is more informative to analyses numerous separates sample instead of one composite. Various sampling points were decided according to the procedure of "STANDARD METHOD".
The sampling point of all drainage systems meeting to the river Morna were equally distributed with special attention to different disposal points. The representative samples were collected from the different major drainage point locations, the samples were collected at regular interval of seven days each, once the sample was collected it was send to the laboratory within half an hour. About 1 lit - 5 lit of the sample was collected in the plastic containers and then transported to the laboratory for the analysis; the samples were then reserved at a constant temp in the incubator for maintaining the ideal conditions for the COD and BOD Test and the other microbial activities. The analysis was carried out in Environment Lab in Akola city. The various tests (physical, chemical and biological) were performed on water samples to know its various characteristics, are as shown in the Tables and graphs as follows.

TABLE -I

Physical Test Parameters							
Sa mp-ling poi nt	T at Point (^{0}C)	T at lab (^{0}C)	Colou r and odour	Samp -ling point	T at Point (^{0}C)	T at lab (^{0}C)	Colour and odour
1	27	28	Soap Soluti on odour less	11	29	30	Pale Yello w, odourl ess

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2	26	28	Soap Solution odour less	12	30	29	Pale Yellow, odourless
3	29	28	Pale black odour less	13	28	27	Pale Yellow, odourless
4	27.5	28	Pale black, odour less	14	26.5	27	Pale black, odourless
5	28	29	Black odour less	15	27	27	Black, odourless
6	25	26	Pale black bad odour	16	26.5	27.5	Pale black, odourless
7	30	29	Pale black bad odour	17	26.1	28	Pale Yellow, odourless
8	29	28.5	Pale black bad odour	18	27	29	Pale black, odourless
9	27	28	Pale black bad odour	19	26.3	28	Pale black, odourless
10	29	29	Pale colour ,odour less	20	26	27	Pale black, odourless

TABLE -II

Chemical Test Parameters							
Sampling Point	**Turbidity (NTU)**	**pH**	**Conductivity mho/m**	**Sampling Point**	**Turbidity (NTU)**	**pH**	**Conductivity mho/m**
1	51.7	7.1	2.2	11	38.3	7.5	2.6
2	51.9	6.8	2.3	12	38.8	7.4	2.7
3	52.1	6.8	2.5	13	30.7	7.2	2.1
4	53.3	6	2.6	14	31.4	7.1	2.3
5	53.6	5.8	2.6	15	32.9	5.1	2.4
6	50.6	7.6	2.6	16	33.7	5.1	2.9
7	51.5	7.5	2.7	17	13.22	6.9	2.1
8	52.7	7.1	2.8	18	23.7	6.8	2.3
9	53.6	6.8	2.9	19	30.7	6.7	2.6
10	33.6	7.6	2.4	20	33.7	6.6	2.8

TABLE -III

Chemical Test Parameters (mg/lit)							
Sampling Point	**Total solids**	**Disso-lved solids**	**Suspe-nded solids**	**Sampling Point**	**Total solids**	**Diss-lved solids**	**Susp-e-nded solid-s**
1	2000	1500	440	11	1000	500	480
2	2500	2000	4500	12	1500	990	500
3	1500	1000	470	13	1500	480	1000
4	2000	100	970	14	1000	500	480
5	3000	2000	800	15	2000	1000	490
6	2500	2000	490	16	2500	1500	990
7	2500	2000	490	17	2500	470	500
8	1500	990	500	18	1500	490	1000
9	2500	990	1500	19	1000	480	500
10	2000	1000	990	20	1500	980	500

TABLE -IV

Chemical Test Parameters (mg/lit)							
Sampling Point	**Volatile solids**	**Total hard-ness**	**Chlori-de content**	**Sampling Point**	**Volatile solids**	**Total hardn-ess**	**Chlo-ride content**
1	60	150	106	11	20	240	125
2	50	170	125	12	10	250	136
3	30	190	140	13	20	236	154
4	30	200	165	14	20	241	155
5	200	230	270	15	10	251	157
6	10	220	102	16	10	256	159
7	10	236	111	17	30	202	166
8	10	250	113	18	10	209	167
9	10	255	122	19	20	221	171
10	10	220	106	20	20	232	175

TABLE –V

Chemical Test Parameters							
Sampling Point	**Sulphate contents (mg/l)**	**Nitrit-es as (N)**	**Iron (Fe)**	**Sampling Point**	**Sulphat-e contents (mg/l)**	**Nitrit-es as (N)**	**Iron (Fe)**
1	118	0.5	0	11	210	0	0.04
2	124	0.4	0	12	230	0	0.06
3	131	0.5	0.01	13	170	0	0.01
4	210	0.45	0.1	14	190	0.65	0
5	231	0.75	0.1	15	220	0.7	0.08
6	150	0	0.01	16	244	0.75	0.1
7	171	0	0.02	17	270	0.01	0.01
8	230	0	0.05	18	278	0.01	0.03
9	255	0	0.06	19	290	0.01	0.09
10	190	0	0.03	20	298	0.01	0.1

TABLE –VI

Chemical Test Parameters					
Sampling Point	**Fluoride as (F)**	**COD (mg/l)**	**Sampling-Point**	**Fluoride as (F)**	**COD (mg/l)**
1	0.14	136	11	0.12	145
2	0.15	140	12	0.13	150
3	0.17	150	13	0.17	156
4	0.18	165	14	0.18	161
5	0.18	173	15	0.19	189
6	0.08	139	16	0.21	190
7	0.09	148	17	0.15	180
8	0.1	151	18	0.17	200
9	0.11	155	19	0.18	210
10	0.11	173	20	0.19	220

TABLE –VII

Biological Test Parameters							
Sampling Point	**BOD mg/l**	**Thermo toler-ant**	**Collifo rm**	**Sampling Point**	**BOD mg/l**	**Ther-mo toler-ant**	**Collifo-rm**
1	221	0	Above 16	11	200	3	Above 16
2	215	3	Above 16	12	220	4	Above 16

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3	210	3	Above 16	13	200	16	Above 16
4	200	6	Above 16	14	220	16	Above 16
5	190	6	Above 16	15	240	16	Above 16
6	245	9	Above 16	16	265	16	Above 16
7	230	8	Above 16	17	230	0	Above 16
8	225	7	Above 16	18	228	0	Above 16
9	220	9	Above 16	19	222	0	Above 16
10	225	3	Above 16	20	220	0	Above 16

III. RESULTS AND DISCUSSION

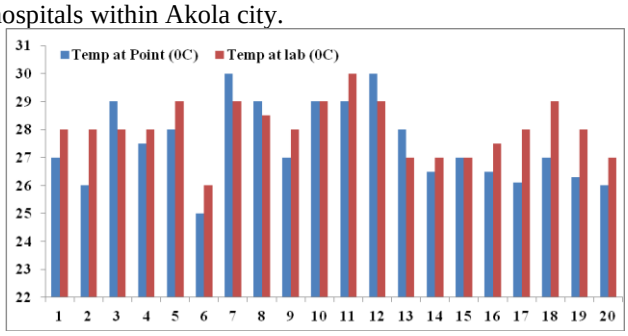
Temperature

There is variation in temperature value with respect to sampling point as well as in laboratory this temperature varies between 27 degree Celsius to 30 degree Celsius.

Turbidity

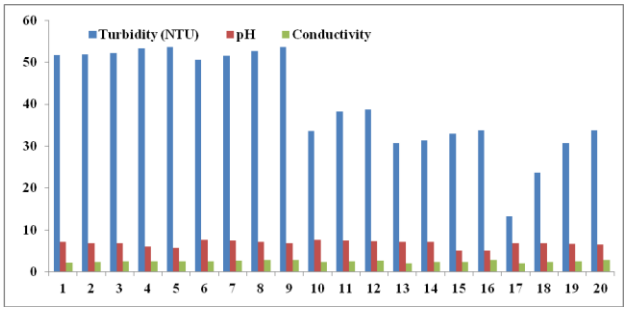
There is variation in turbidity value with respect to sampling Turbidity varies between 53.6 to 13.22 NTU this may be because of strong sewage meet at that point pH

There is variation in pH, throughout the sampling locations except few points. pH varies from 7.4 to 5.1 Near the end points of all nallas, the pH was found to be acidic; this might be due to high concentration waste disposal in the nallas from slum area and from small scale industries or from the hospitals within Akola city.



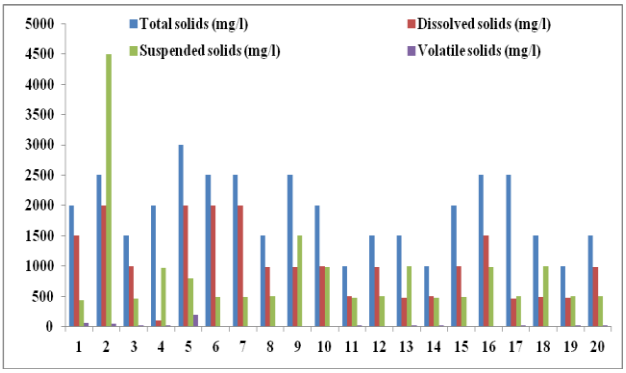
Conductivity

The conductivity variation with respect to sampling points shows a continuous changing pattern throughout the length of nalla, samples from the locations shown conductivity increases in the range of 2.2 to 2.9 mho/m



Total solids

Total solid varies from 2000 to 3000 m/l from sampling points. Total solids vary from 2000 to 2500 mg/l at the sampling point no.1 the total solids found to be 3000 mg/l. This might be due to disposal of concentrated domestic waste from sampling area.



Dissolved solids

Dissolved solids vary from 100 to 2000 mg/l.

Suspended solids

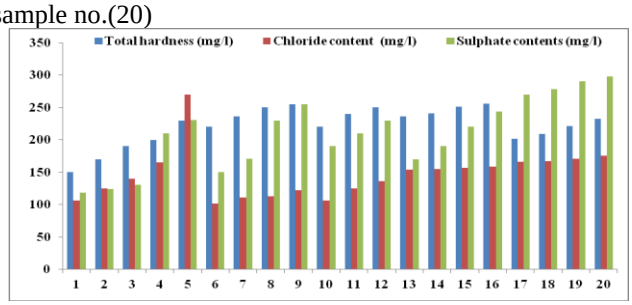
Suspended solids vary from 440 to 4500 mg/l. An increase value of 4500 mg/l observed near sampling location no (2). The domestic waste disposal from the slum area along with the disposal from fish and meat market may be the reason of same.

Volatile solids

10 mg/l to 200 mg/l is the increase in the value of volatile solids observed from starting point to sampling point No. 5.

Hardness

Hardness varies from 150 to 256 mg/l from sample no. (1) to sample no.(20)



Chloride content

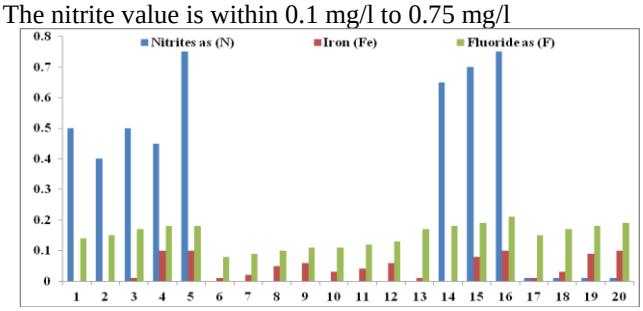
In sample No. 5 chloride content in waste water was found to be 270 mg/l. The large amount of chloride was detected might be due to disposal of waste water from ice-cream plant near to sampling point.

Sulphate content

Sulphate content varies from 118 to 298 mg/l from sample No. (1) to sample No. (20). Sulphates were form due to decomposition of various sulphur containing substances present in sewage.

Nitrites

The nitrite value is within 0.1 mg/l to 0.75 mg/l



Iron

Iron content is within 0.1 mg/l to 0.06 mg/l

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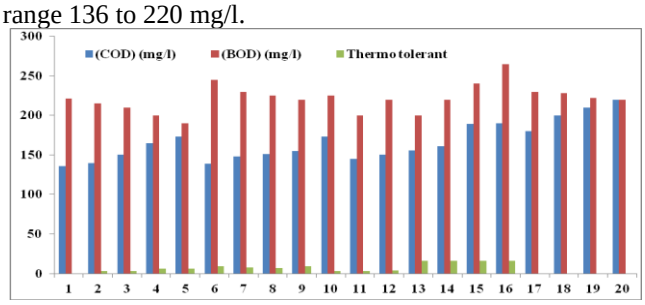
Chemical Oxygen Demand (COD)

There is less variation in chemical oxygen demand (COD) found in the waste water sample. Chemical oxygen demand was found in sampling no. (1) to sampling No. (20) Within range 136 to 220 mg/l.



Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand varies from 190 to 265 mg/l. from sample no. (1) to sample No. (20).

Thermotolerant

It varies with respect to sampling no. (1) to sampling no. (20). It varies from 0.00 to 16 from sample no. (1) to sample no. (16)

Coli -form

The bacterias are found in the waste water will cause the serious out break of fatal water born diseases if mixed directly with the river water. This coli -forms shall make the river water unfit for humans and could cause sudden death of cattles and fishes. The presence of pathogenic bacterias may be because of the open latrines from the slum area and also because of the discharge of waste water from septic tank of Government District Hospitals

IV. CONCLUSION

All the results obtained were compared with different references taken for the analysis. The quality of sewage water is moderately danger for human health. From the results following conclusions observed to be justified.

The maximum value of BOD and COD are 265 mg/l and 220 mg/l respectively and can easily be lowered down by any conventional sewage treatment process, and treated water can be used for irrigation purpose.

The level of contamination due to various factors like sulphate content, chloride content, COD etc. is comparatively lesser, as it is purely a domestic waste.

The water shortage problems of the city and farmers as well living in and around the city can efficiently solved by treating such a large quantity of water mass available easily.

Farmers for irrigation purposes can directly use treated water. Also, if the treated water disposed off in any water body or on land, it possesses no harm to it.

The water samples from all the sampling stations are free from contamination like heavy metals, harmful chemicals etc. as there is industrial waste disposal. There is a variation in the values of various parameters observed due to self-purification of the sewage, as it flows for long distance.

Due to self-purification of the stream, any low cost conventional treatment plant can prove efficient.

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