Study of Pollution of Ganges water obtained from Industrial Areas of Bihar

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Abstract

2525 KM long Ganges enters at Buxar in Bihar and exits at Rajrnahal covering a distance of nearly 560 Km. Nearly four lacs people reside in this heavily industrial zone - i.e. Bata India Ltd. at Mokama, Me Dowell Distillery at Hathidah, Barauni Thermal Power Station, Hindustan Fertilizer Co. Ltd. and" Indian Oil Refinery at Barauni. It is estimated that 6,420 m^3/d (cubic meter) per day of domestic wastes and 48,240 m^3/d of industrial effluent are being generated by these industries, which are directly discharge into the river Ganga.

Keeping in view the above background a modest attempt to evaluate and analyse the pollution load in Ganga river around Rajendra Bridge at Mokama in the vicinity of Barauni - Mokama industrial complex with special emphasis on the pollution of the river caused by the discharge of industrial effluents.

Key words: B.O.D. (Bilogical Oxygen Demand), C.O.D. (chemical Oxygen Demand), T.S.S. (Total Suspended Solid), T.D.S. (Total Dissolved Solids).

Introduction

The deterioration in chemical, physical and biological characteristics of water is brought about mainly by human activities.

The water pollution can be further classified into following catagories:-
(a) Surface water (b) Ground water (c) Soil water

All the human activities directly or indirectly lead to the contamination or pollution of water streams. This contaminated or polluted state of water may be due to physical pollutant *e.g.* colour and odour or chemical pollutants *e.g.* pH, B.O.D., C.O.D., etc. or biological pollutants *e.g.* Bacteria or Viruses or due to the presence of undesirable concentration of several heavy metals.

Table 1. Physico-chemical Characteristics of Mokama sampling site (S₁) period of collection of sample - 2010

Parameter Analyzed	February-2010
Temperature °C (Air)	23
Temperature °C (Water)	17.5
pH	7.7
Electrical Conductivity μ mhos/cm	308
Turbidity (MTU)	14
Chloride	22
Sulphate	15
Dissolved oxygen	8.6
Bio-Chemical Oxygen Demand (B.O.D.)	1
Chemical Oxygen Demand (C.O.D.)	15.9
Total Solids	312
TSS*	225
TDS**	97
Total Alkalinity	167
Total Hardness	94
Calcium (Ca^{++})	22
Magnesium (Mg^{++})	12

*TSS-Total suspended solids; **TDS=Total dissolved solids

(All values are in mg/l except pH, electrical conductivity and turbidity)

Table 2. Physico-Chemical Characteristics of Barauni sampling site (S₂) period of collection of sample - 2010

Parameter Analyzed	February-2010
Temperature °C (Air)	22
Temperature °C (Water)	21
pH	7.3
Electrical Conductivity μ mhos/cm	355
Turbidity (NTU)	71
Chloride	69
Sulphate	38
Dissolved oxygen	7.2
Bio-Chemical Oxygen Demand (B.O.D.)	19.9
Chemical Oxygen Demand (C.O.D.)	67
Total Solids	510
TSS*	180
TDS**	318
Total Alkalinity	110
Total Hardness	227
Calcium (Ca^{++})	46
Magnesium (Mg^{++})	27

*TSS=Total suspended solids; **TDS =Total dissolved solids

(All values are in mg/l except pH, electrical conductivity and turbidity)

Table 3. Physico-Chemical Characteristics of Hathidah'sampling site (S₃) period of collection of sample - 2010

Parameter Analyzed	February-2010
Temperature °C (Air)	21
Temperature °C (Water)	18.5
pH	8.2
Electrical Conductivity μ mhos/cm	282
Turbidity (NTU)	17
Chloride	14
Sulphate	15
Dissolved oxygen	9.2
Bio-Chemical Oxygen Demand (B.O.D.)	0.99
Chemical Oxygen Demand (C.O.D.)	19
Total Solids	310
TSS*	79
TDS**	225
Total Alkalinity	155
Total Hardness	110
Calcium (Ca⁺⁺)	27
Magnesium (Mg⁺⁺)	11

*TSS = Total suspended solids; **TDS = Total dissolved solids

(All values are in mg/l except pH, electrical conductivity and turbidity)

Table 4. Physico-chemical Characteristics of Patna sampling site (S₄) period of collection of sample - 2010

Parameter Analyzed	February-2010
Temperature °C (Air)	22
Temperature °C (Water)	18
pH	7.7
Electrical Conductivity μ mhos/cm	312
Turbidity (NTU)	24
Chloride	19
Sulphate	16
Dissolved oxygen	7.60
Bio-Chemical Oxygen Demand (B.O.D.)	1.45
Chemical Oxygen Demand (C.O.D.)	45
Total Solids	355
TSS*	89
TDS**	272
Total Alkalinity	165
Total Hardness	99
Calcium (Ca⁺⁺)	25
Magnesium (Mg⁺⁺)	9.2

*TSS=Total suspended solids; **TDS =Total dissolved solids
(All values are in mg/l except pH, electrical conductivity and turbidity)

Tables 1-4 show the degree of pollution, depending upon the discharge of effluents from different Industries. The cleansing of water requires different ways to remove various impurities.

Water has been the most exploited natural system since the beginning of human civilization. In order to meet the ever-increasing demands of man for essential commodities like food, clothes, shelter etc. several medium and large scale industries are being set up in recent decades. This rapid technological development and type of modern life cause the deterioration of our clean environment, the water, the air and the soil.

We are concerned with water pollution in this paper.

Water Pollution :

The deterioration in chemical, physical and biological properties of water is brought about mainly by human activities. Substances like bacteria, viruses present in such concentration so as to compare the quality of water is unsuitable for its intended use and presenting a hazard to man[1-6].

Today, India ranks amongst the first ten heavily industrialized countries of the world. This has resulted in heavy backlog of gaseous, liquid and solid pollution in the major rivers of the country.

The Ganga, holiest among the holy rivers of India emerges from the snow bound heights of the Himalayas in the North nearly 4,000 meters above the sea level.

The Ganga 2525 Km long enters Bihar at Buxer and exits at Rajmahal covering a distance of nearly 560 Km. Investigation into its physico-chemical quality around Barauni-

Mokama. Mokama -Barauni industrial complex located on either sides of the river Ganga. Two industries viz. Bata India Ltd. at Mokama and Me Dowell Distillery at Hathidah are situated on the right bank of Ganga, Another three major industries viz. Barauni Thermal Power Station, Hindustan Fertilizer Co. Ltd. and Indian Oil Refinery all at Barauni. We are evaluating and analysing the pollution load in Ganga River near Barauni - Mokama industrial complex.

The selections of location for sampling are generally decided on the basis of the defined objectives of investigation being undertaken. It is well established fact that the Physico-Chemical quality in a dynamic system of the river from place to place. Hence we have selected different sampling stations. We have chosen four sampling stations, S_1, S_2, S_3 & S_4 and their Physico-Chemical characteristics are reported in four tables (1-4).

The Physico-chemical characteristics of industrial effluents discharge by polluting industries directly depends on the chemical compositions and the amount of raw materials used by these industries and also the various stages of operations leading to the manufacture of the desired products.

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