

Water Quality Assessment of Gaur River Due to Dairy Waste

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Abstract— This paper is about to discuss the effects on the quality of water river Gaur due to establishment of dairy industries near the banks of the river. Water quality of the river changes drastically due to direct release of waste water in the river without any pre-treatment, water quality change threatens the aquatic ecosystems of the river. The location of the gaur river 62.7 km² of total area and situated between 79°58'6.72" and 80°4'59.10" E longitude and 23°1'46.15" and 23°6'25.03" N. Gaur river is also the main tributary of the River Narmada in the Mandla region in Jabalpur district. Due to increase in demand for milk and their products many dairies of different sizes have come up in different places. The dairy industry involves processing raw milk into products such as consumer milk, butter, cheese, yogurt, condensed milk, dried milk (milk powder), and ice cream, using processes such as chilling, pasteurization, and homogenization. The effluents are generated from milk processing through milk spillage, drippings, washing of cans, tankers bottles, utensil, and equipment's and floors The dairy industry generate on an average 2.5-3.0 litres of wastewater per litre of milk processed. The current condition of river is decaying due to direct release of waste water from dairy industries established on the banks of river Gaur; the waste water released from the industry largely contains fats, casein, lactose and inorganic salts. These all contribute high Biological oxygen demand (BOD), and Chemical oxygen demand (COD).

Index Terms— Alkalinity, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Chloride, Colour, Fluoride, Hardness, Iron, PH, Temperature, Turbidity, Water quality assessment.

I. INTRODUCTION

Organic pollution occurs when large quantities of organic waste, which act as substrates for microorganisms, are released into watercourses. During the decomposition process the dissolved oxygen in the receiving water may be used up at a greater rate than it can be replenished, causing oxygen depletion and having severe consequences for the stream biota. Organic effluents also frequently contain large quantities of suspended solids which reduce the light available to photosynthetic organisms and, on settling out, alter the characteristics of the river bed, rendering it an unsuitable habitat for many invertebrates. Toxic ammonia is often present. When an organic polluting load is discharged into a river it is gradually eliminated by the activities of microorganisms in a way very similar to the processes in the sewage treatment works. This self-purification requires sufficient concentrations of oxygen, and involves the breakdown of complex organic molecules into simple inorganic molecules.

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Dilution, sedimentation and sunlight also play a part in the process. Attached microorganisms in streams play a greater role than suspended organisms in self-purification. Their importance increases as the quality of the effluent increases since attached microorganisms are already present in the stream, whereas suspended ones are mainly supplied with the discharge.

II. LITERATURE REVIEW

In India studies is conducted on the effects of organic waste like dairy wastes in rivers was carried out by Dilip k Sharma, Uma Bhargav, Fenting li (2014), Ashish Tikariha, Omprakash Sahu (2014), Prof N.B Singh, Ruchi Singh, Mohammad Mazer Imam (2013), Bharati S. Shete, and N.P. Shinkar (2013).

India is the highest milk producing country in the world, having its annual milk production of 112.5 million tons in 2010 [Annual report MoA, GoI, 2010-11], but the milk productivity per capita is very low. The rapid changes in demand for dairying as profession, in Jabalpur, India had exerted unprecedented pressure on the resources and environment. The demand for more milk production was largely met by increased number of animals rather than lesser number of efficient milk producing animals. The cumulative effect of higher demand for milk, increased animal population, availability of limited space and higher cost of distribution had rapidly changed the economic scenario for livestock rising in Jabalpur, India of distribution had rapidly changed the economic scenario for Milk productivity in conjunction with processing generated waste in the form of solids, liquids and gases. These wastes were dumped on surrounding land, mostly flushed with water and finally discharged into the river, leads to environmental pollution, methane and other GHG emission, and causing environmental hazards.

III. OBJECTIVE

- To assess overall water quality of River Gaur.
- To study the variations in water quality of the river at different sampling station of the river bank.
- To identify major pollution sources present and expected including domestic pollution source.
- To identify major parameters for improvements in the water quality of the river and environmental conditions of water.

IV. LITERATURE REVIEW

The river and surrounding areas across the banks of the Gaur River is surveyed to realize the actual condition of the areas and levels of contaminations of water. To find solution for the improvement of water quality of river water.

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To determine the suitable location for sampling all banks of the river Gaur has been visited and take samples from each bank to know the level of contamination in each of the bank of River Gaur. Collected samples represent various characteristics of banks of River Gaur.

- Locating point for collection of sample in the river Gaur.
- Collection of samples from the River Gaur
- In situ testing of temperature and colour
- Laboratory testing of samples
- Comparing the results with the water quality by govt agencies
- Assessment the condition of water
- Outcome and results
- Improvement measures for minimize the contamination levels
- Recommendation for further studies quality assessment of river water

V. RESULTS

- Turbidity is within the range in Katiya Ghat and Katiya pump house.
- Turbidity levels are beyond the desirable limits at Kosam Ghat and Gaur (near Bridge).
- PH levels at all the sampling location are within the acceptable value.
- TDS, TH at all the sampling station are within the permissible range
- Colour of water in Kosam Ghat, Gaur (near Bridge) is pale yellow indicates contamination of water through organic wastes.
- Presence of chlorine indicates contaminations through human wastes.

The various location parameters of river Gaur are given below:

Parameters	Katiya ghat	Kosam ghat	Katiya pump house	Gaur (near Bridge)
Turbidity(NTU)	5	23	3	36
TDS (mg/L)	22	160	210	260
Colour	Clear	Pale yellow	Clear	Pale yellow
Temperature(C ^o)	31.2	31.3	33.1	33.2
Iron (mg/L)	0.5	0.3	0.5	0.5
	8	7.5	7.5	8
Fluoride (mg/L)	0.3	0.4	0.2	0.4
Alkalinity (mg/L)	75	80	70	82
Chloride (mg/L)	13.4	14.6	11.5	16.5
Total Hardness (mg/L)	120	12.6	110	160
Dissolve Oxygen (mg/L)	7.4	7.1	7.5	7.2

VI. RECOMMENDATIONS

- Wastewater from dairies and cheese industries contain mainly organic and biodegradable materials that can disrupt aquatic and terrestrial ecosystems.
- Due to the high pollution load of dairy wastewater, the milk-processing industries discharging untreated/partially treated wastewater cause serious environmental problems
- Steps should be taken to prevent the direct release of untreated waste water in the river stream
- Strict action should be taken against the owners of the industry to prevent the release of waste water in river
- Provisions of restricting local residents in terms of bathing, washing clothes, bathing cattle near the banks of river.
- The Indian government has imposed very strict rules and regulations for the effluent discharge to protect the environment.

REFERENCES

- [1] Boyd, J. (2000) "Unleashing the Clean Water Act, the Promise and Challenge of the TMDL Approach to Water Quality," Resources, Issue 139.
- [2] D.C. Dairy statistics (2002) New Zealand Dairy statistics 2001/02. Livestock improvement, Private bag 3016, Hamilton
- [3] Dairy Industry waste water sources, characteristics and its effects on environment by Bharati S. Shete^{A*} and N. P. Shinkar^B